

## **GARRETT RAILROAD UNDERPASS PROJECT**

### **INTRODUCTION: Herbert P. Kleeman, Mayor, City of Garrett**

The City of Garrett, with the assistance of DeKalb County, the Indiana Department of Transportation, CSX Transportation, S.E. Johnson and Congdon Engineering Associates, completed in 2000, a project of great importance to Garrett.

This project has a long history. In 1919, one of my predecessors, Mayor J.A. Clevenger, was encouraged by the Garrett Community Club to get “a satisfactory crossing of the Baltimore and Ohio railroad in the city.” The local group had encouraged such action before World War I, but the effort was delayed until the war was won in 1918.

Mayor Clevenger stated that he would immediately write the state public service commission to “get that body to order the improvement made.”

Seventy-eight years later, in late 1997, after meeting with Judy Congdon, our city attorney, city planner, and me, the Indiana Department of Transportation finally gave the go-ahead for the project.

The B&O railroad founded Garrett in 1875, and the railroad has remained a major influence in Garrett’s history. B&O’s descendant, CSX Transportation, has a major rail switching yard and terminal in Garrett that essentially divides the city into two halves (north and south).

When CSX purchased a portion of Conrail, rail traffic through the CSX Garrett terminal significantly increased. Growth in Garrett is also causing additional vehicular traffic on Randolph Street (State Road 327), the main north-south arterial street in Garrett.

Traffic back-ups at the Randolph Street-CSX grade crossing before completion of this project were common, and on the increase. In late 1994, Congdon Engineering Associates began meeting with City of Garrett representatives to review several options for rectifying the chronic tie-ups. After reviewing preliminary designs for an overpass and an underpass, a 1996 Feasibility Study determined that the underpass option was more feasible. An underpass was deemed better for the city since an overpass would have required demolition of several existing buildings on both the north (houses) and south (downtown commercial) approaches.

In addition to major utility relocation including water, electric and phone lines, there was the question of draining the underpass. When we announced that an underpass would be constructed, instead of an overpass, there was a great deal of concern about flooding. Garrett was essentially built on a swamp, and soft ground and floodings have been chronic problems in several parts of the city. The flooding concerns of Garrett’s citizens were finally put to rest after a five inch rain last fall left the completed project totally dry.

Construction for the project was started in subzero weather in January 1999. A temporary railroad trestle was constructed to allow train traffic to proceed unobstructed while the permanent bridge was built. The permanent bridge was completed in August 1999.

As might be expected with a fast track project, several problems were encountered throughout construction. Diligent engineering work by Congdon, along with the participation of all project partners including S. E. Johnson in the partnering effort sponsored by INDOT and patiently facilitated by White Knight Services helped to smooth out any logistical and engineering problems that we encountered along the way.

The underpass opened last July, and has served to unite our community, both literally and figuratively.

**OVERVIEW: Judith G. Congdon, P.E., President, Congdon Engineering Associates, Inc.**

The approximately twenty long through trains per day, and the numerous switching movements associated with the nine track yards on either side of Randolph Street, were cutting off access between the north and south halves of Garrett and seriously interfering with emergency operations. Previous considerations of an overpass structure left the city with the option of replacing a north-south division with an east-west division, since an overpass would create a physical and visual barrier extending into the Central Business District, and would seriously affect, if not demolish abutting businesses.

In late 1996, the city contracted with Congdon Engineering Associates, Inc. (CEA) for a feasibility study to address the problem. While an overpass structure was also considered, for the first time an underpass option was given serious consideration. The existing tracks were only a foot higher than the surrounding area, but since the vertical clearance for a roadway (5 meters or 16 ½ feet) is so much less than that required for a railroad (7 meters or 23 feet), the roadway could be brought back to existing grade in a much shorter distance thus keeping open the intersections of Railroad Street to the north and Quincy Street to the south with only minor grade adjustments. There would also be no impacts on the CBD, and no significant damage to existing businesses.

Only two small problems remained with the underpass option: (1) there was no place to drain the underpass to, and (2) an underpass would cost considerably more than an overpass. The first problem was solved with a lift station and 7000 foot force main; and the second by showing that the project was justified from an economic standpoint, even at the higher cost, especially since social and environmental factors greatly favored the underpass.

While the feasibility study was ongoing, CSX Transportation and Norfolk and Southern Railroad were negotiating for the acquisition of Conrail's trackage, including the tracks passing through Garrett. As soon as it was announced that an agreement had been reached among the three railroads, contact was made with CSX Transportation, requesting funding for twenty percent of the construction costs of the proposed underpass. When CSX agreed to participate at this level, Garrett and CEA met first with the Indiana Department of Transportation to request eighty percent federal funding of the construction and construction engineering, and then with DeKalb

County to request help in funding the engineering and right of way acquisition. Both INDOT and the county agreed to the requests. However, CSX had placed some restrictions on their agreement to participate. The permanent railroad bridge had to be open to rail traffic by September 1, 1999 (it was currently autumn 1997), rail traffic could experience only minor interruptions, CSX would add another through track on the north side, which would also be carried by the bridge, and the number of trains would double to approximately forty per day by autumn 1999 and to approximately seventy per day by spring 2000.

Adding the new track on the north side meant that a temporary runaround, as had been proposed in the feasibility study, would no longer fit, and temporary construction would be required to keep the trains running. Only short-term closures of fourteen days and twenty-one days, on only one track at a time, would be permitted by CSX. In addition, due to having to have the permanent railroad bridge open by September 1, 1999, no permanent right of way could be acquired since the schedule would not allow for the slow federal aid right of way acquisition process. The agreements were in place between all parties, CSX, INDOT, Dekalb County, the City of Garrett and CEA by the end of January 1998, and design work could begin. The project was scheduled for a September 1998 letting with plans required at INDOT in July 1998, allowing less than six months for design.

Design proceeded at a hectic pace, with intermediate submittals being walked through INDOT and CSX for approvals. Consistent cooperation by the design divisions of both entities was essential for meeting the schedule.

A temporary trestle structure was designed to support the three existing plus one new railroad track, with only one track at a time allowed to be out of service for up to twenty-one days while the trestle was constructed. Once the temporary trestle was complete under all four tracks, excavation began for the permanent structure. This construction was also completed under one track at a time so that train traffic experienced almost no interruption. The temporary trestle was put into service twenty five days ahead of schedule and the permanent structure was completed fourteen days ahead of schedule.

In order to avoid acquisition of any permanent right of way, soil anchored, or tieback walls were planned along both sides of the depressed roadway. This type of construction avoided the large cut areas that would be required for conventional retaining walls or mechanically stabilized earth walls, and made construction possible within the available right of way.

Sidewalks along both sides of the depressed roadway provide pedestrians access beneath the well lit underpass, with separate sidewalk grades of less than five percent complying with ADA requirements. At the low point of the roadway, the walkways wrap around the outsides of the piers so that the center bridge span could be kept shorter, thus keeping the structure depth less and the entire project length as tight as possible. With no convenient outlets for storm water, drainage is handled by means of a three phase lift station and force main carrying roadway drainage 7000 feet east to the Carper Drain. Road and bridge construction began on the project in January 1999 and the roadway was open to traffic in July 2000 just eighteen months later.

The many long term benefits include improved daily access on SR 327, Randolph Street, through Garrett, improved emergency access, reconnection of the north and south halves of the city without sacrifice of businesses or other amenities, and preservation of Garrett's railroad heritage without it being an impediment to the city's growth.

The City of Garrett now has its north and south halves reconnected with an underpass structure of which they are extremely proud. Although many local residents, including some city employees, insisted that the underpass simply could not be built, they happily started using it, just two and one half years after the start of design.

This project was featured as Construction Digest's cover story in November 1999 receiving an Indiana Cities and Towns 2000 Community Achievement Award and a Consulting Engineering of Indiana 2001 Engineering Excellence Merit Award.

**DESIGN: Randall K. Henderson, P.E. Manager Bridge Department Congdon Engineering Associates, Inc. and Project Manager for the Garrett Railroad Underpass Project.**

A kick off meeting for the Garrett Railroad Underpass Project was held with all parties involved January 23, 1998. Survey began shortly thereafter. Five design submittals were required to INDOT (structure size and type, preliminary field check, preliminary plans for final approval, final check prints, and final tracings). The hearing submittal was not required since no permanent right of way was being acquired. Each submittal was walked through in person with the INDOT reviewers. Each submittal was also sent to the railroad for their review and comment. An on site preliminary field check was held in March 1998 with all parties involved and the geotechnical investigation began at the same time. Although a public hearing was not required, a public information meeting was held to inform the public of the project. Final tracings were submitted in late June 1998. A prebid meeting was held at the Ft. Wayne District Office in August shortly before the September bid date to get contractor input on constructability and to inform contractors of the project.

Since temporary runaround tracks were not feasible to maintain rail traffic, a temporary trestle structure lifted into place in sections was chosen as the best option to maintain train traffic.

As mentioned previously, the railroad required that only one track could be closed for construction at a time. The south track could be closed for a maximum of 14 calendar days. The other three could be closed for up to 21 calendar days each for installation of the temporary trestle sections and permanent end bent piling. When it was necessary to have equipment within eight feet of an adjacent track, the adjacent track could be closed for up to 16 hours.

The temporary trestle consisted of four spans at 30'-2" each with a 0° skew. The temporary supports had to be constructed between the proposed permanent supports, and the temporary superstructure had to clear the proposed permanent substructures.

Each track was supported by four W33, A36 steel I-beams. Timber track ties were mounted on top of the beams. Timber joists spaced between the ties, with timber planking mounted on top, were used for temporary walkways between each track and along the outsides of the tracks. The

temporary trestle was designed for Cooper E80 loading. All temporary structural steel was unpainted, and all timber was untreated.

Each interior bent HP 12x53 steel H-pile was predrilled to approximately 23.5 feet below the existing ground to allow for excavation of the underpass. A 70-ton design load was used for each pile.

Temporary sheet piling was driven between the three northern most tracks to allow for excavation of the bent caps for one track with train traffic on the adjacent track. After the bent caps were in place, the superstructure sections were lifted into place, attached to the bent caps, and the underpass at the bridge was excavated out. The temporary cross bracing was installed on the interior bents as excavation proceeded down.

The permanent piers and end bent caps were then constructed. As sections of the permanent superstructure were ready to be installed, the temporary trestle piles were cut off below the proposed subgrade at the interior supports, and the trestle sections were lifted out as the permanent sections were lifted in.

For removal of the temporary trestle and installation of the permanent superstructure, the south track could be closed for a maximum of seven calendar days and the other three could each be closed for up to ten calendar days. The same requirements for only one track to be closed for construction with up to 16 hours of adjacent track closure if equipment was within eight feet of an adjacent track also applied. Since the temporary trestle had to be constructed early on in the project, the railroad decided to fabricate and supply the structural steel and timber for the temporary trestle to avoid any supplier delays.

The permanent bridge structure chosen for the site was a three span 26.42', 37.34', 26.42' ballast deck structure skewed 7° 30' Lt with a 69.75 foot out to out coping width. Six foot wide sidewalks along both sides of Randolph Street were routed under the end spans. A three span structure was chosen over a single span structure to minimize the superstructure depth and the lifting weights of the superstructure sections. The bridge was designed for Cooper E80 loading with diesel impact. The stringers are painted W27 steel I-beams. Weathering steel deck plates are welded to the top of the beams, and asphalt mastic is used on top of the deck plates to create a cross slope for drainage. A waterproofing membrane is laid on top of the mastic and two layers of asphalt plank are placed on top of the waterproofing to protect it from the ballast.

Precast bridge rails and abutment backwalls were utilized to save time. Also, it was felt that vibrations from train traffic could cause cracking of cast in place concrete. Temporary ballast retainers were used as each section of the superstructure was installed.

The interior supports are five foot wide wall piers with six foot wide caps on spread footings. The wide pier stems and caps are the minimum that the CSX would allow. The end supports are pile bents with two rows of S.E.C. piles predrilled ten feet below the existing ground.

The underpass retaining walls are tieback walls with steel H-pile soldier beams, timber lagging and a cast in place concrete wall facing. Four foot wide vertical geocomposite drains spaced at

eight feet and outletting into weep drains under the sidewalks were used behind the walls for drainage. The maximum height of the walls is 23 feet. The total length of walls is approximately 1150 feet.

A soil nailed retaining wall was originally proposed but was changed to the tieback wall when numerous sand seams made it extremely difficult to shotcrete the cut faces before they would collapse.

Conventional cast in place R.C. retaining walls and mechanically stabilized earth (MSE) walls were not feasible due to right of way restrictions and due to their higher cost. The railroad would only allow R.C. retaining walls adjacent to the sidewalks under the bridge.

Randolph Street under the bridge consists of nine inch plain concrete pavement providing two 12 foot lanes, two four foot shoulders and two six foot sidewalks. Since the maximum road grade is 8% and ADA requirements allow a maximum of 5% for walks, the sidewalks had to be constructed on a different grade from the road. The standard six inch curb section transitions to a 6.28 foot barrier rail section by the time the walk intersects the bridge.

To control storm water drainage into the underpass, a lift station was constructed at the southeast corner of the bridge. The lift station consisted of three 75 hp electric submersible pumps mounted in a 43.5 foot deep pit. A diesel powered standby generator provides power to the pumps during power outages. Approximately 7000 feet of 24 inch diameter force main was required to reach the outlet at Carper Drain.

**CONSTRUCTION: Keith A. Lytton, P.E., Manager, Construction Engineering Department, Congdon Engineering Associates, Inc. and Resident Project Representative for the Garrett Railroad Underpass Project.**

The construction phase of the project got off to a slow start due to difficulty in relocating a GTE fiber optic cable beneath Randolph Street. Construction for the underpass itself was not started until January 18, 1999 while construction at the lift station and force main began in November 1998.

The subcontractor began work on the shaft for the wet well on November 9, 1998. The well was excavated, and a prefabricated metal ring was built and placed in lifts as the excavation proceeded. The wall of the wet well was excavated as close to the exact dimensions of the prefabricated shell as possible. The small void that was left was back-filled with stone after the shell was complete.

The well was excavated to an approximate depth of 48 feet and no problems were encountered until at 38 feet a seam of gravel was exposed. This seam was located approximately 20 feet below the ground water level, and a large infiltration of water was encountered. This required several pumps to keep the water levels down so that work could progress. It was estimated that over one million gallons a day were being pumped at this point. The shell placement continued, and it was hoped that this would seal some of the gravel seam, however, this did little to stem the influx of water.

When the excavation reached the elevation required, the contractor began form and reinforcement placement. The lower wet well chamber was to be poured in place while the shaft for the piping system was to be precast and placed tongue in groove. The infiltration of water was helpful at times as the excavation was allowed to flood and the water was used as a curing agent for the poured concrete walls and roof. The chamber was placed in several pours. The floor slab was poured on December 11, 1998. The walls were poured in two eight-foot sections and the roof of the wet well was placed on February 4, 1999. Curing was performed and the area between the wet well chamber and the prefabricated steel ring was filled with pea gravel. The precast concrete shaft sections were placed and once again, the open areas were filled with b-borrow.

Originally, a gravity storm sewer system had been planned for the removal of water from the lift station. It was discovered, however, that the required thirty feet of clearance from the outside south rail, as indicated on the railroad valuation maps, was questionable in some areas. As an alternative to having the contractor place sheeting for an extended length of trench, the design team opted for a 24 inch force main that would use the existing city right of way along with railroad right of way and would still allow the water to discharge into Carper Ditch. The pipe used was a 24" Polyethylene pipe with two air release valves placed at high points on the run of pipe.

The placement of the force main started at the exit point on March 16, 1999, and was brought to within 20 feet of the newly placed valve pit in a little over a month on April 20, 1999. The pipe was placed outside the roadway itself except where residential housing forced the placement of the pipe within the roadway. This type of pipe proved its flexibility, as there were many underground utilities that had to be worked around. The pipe, with an approximate five degree allowable deflection, proved to be invaluable, as on many occasions it had to be moved lower by up to 12 inches. This was done by moving the 20 foot sections within the bell of the pipe.

Three four inch pumps that are 75 hp, with a total capability of pumping 8800 GPM, power the lift station. These pumps are regulated by a bubbler system with a backup float function. The bubbler system works based on the pressure of the weight of the water compressing the air in a tube. When the air is compressed to a preset pressure, the pump will start. The system is powered by electricity with a diesel generator backup. The chamber holds 3771 cubic feet of water. If the entire chamber were filled, the three pumps could empty the chamber in three minutes and 13 seconds.

Temporary bridge construction started on January 18, 1999. Over the next two months, over 8800 linear feet of H-Pile was driven for the temporary structure. The trestle had to be constructed for each track one at a time, and the contractor was to have twenty-one days to perform the replacement of each track. The railroad, however, helped the contractor by removing ballast and moving railroad ties to the sides so that piling could be driven without closing the tracks for more than the 16 hour daily closure. This left only the piles that were located directly in the area of the rails of each track to be placed. This amounted to only eight of the 128 piles. When each track was closed for the official 21 days, or 14 days for track number

four, the contractor had only two piles to drive instead of 32. This allowed the contractor to move directly to the removal of tracks, excavation of soil and placement of the pile caps.

The piling did present some problems as the piles were twisting and moving some from the original positions. When the piles were excavated to place the caps, it was discovered that some piles were seriously out of alignment and were not completely under the pile caps as required by plans. A design was submitted by the contractor that would allow for three different scenarios to be used in which plates or braces were added to the piles so that the weight was distributed to the piles as originally planned.

When the pile caps were placed, a temporary structure that was prefabricated by the railroad was placed on the caps and welded into place. With one track being placed at a time, when a new rail structure was placed, it had to be welded to the structure sections already placed. Bracing was also added as the structures were placed. Bracing between the structures was very important, due to the fact that when the structures were placed, only approximately five feet of piling below the caps was exposed. As excavation progressed, however, 19.4 feet of piling would be exposed. With this much piling exposed a large sway could take place when the trains were using the structure.

The proposal originally had allowed for the contractor to work within eight feet of the passing trains. After the construction was already underway, the contractor was informed by the railroad that federal requirements stated that no work could be performed within thirty feet of passing trains. The contractor would be required to clear the area of personnel and all equipment when trains passed on any of the adjacent tracks. While an agreement was reached with the railroad, and the contractor could once again work within eight feet of passing trains, a total of seventy-one hours of work time had been lost which set the contractor back almost two weeks.

The proposal also stated originally that the contractor had to have all temporary structures completed by June 30, 1999. At a partnering meeting, CSX informed the other partners that the date had to be moved to June 1, 1999. The contractor indicated that with the present conditions this would be impossible. The state agreed to pay the contractor additional incentive bonuses to accelerate the project. With the original two month utility delay and the lost time due to the clear zone requirement, it would have appeared to be difficult to achieve this date. The contractor, however, had all temporary tracks open on May 6, 1999 and earned the full incentive that was agreed upon.

The contractor began excavation for the permanent structures immediately upon the completion of the temporary structures. Concrete placement began on May 28, 1999 and continued through the summer.

Due to the impending railroad merger, CSX needed the permanent structure opened by Labor Day. The state agreed to compensate the contractor to change the order of their operations. The contractor originally planned on excavating and placing the soil nailed walls after the temporary structures were complete. This would allow for the excavation to progress to the footing elevations while the walls were being placed. With the new stipulations by CSX, the corners had



to be cut back to allow for the footings to be reached by equipment. These areas would have to have special considerations when the walls were being placed.

The corners were cut back and excavation took place just under the structure to allow access to the areas required for pier footing placement. The footings and piers contained almost 575 cubic yards of concrete. Due to the large dimensions of the piers, they were poured in halves, north halves first. The concrete would be generating large amounts of heat during hydration, and for this reason, the pours were performed at night. A concrete pump truck was utilized for all pours, and for the bent and pier pours, areas of the temporary structure ties were removed to allow access to the top of the forms from above.

The permanent structures had to be constructed one track at a time also, but had a more limited restriction of ten days per tracks one, two, and three and seven days maximum closure of track four. The contractor, however, opened the last track in four days.

The rails had been bolted down to the temporary structure. These were unbolted, and the temporary structure was lifted off and placed to the side for dismantling and removal. When the temporary bridge was removed, the concrete backwalls for the permanent bridge were placed. The backwalls were made of precast concrete, with grout sleeve splices inset in the concrete. The backwalls were placed with the grout sleeve splices setting down over the exposed reinforcing steel from the bent. It was attempted to grout the sleeves as planned, however, after the use of three different types of materials, it was discovered that the material had to be more liquid than the high strength grout allowed for the pump to work. The state allowed for the use of epoxy sealer to be used in the splices.

When the backwalls were placed, the beams were brought onto the bents. Beams were set and the steel plates were placed and welded. All steel was required to have 100% welding. The ballast retainers were added and were approximately 18 inches tall. The retainers were made to be removed when the adjoining deck plates were welded together and ballast had been placed. The bolts then would be removed holding the plates in place, and the plates would be pulled from the ballast.

While the ballast retainers were in place, a lift of asphalt was placed with a minimum depth of one and one half inches on the outside of the plates to two and one half inches at the center. This allowed for a crown to remove the rainwater to the edges of each structure. The asphalt was placed with a paving machine. When the pavement was cooled, a layer of butyl rubber was placed, followed by two layers of asphalt planking. This material was placed so that the ballast could be placed and not injure the waterproofing material. Once the asphalt planking was placed, ballast was brought on, and finally, the rails and ties were placed. The rails and ties were prefabricated on the side of the job and lifted in place so that the only work was to rebolt the rails and adjust the rails to the correct elevation. This work was done by railroad force account.

Once a track was complete, the contractor planned to take a day to reset and prepare for the next closure. However, the procedure went so well, two days were often taken due to the long days being worked during this period.

The remaining tracks were placed in much the same way with the exception that the outside tracks had precast concrete walls placed. The walls had steel plates insets on the inside to be welded to the steel plate decking. They also had ferrule loop inserts to allow for bolting of the railing to the deck. These bolts were placed first so that the railing could be released and the next section brought up to the deck. The bolts would then hold the railing until welding on the plates could be completed.

The permanent structure was required to be in place by September 6, 1999, however, the contractor once again finished well in advance of the railroad deadline. The last section was in place, and the permanent structure was open to traffic on August 18, 1999. This was over two weeks in advance of the required date.

When the job was let, the project was to use soil nailing for the retaining wall system with face panels, in accordance with the geotechnical recommendations. When the nailing was started, however, it was noticed on the first day of shotcreting, that the wall was failing. The soil was pulling away under the weight of the shotcrete. Separation started within hours of placement, and by the following morning cracks as large as two inches were recorded. Schnabel was the subcontractor and requested that the vertical wall be cut back approximately 14 degrees from the vertical to reduce the pulling pressure on the soil wall. After cutting the soil back, this was attempted, and while soil movement was reduced, the soil nails that were placed were only approaching 50% of the pressure required per the plans and specs. Schnabel suggested more soil nails in the weak areas, however, this still did not provide the required strength.

At the following partnering meeting, INDOT's soils representatives supported the geotechnical report and felt that once the soil nailing went below the top five feet consisting of a mixture of soil and cinders, the soil nailing would work as intended. However, since this job was to be fast tracked and to keep things moving quickly, Schnabel presented an alternate design for a tieback wall system that was accepted.

The tiebacks were to be a row of H-Piles 12x53 spaced 2.5 meters apart. These were then to have wood lagging placed between the beams and one permanent tieback tendon per H-Pile. The reinforcing steel would then be tied to the welded studs placed on the H-Piles, and the concrete walls poured against the wood lagging. This method worked well from the beginning.

The railroad required an earlier opening date for the temporary structures than had been stated in the proposal, changing from June 30, 1999 to June 1, 1999, and forcing the contractor to alter their schedule. This required the corners by the structure to be built out of sequence, thus not allowing for soil to remain undisturbed before the walls could be placed. With the new method, the piles were driven, the wood lagging placed, and the wall concrete poured all before the backfill was placed. After the walls were complete, the corners were backfilled with number eight stone.

This method was utilized one more time in a way not anticipated. During the wall placement, the contractor was excavating under the structure to prepare for retaining wall placement behind the bents. Behind bent number one, a one-inch seam was encountered where water was seriously eroding the soil under the bent. The water eroded all the soil by the battered piles over a 25 foot

length. The end bent was in danger of serious undermining, and with trains using the permanent structure, it was imperative that a solution be implemented immediately. It was decided to weld studs on the exposed piling, place wood lagging on the piles and to pump concrete behind the lagging. This shut off the exposed water seam, filled the voids created by the erosion and prevented any further exposure.

The walls were started on July 10, 1999, with pile driving. The final wall pour was placed on December 13, 1999. The wall had originally been scheduled for a class two rubbed finish, however, the contractor requested a substitution of masonry coating which was placed in the spring of 2000.

Slopedwalls were placed under the structure at the corners. This was also backfilled with number eight stone. Due to the placement of the permanent structure before the work underneath had been completed, a stone slinger was utilized to place the backfill behind the retaining walls located behind the end bents.

The contractor requested replacement of the subgrade treatment with chemical modification. The state allowed this with the requirement that there be no additional cost to the contract. Lime stabilization was performed on April 6, 2000. Tests passed at over 100% for density and rock placement was started on April 12, 2000. The pavement was to be nine inch concrete with a sub-base of a combined seven inches of number eight and number 53 stone.

Pavement has previously been placed from station 9+950 to 10+000 during the summer of 1999. This was done so that the intersection of Quincy Street and Randolph Street (SR 327) could be opened in advance of the remaining pavement. This allowed the contractor to work on one intersection at a time with 30-day closures allowed for each. The remainder of the pavement was begun on April 19, 2000, and completed on May 15, 2000.

The pavement was placed and followed with the variable height retaining walls. The walls varied in height from 3.34 to 6.28 feet. This was required due to the variable sidewalk slope vs. the road slope. The retaining walls for the sidewalk were tied into the pavement, which allowed for the pavement to act as a footer to protect the wall from overturning from the pressure of the sidewalk and backfill behind the walls. Number eight stone was used as backfill, as this material is semi self-compacting and allows for any drainage needed to the underdrains. Sidewalks were placed last.

The roadway and sidewalks were open to unrestricted traffic on June 30, 2000. After almost eighteen months of construction, with a parade of cars, trucks, school buses, and police, the local population was allowed unrestricted passage between the north and the south halves of Garrett for the first time since the City was founded.