

The Potomac Crossing

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Introduction

The Potomac Crossing is the seven and one half mile corridor of Interstate 95, starting South of St. Barnabas Road in Maryland and extending across the Potomac River into suburban Virginia, ending at Telegraph Road. This seven and one half mile corridor sees a daily traffic volume of over one hundred and ninety five thousand cars. With this much traffic volume in such a short stretch of road, it was no surprise that excruciatingly lengthy bottle necks are a daily occurrence. A visit to the D.C./Virginia/Maryland region, and you'll see just why it was time for some major road/bridge improvements in one of the worst bottle necking stretches of road in the country.

Planning

The Potomac Crossing project did not just develop overnight, as some people have speculated. In fact, the actual improvement planning process began in 1988. Initially, the process involved setting up studies to determine what the traffic needs would be in the twenty-first century, and then determining how to meet those needs with the current road and bridge conditions. The initial study would eventually take eight years to complete, and the outcome was as predicted-numerous recommendations and changes were needed to keep up with the population growth, including the construction of a much needed new Woodrow Wilson Bridge. In 1998, the Potomac Crossing Consultants, consisting of Parsons Brinckerhoff, URS Corporation, and Rummel, Klepper, and Kahl, completed the Woodrow Wilson bridge design. Finally, in 2000, the final environmental impact study was completed with the go ahead.

The next step, as in most any construction project, is determining who or what would be financing a project of this magnitude. Eventually the costs of the project would be divided four ways: with the state of Maryland contributing 3.5 million dollars, Virginia contributing 515 million dollars, and the District of Columbia with 16 million dollars. Who are we forgetting, oh

last but surely not the least the good ole' Federal Government would end up kicking in one thousand six hundred and thirteen million dollars.

Designing the Potomac Crossing

The Potomac Crossing is one of the largest on-going federal highway projects in the history of the United States, with a projected cost for completion of 2.43 billion dollars. To accomplish this mega undertaking, bridge and road contractors from all across the United States would be recruited to bid on; and if selected to become part of this ongoing heavy highway construction challenge. The basic overall construction process requires a work force, on any given day, from one thousand to two thousand workers along this seven and one half mile stretch known as The Potomac Crossing, encompassing over seventy bridges and four major interchanges consisting of Interstate 95 at Route 210/Indian Head Highway, Route 295 at Interstate 95, access into Washington D.C. from I-95, US Route 1 at 495 and Telegraph Road in Virginia. Not to mention the extensive amount of general road work improvements.

What type of work would be required for such a project, you ask? How about first off moving large quantities of dirt either on land or the actual dredging of the Potomac River, along with the relocation of existing utilities, micro tunneling/boring, installation of hundreds of retaining walls, sheeting and shoring with tie backs, shotcrete walls, relocating numerous electrical transmission towers and poles, installation of sound barrier walls, actual construction of new roads with all the additional road signage, widening of existing highways, and repaving of new and existing roads. Additionally, the construction of quite a few of the new bridges would also require the demolition of the existing old bridges, many of which had been painted with lead paint. We all know what "lead paint" means, when dealing with safety of our employees. The demolition and removal process means lots and lots of concrete concerns, more specifically silica exposure.

The New Woodrow Wilson Bridge

One of the main causes, for much of the bottle necking, was the aging Woodrow Wilson Bridge. Having been completed in 1961, and consisting of only 6 lanes total, it was only designed to accommodate a mere seventy five thousand cars a day. Only 8 years after construction, it had already exceeded its intended capacity. Now, over 40 years later, the existing Woodrow Wilson Bridge carries nearly 3 times that capacity (nearly 200,000 vehicles a day).

The new twin bridges are six thousand, seventy five feet long, and consist of twelve lanes (six in each direction) and seven feet wide shoulders. Eight of the twelve lanes will be used as general travel lanes, which match the current beltway configuration. This will alleviate much of the bottle necking caused by the prior merging from eight lanes of the beltway down to six on the old Woodrow Wilson bridge. Two additional lanes will be used for merging/diverging lanes for local and express travelers, while the two remaining lanes will be for HOV and Express bus service. Eventually the plan is to incorporate the HOV/Express bus lanes into actual rail transit passages, allowing for mass transit via railway.

An additional upgrade to the newly designed Woodrow Wilson Bridge is the 20' height increase over the old bridge, allowing now a 70' clearance. Why would this be important you ask? Well the additional height allows for an increased percentage of boats to pass through without the need

to raise the drawbridge. That percentage equates to a drop from 260 average yearly raisings to a mere 65 annual predicted raisings for the years to come. All this boils down to is less traffic interruptions due to the raising and lowering of the drawbridge.

Before any major construction could begin on the new bridge, dredging of the Potomac River had to be completed. The first contract, valued at 14.5 million dollars, was awarded in 2000. The scope of the dredging consisted of the area south of the old Woodrow Wilson Bridge. This dredging operation would eventually require the movement of 340,000 cubic yards (145 barges) of soil/sediment, and whatever else you can dredge up from the river bottom. This material was then transported, by barge, down to the eastern shore of Virginia—a distance of 170 miles round trip. Once there, it was used to fill a retired strip mine and restore unused farmland. The dredging was completed in February 2001.

The next bridge contract, a 125 million dollar contract, was awarded to the joint venture of Tidewater Construction, Kiewit Construction, and Clark Construction for the installation of the pedestal foundations, which would eventually support the v shaped pier spans. To begin the operation, the joint venture would have to assemble a fleet of barges and barge mounted cranes, in order to drive sheet piling into the river bottom to create a water tight cell. Once the water tight cell was complete, 623 pipe piles, at least 200 feet long, and weighing nearly 90 tons each, were brought in by barge from Gulfport Mississippi and Houston, Texas. These 623 piles, when laid end to end, would total a distance of 22 miles. In order to drive such large diameter piling, to nearly 200 feet below the river bottom, required the usage of two of the largest pile driving hammers in the world. These two hammers were over thirty feet long each, and had a pile driving head wide enough that a six foot worker could easily lay down across it. These pile hammers would generate 368,000 foot pounds of energy and 405,000 foot pounds of energy respectively. In order to lift such gigantic hammers, it took 300 ton ringer crane and a 600 ton ringer crane each with 300 foot length of boom.

Once all piles were driven, rebar cages were constructed and placed inside the driven pile. The rebar caged piles were then filled with concrete. The next step was the construction of the rebar pedestal cages, once those were complete, concrete forms were placed around the rebar pedestal cages, which were once again filled with concrete.

On any given pedestal, anywhere from 2000-6000 cubic yards of concrete was placed. In order to meet such high demand quantities of concrete, the joint venture had a batch plant constructed on Maryland shore side of the Potomac River. Once manufactured, the concrete was transported over to the piers by either hoppers or concrete trucks, located on barges and tug boats. To actually place the concrete into the pedestals, a Rotec machine mounted on a barge was used. A Rotec is a 100 ton grove crane with a conveyor system mounted on top of boom. The concrete rides on top of conveyor to point of discharge into the pedestal. Once a pedestal was poured, granite slabs were placed around the pedestal base. This created the foundation for the actual bridge spans. The disassembly of the water tight cells, pulling out the installed sheeting and shoring system, and the final demobilization for this particular contract was complete on July 1, 2003.

As you all probably realize, working on rivers or any other waterway for that matter, involves many unique challenges. For instance, we had to provide employees general transportation out to our water sites, via the usage of tug boats, work boats, barges. Then they had to have an additional means of transportation to move them around the worksite once they were out there. The hazards associated with this mode of transportation were even more apparent, because our

worksite locations were directly in line with an active shipping channel. This meant anywhere from barges and sailing boats to extremely large shipping vessels would travel through our “worksite”. Some additional requirements for our site included not only having to comply with OSHA 1926 Construction standards, but also The Army Corp of Engineers EM385 and Coast Guard requirements.

Through next couple of years, numerous additional contracts were awarded on the Potomac Crossing project. For instance, bridge contract BR-3C, a 191 Million dollar contract, was awarded to American Bridge Company and Edward Kraemer and Trumbull Corporation. This contract included the fabrication of casting beds on the Maryland side of the Bridge, which would be used to cast 616 various segments for the 12 V-shaped piers. Once the segments were cast, they would be brought out by barge to their respective place, and then put in place via crane. Once the V-shaped piers were complete, the structural steel was placed, decking laid, rebar placed and additional concrete poured. This concluded the major construction items needing completion for the new Woodrow Wilson Bridge, however numerous other construction items still needed to be completed.

Bridge contract BR-3A, a construction contract worth 186 million dollars, involved the construction of a moveable span, known as the draw bridge. This contract was again awarded to American Bridge Company and Edward Kraemer and sons. The drawbridge was constructed in place, through the usage of an extensive formwork system, followed by the placement of structural rebar. Once the formwork and rebar mat was complete, over 8,000 cubic yards of concrete was placed. The 2000 ton each bascule leafs, as they are called, were then brought in by barge from Texas. The total weight, of the 4 leafs, equal that of the weight of the Eiffel Tower. This particular segment of work was so significant that it was featured on “Extreme Engineering” on The Discovery Channel.

Bridge contract BR-3B consisted of 2600 feet of bridge span from the Virginia approach side. This 115 million dollar contract was awarded to the joint venture of Granite Construction and Corman Construction. Construction consisted of driving 410, 40 foot lengths of concrete pile into the ground, along with the construction of two additional casting beds on the Virginia side, which would be used to construct additional segments of the V-shaped piers. Once the piles were driven, pedestal rebar cages and form work were constructed, followed by the pouring of concrete to fill the pedestals. As in contract BR-3C, the cast pier segments were transported and placed on top of the completed/poured pedestals. Once the pedestal and pier segment construction was complete, the steel placement began, followed by decking, rebar, and placement of the concrete.

Contracts BR-3A, BR-3B, and BR-3C, all associated with the construction of the twin Woodrow Wilson Bridges, are now more than 60% complete. The completion of the outer loop was celebrated with the dedication of the first new Woodrow Wilson Bridge on May 18, 2006, however the first bridge over the Potomac was actually not officially complete and available for use until June of 2006. The Secretary of Transportation, the honorable Norman Mineta, was present at the dedication ceremony; along with the Governor of Maryland, Robert Ehrlich, the Governor of Virginia, Timothy Kaine, and the Mayor of the District of Columbia, Anthony Williams, along with various other distinguished guests. The dedication ceremony’s main highlight consisted of a flyover by the Blue Angels, which signaled the completion of the first phase of this massive project.

Once the existing traffic pattern was able to be switched over to the completed outer loop and bridge span, the demolition of the adjacent old bridge could begin. In order to allow crane placement adjacent to the new bridge, the old span on the Virginia side would have to be completely removed. To expedite this process, the joint venture of Corman Construction and Granite Construction decided to use explosives to drop the 1600 feet of old span to the ground. Once the steel was on the ground, this allowed a safer means for employees to cut up the steel scrap, which would then be hauled away by truck. Before any such cutting and hauling could begin the bridge would first have to come down. To accomplish such an extensive demo plan, Demtech, an explosive demolition contractor out of Wyoming, would be hired to plan, place, and set off the explosives required to take down the old span.

As with any high risk activity, a demolition plan was developed. This demolition plan consisted of numerous preparation works including a significant amount of steel preparation, conducted by Corman Construction, for the placement of the explosives. This work, that Corman Construction would complete, consisted of having to burn holes in the existing steel bridge span in 548 different locations. Demtech would then use over 208 pounds of RDX explosives, which delivered over 6.5 million pounds of energy at the focal point of the explosion. RDX explosives are linear shaped charges 9 inch-8 ½ feet in length, and burn at a rate of 28,000 feet per second. In order to ignite such an explosive system, 31,000 feet of primer cord along with 46 different delays were required.

On the days leading up to the implosion, several other tasks had to be done besides just the placing of explosives. For instance, fifteen seismographs had to be placed strategically at various locations around the site including the Jones Point Lighthouse (constructed in 1860), a local cemetery, and of course all along the adjacent local residences. Public notices of the blasting operation had to be sent out and publicized to help control any mass hysteria or confusion the loudness of the blasting operation could cause. Once all the preliminaries were complete the scheduled bridge demo could proceed.

The bridge demo was scheduled for midnight on the night of Monday, August 28, 2006. Why would you want to conduct such a high risk activity for the middle of the night you ask? Due to the high volume of traffic flow during the day, the public risks and potential interruption in traffic flow was just too overwhelming to have to deal with. So it was all set to be just the contractors and a few random sightseers, however the Potomac Crossing Consultants (PCC) ran a contest, shortly before the scheduled demo, with the prize being the opportunity to push the handle of an antique blasting plunger to signify the actual setting off the bridge implosion by the blasting subcontractor. With the word of the blasting spreading like wildfire, news stations from around the world were inquiring about the explosive event. And actually on the day/night of the demo, over 20 local and national news stations had set up shop to film and document this day in the Woodrow Wilson Bridge's history. Additionally, the involved contractors had to not only manage the intruding public and media, but also had to manage and coordinate with the local Fire Marshal, Alexandria police, Virginia State Police, Maryland State Police and the National Park Police. American Bridge, a neighboring contractor, also had to be included in the coordination due to their close proximity to the blasting site and the potential exposure to their equipment and employees to whatever course it took. It was established that the local fire company would be onsite throughout the blast, in case something should not go as planned. Additional areas of responsibility were designated to a cadre of supervision and workers, who would patrol the job site, Jones Point Lighthouse Park, the local cemetery, along with the Washington Street Bridge to

ensure that the various areas were clear of all unauthorized personnel. For being such a “low key” event, people were found hiding in the cemetery behind grave stones and in trees trying to get the best view of the explosion. The pedestrian traffic along the Washington Street Bridge generated a crowd of over 1000, who had gathered to witness the demo of the old bridge. The new span of the bridge, 50 feet from the demo site, had to be cleared three times by the Virginia State police because of so many cars stopping on the bridge trying to witness the explosion of the old bridge. Once the final walkthrough for intruders was complete, all personnel were accounted for, and the State Police had cleared traffic off the new bridge span, the time came to set off the implosion at 12:30, a mere 30 minutes later than planned. The implosion was set off without a hitch. Immediately following the demise of the old span, the next half hour was strictly dedicated to checking the bridge for misfires and structural integrity. Only 25 misfires were found, and of course not much was left of the old span of bridge. The following work day consisted of clearing all of the debris and hauling it away. Once this was complete, the beginning of the second twin bridge began. The process will be almost identical to the outer loop bridge span; hence they are “twin” bridges. With the second span planned for a mid 2008 finish, it looks like a promising future for the new Woodrow Wilson Bridge.

Facts of Interest

The total weight of steel included in both twin bridge spans of the Woodrow Wilson Bridge is in excess of 140 million pounds. The total number of bolts used on this project alone included over 1.6 million. The total length of the actual 288 bridge beams, when placed back to back, equals 97,000 feet or 18.5 miles. Total cost of the Woodrow Wilson Bridge alone was almost 650 Million dollars.

Work on the Potomac Crossing Land Contracts

While the work on the Woodrow Wilson Bridge is the main feature of the Potomac Crossing project, it is only one piece of the total package consisting of 73 bridges and countless other noteworthy construction projects. The environmental package alone totaled 50 million dollars, which included mitigated planting, installation of sound walls, habitat preservation, wet land creation, river grass planting, reforestation and stream restoration, along with countless other impact studies and future environmental planning. The following contracts also are working at this very moment with most over 50% complete: VA-4 US ROUTE 1 Interchange, which is a Virginia tie in contract valued at 54.6 million dollars, awarded to Corman Construction to build a new Washington Street bridge and for the removal of the old Bridge. The VA-5 US ROUTE 1 Advance bridge contract awarded to RR Dawson, a 38.39 million dollar contract to construct the longest and overall largest bridge, which will parallel the outer loop of the beltway and provide the outer loop local lanes of the new beltway. The US ROUTE 1 Interchange contract VA6/7 was awarded to Tidewater Skanska Inc., a 1466 million dollar project contract, which is the largest single contract awarded and includes the construction of 19 bridges.

The Telegraph Road ground preparation contract awarded to Shirley Contracting for 2.98 million dollars. I- 295 Contract MA 2/3 awarded to G.A. and F.C.Wagman for 45.4 million dollars includes construction of 22 Bridges and high mast lighting. Maryland contract MB1/2 awarded to F.C Wagman for 18.7 million dollars includes retaining wall installation, noise barrier walls, and slope stabilization. MD 3, MD 210, and Oxon Hill Interchanges awarded to Corman

Construction include 44.2 million dollars to construct four new bridges and demolish two existing bridges. Maryland access to Harbor place one bridge awarded to Shirley Contracting.

Generally speaking, the safety hazards and construction aspects associated with the Potomac Crossing project are no different than most any other job in heavy civil construction. The main difference is that these hazards and construction aspects were and continue to be spread along a 7 mile stretch of road, and consist of numerous different contracts and hundreds of contractors. The quantity of excavations, confined spaces, foundations, columns, piers, working at extreme heights, demolishing, lead abatement, silica exposure, working over and above the water, working at night, working on the Interstate right next to cars driving sixty five miles per hour if we're lucky, utility work, pile driving, constructing formwork, placing concrete, working with cranes , forklifts, front end loaders, backhoes, excavators, working out of hundreds of aerial lifts just multiplied the chances of having accidents .Were there accidents you ask? Yes, but I'm certain the severity and incident rates were considerably less than the potential, due to the efforts of all those involved including all the safety personnel and most importantly the efforts of all the employees and their acceptance and willingness to do the right thing.

With a end note, I would like to quote from Winston Churchill, Prime Minister of Great Britain during World War Two, "This is not the end, nor is it the beginning, but it is the beginning of the end." Or something like that.

In order to even begin to undertake and manage successfully the safety and health of the hundreds of daily employees, general public, not to mention the environmental concerns of the Potomac Crossing project required a small army. Many safety engineers, managers, directors, and various other personnel were involved in the daily operations to ensure that the project was completed as safely as possible. At this time we would like to acknowledge those whom we had the pleasure to meet and/or work with on this project: Dana Harbold-Corporate Safety Director Wagman Construction, Mike Pickeral-Safety Manager Wagman Construction, John Arnoux-Safety Manager PCC, Bob Miller-Safety Manager PCC , Chris Clagget -Safety Engineer American Bridge /Kraemer Construction, John Voigt-Safety Manager Skanska/Tidewater, Glen Dixon-Safety Manager Skanska/Tidewater, Jim Summers Safety Superintendent Shirley Contracting, John Sewell-Safety Superintendent Shirley Contracting, Chuck Short-Corporate Safety Director Shirley Contracting, John Dowdell-Safety Manager R.R. Dawson Construction, Rick Reinkey-Safety Manager Granite Construction, Jim Ralston-Safety Manager Corman Construction, Donald Barr- Corman Construction, along with our buddies at Zurich Insurance North America, who were kind enough to stop in and lend an extra set of eyes.