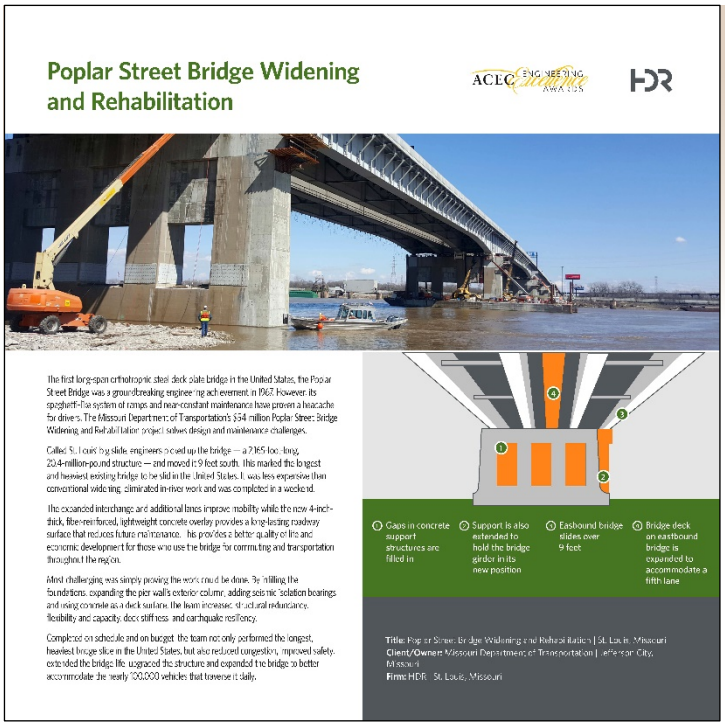
ACEC Missouri

2020 Engineering Excellence Awards

Grand Conceptor Award



HDR Engineering, Inc., St. Louis

PROJECT TITLE:

Poplar Street Bridge Widening and Rehabilitation

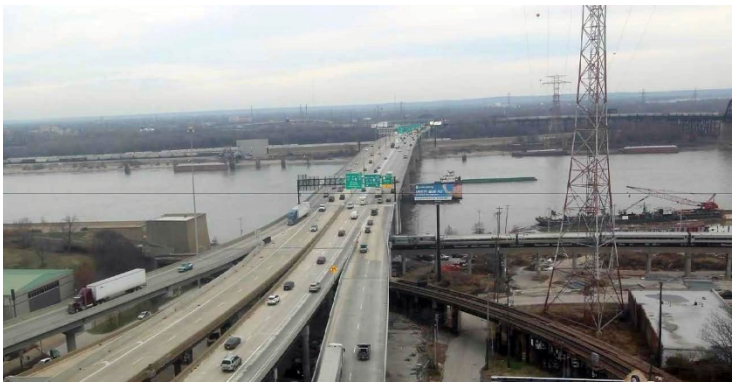
CLIENT/OWNER:

Missouri Department of Transportation

The Poplar Street Bridge is a 50-year old five span (300'-500'-600'-500'-265') 2165' long structure which carries I-64 &I-55 over the Mississippi River in downtown St. Louis and connects Missouri and Illinois. The bridge has twin Eastbound and Westbound superstructures consisting of two variable depth steel box girders (25' max. depth) with an orthotropic steel deck on a shared substructure.

The Missouri Department of Transportation hired HDR to provide the following improvements to the Poplar Street Bridge: 1) Increase lane capacity of the EB Bridge from 4 to 5 lanes in conjunction with improving interchange ramp structures on the Missouri side, 2) provide a new and improved riding surface and 3) Rehabilitate the structure.

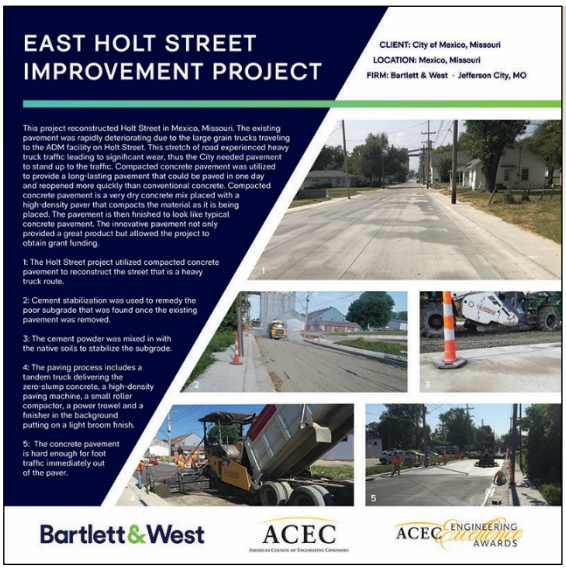
A unique aspect of the project was the sliding of the existing bridge. In lieu of a traditional widening, the eastbound superstructure was successfully slid 9' to the south onto widened piers on March 31, 2018 over the course of 2.5 hours and was widely reported as the 2nd longest bridge slide ever in the United States by length. The eastbound and westbound superstructures were then connected together using a concrete deck on a stringer-floor-beam type cross frame system which added redundancy and improved the performance of the structure.



HDR also improved the riding surface by replacing the existing thin overlay with a 4" lightweight fiber reinforced concrete overlay connected to the orthotropic steel deck by shear studs. The new overlay solves recent problem MoDOT has had maintaining the asphalt overlay but provides added stiffness to the deck system to better help prevent fatigue cracking from occurring.

The rehabilitation of the bridge included the repair of numerous fatigue cracks in the orthotropic steel deck plate system, partially a result of the reduced deck system stiffness from the failed overlay. It also included replacing the existing geared type bearings with lead-core seismic isolation bearings.

Grand Awards



Bartlett & West, Inc., Jefferson City

PROJECT TITLE:

East Holt Street Improvement Project

CLIENT/OWNER:

City of Mexico, MO

Bartlett & West is the City's on-call engineer and was responsible for the East Holt Street Improvement Project to replace a portion of the street that was in disrepair due to heavy truck traffic that utilizes Holt Street to access the ADM facility at the west end. Bartlett & West's services began by helping the City of Mexico, Missouri apply for grant funds to make the project possible, and then providing full design services including surveying and public involvement. During construction, Bartlett & West provided construction administration and observation. Innovative engineering was displayed in the use of cement subgrade stabilization and compacted concrete pavement, which are both unique alternatives to the conventional subgrade and pavement types commonly used in Missouri. After considering pavement options that would provide the strength and lifespan needed on this street for the volume of truck traffic, Bartlett & West decided concrete was needed. However, Holt Street is the only access point for many homes and businesses, so the construction and curing time needed for installation of conventional concrete was not feasible in this location. Compacted concrete pavement provided a solution to these complexities since it has a faster installation method, which allowed the street to be paved in one day while providing the necessary strength and longevity. After the removal of the existing roadway, the project team determined that the subgrade was wet and unsuitable for successful installation of the compacted concrete pavement. The design team decided that cement stabilization, which is uncommon in mid-Missouri, was the solution to poor subgrade that could utilize material found on site, while being conscious of the project budget and schedule. Another complexity of this project was designing ADA compliant sidewalks along the East Holt Street corridor, which was complicated with existing utilities, right-of-way limitations, and coordinating with property owners. Existing sidewalks were only 4' wide, with utility poles embedded in the sidewalk. It was determined that utility poles could not be moved, so the design team had to make use of the space they had. The design team's solution was to maintain a 4' wide ADA sidewalk, and provide passing squares every 200' as required. To eliminate the need for more right-of-way, the team took advantage of the driveways located along the corridor by placing the passing squares within driveways. The installation of a unique pavement material chosen by Bartlett & West over subgrade that was stabilized with uncommon methods to mid-Missouri makes concrete construction methods more competitive with asphalt roadways and provides municipalities new options for future pavement replacement projects.

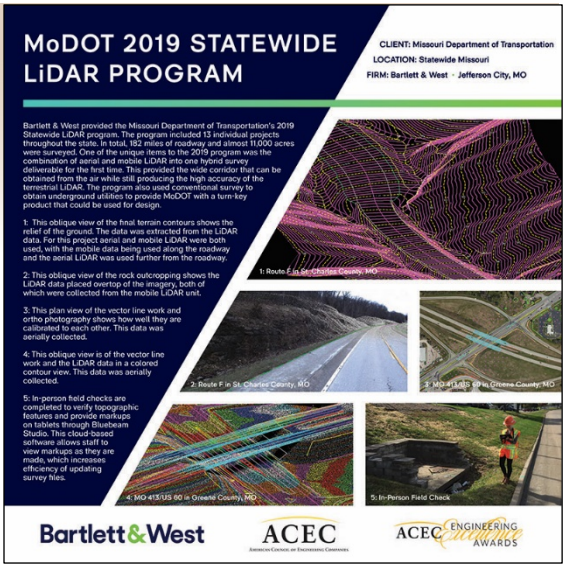
Bartlett & West, Inc., Jefferson City

PROJECT TITLE:

MoDOT 2019 Statewide LiDAR Program

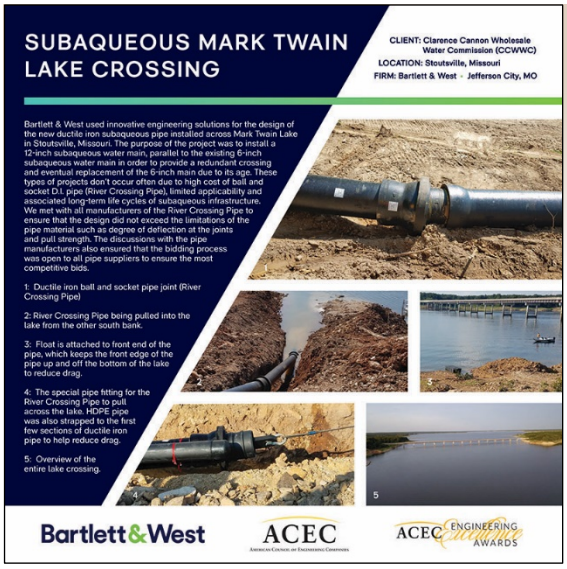
CLIENT/OWNER:

Missouri Department of Transportation



Bartlett & West was selected by the Missouri Department of Transportation's (MoDOT's) Central Office to provide LiDAR services for the 2019 Statewide Aerial and Mobile LiDAR Program after being short-listed and interviewed. The 2019 scope included the surveying of thirteen individual projects, with the goal of providing MoDOT with ready-to-use files for their designers. This year, four projects located in the St. Louis District were designated as "hybrid" projects. MoDOT wanted each of the hybrid projects to be flown for aerial LiDAR and orthography to provide aerial files, as well as scanned with mobile LiDAR for its higher density data for

which to analyze the existing pavement and nearby topography. The mobile data was substituted in place of the aerial data within the critical pavement regions to capture high density survey information such as utility poles, drainage features, manholes, or fire hydrants, for example, which would be helpful for designers when laying out sidewalks, lighting, signals and signing. Three of the four St. Louis projects were urban in nature and one was rural. The hybrid project areas covered 12.8 miles and 343 acres. The remaining nine projects were all rural with LiDAR data acquired by aerial means. One project was in the Kansas City District, and eight were located throughout the Southwest District. Each received orthophoto imaging, ground targeting, aerial photography, LiDAR acquisition and control surveying, which covered a total of 169.4 miles and 10,543.8 acres. One corridor project on I-44 was 69 miles in length with over 3,300 acres of data acquired. MoDOT also required Bartlett & West to complete a conventional survey for obscured areas under bridges, for locating underground utilities such as telephone, water, sewer, gas, and to verify drainage facilities such as manholes, inlets, storm systems and check on flow line elevations. The conventional survey items described are picked up and then compiled with the hybrid LiDAR data to complete a “turn-key” set of survey files in Microsoft Select Series 4, ready for the designer. Another value of hybrid LiDAR is its safety factor. With both mobile and aerial, the units have minimal impact on highly traveled lanes. In the past, the only way to survey existing roadways was to condense lanes so the surveyors could walk out on the pavement for intermittent shots, which caused backups and delays for commuters. A mobile unit can drive one way with the scanner running and turn around and drive the other direction, along with the normal traffic, and be done. An aerial scan is rarely even noticed and therefore both modes are very safe and non-intrusive to commuters. As the project unfolded, communication was key to making sure that all subcontracting survey firms were matching the quality expectations. Bartlett & West field checked all projects and worked with their partners to make the necessary corrections to produce and deliver high quality survey files to MoDOT within the scheduled time frame.



Bartlett & West, Inc., Jefferson City

PROJECT TITLE:

Subaqueous Lake Crossing – North Fork of Mark Twain Lake

CLIENT/OWNER:

Clarence Cannon Wholesale Water Commission

This project is worthy of recognition because of the innovative engineering solutions that Bartlett & West used for the design and installation methods of the new ductile iron subaqueous pipe installed across Mark Twain Lake in Stoutsville, Missouri. These types of projects don’t occur often due to high cost, limited applicability and associated long term life cycles of subaqueous infrastructure. The purpose of the Subaqueous Mark Twain Lake Crossing project was to install a 12” subaqueous water main, parallel to the existing 6” subaqueous water main in order to provide a redundant crossing and eventual replacement of the 6” main due to its age. Bartlett & West’s scope of work included permitting, field surveys and data collection including surveying the bottom of the lake using sonar and GPS, design, construction plans, bid package completion, bidding, and construction administration assistance. Before design and construction took place, Bartlett & West completed a survey of the lake bottom using a combination of sonar and GPS technology that was critical in determining the correct length of pipe required for the jagged profile of the lake bottom. Bartlett & West also coordinated with ductile iron subaqueous pipe manufacturers early in the process, to ensure that the specifications used in design provided sufficient strength and flexibility but were open enough to allow competitive bidding from all U.S. manufacturers. Installation of the unique subaqueous pipe included several safety and environmental risks that were mitigated by the careful installation methods with floats that Bartlett & West used to reduce drag on the bottom of the lake. The project timeline and schedule were critical for multiple reasons. Thirty-four years of water levels had to be studied in detail for the water level at time of installation to be anticipated and to ensure adequate coverage over the pipe for frost protection. Coordinating lead times on permitting from multiple different agencies was another scheduling challenge. Permits were obtained on time through the Department of Natural Resources Water Protection Program, the Department of Natural Resources State Parks Division, the Missouri State Highway Patrol Water Patrol Division, and the United States Army Corps of Engineers. The early completion of this project was important because within one week of the installation of the new subaqueous transmission main, a leak was reported on the existing 6” line. The new 12” subaqueous line is now the single source of water for 11,382 people within the Cannon Public Water Supply District Number 1 and Marion County Public Water Supply District Number 1.

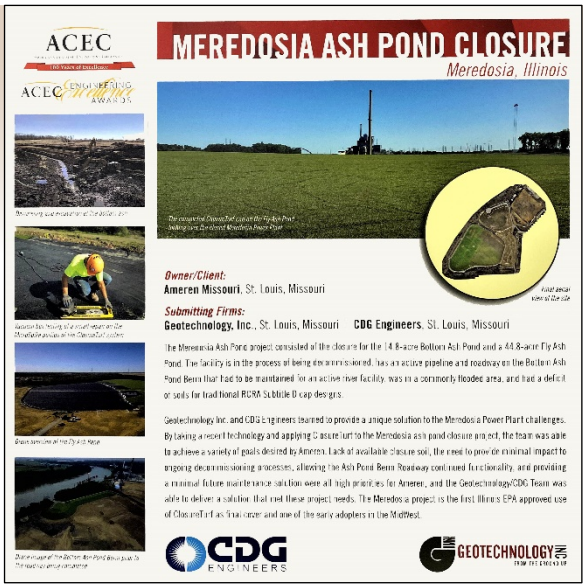
Geotechnology, Inc. and CDG Engineers, Inc., St. Louis

PROJECT TITLE:

Meredosia Ash Pond Closure

CLIENT/OWNER:

Ameren Missouri



Geotechnology's team was responsible for Design Engineering and Construction Quality Assurance (CQA) for the 14.8-acre bottom ash pond and a 44.8-acre fly ash pond. Design Engineering services included: drilling, monitoring well installation, geotechnical laboratory testing, groundwater modeling, Groundwater Management Zone application, slope stability studies, seismic studies, closure alternatives analysis, design, and bid documents. Support was also provided for flood plain permitting and endangered species planning. Specific reports included: Hydrogeologic Site Investigation; Groundwater Model Report; Groundwater Management Zone (GMZ) Application; Groundwater Monitoring Plan; Closure Plan; Post-Closure Plan; Construction Quality Assurance Plan; Construction Plans; Construction Specifications; and Construction Cost Estimating. CQA activities were provided at Ameren's Meredosia Power Station for the first ClosureTurf cap used in Illinois for the closure of a fly ash pond and a bottom ash pond. Our services included partial clean closure observations, cap construction, observation, sampling, testing, inspection, documentation, and reporting of CQA activities.

Problem: The facility is in the process of being decommissioned, has an active pipeline and roadway on the Bottom Ash Pond Berm that had to be maintained for an active river facility, was in a commonly flooded area, and had a deficit of soils for traditional RCRA Subtitle D cap designs.

Solution: Geotechnology performed a feasibility analysis of alternative capping designs that meet the performance requirements of a Subtitle D design. Partial clean closure in conjunction with a ClosureTurf cap was determined to be the most cost and time efficient method to remediate the site with minimal impact to ongoing operations and decommissioning activities. In addition, the long-term care requirements were reduced, which is a benefit for the facility since there will not be full time personnel available after the decommissioning process is complete. Geotechnology's CQA team provided CQA services for the partial clean closure, roadway construction, and installation of an alternate cover system, ClosureTurf, on the site. This project represents the first Illinois Environmental Protection Agency-approved use of ClosureTurf for an ash pond closure in the state of Illinois. CQA activities associated with the Closure Turf system installation include observation and documentation of installation activities; non-destructive testing; and submitting geosynthetic samples for destructive testing by independent laboratories. Geotechnology performed CQA services for the installation of a 40-mil HDPE MicroSpike geomembrane, the artificial turf geosynthetic, the sand infill, and an ArmorFill treatment on steep slopes and stormwater ditches.

Olsson, Joplin

PROJECT TITLE:

Joplin Disaster Recovery Infrastructure Projects

CLIENT/OWNER:

City of Joplin, Missouri

The Problem: The EF-5 tornado that struck the City of Joplin May 22, 2011, devastated the community with the loss of life, homes, vehicles, hospitals, stores, and so much more. The existing infrastructure of the area was also ravaged by the tornado. Because of fallen trees, debris, and aging infrastructure, the need for a massive cleanup was due. Since the tornado hit a primarily older part of the city, the damage to the infrastructure was severe. New Americans with Disabilities Act (ADA) regulations had been adopted since the initial infrastructure was constructed. The problem was; how do we create a sense of

place to inspire revitalization and development within the area affected by the tornado, while rebuilding the damaged, destroyed, and dilapidated infrastructure to meet ADA standards and provide safe and efficient travel through the neighborhoods and along major corridors? The project proposed several challenges. The first challenge was the extremely compressed timeframe. The U.S. Department of Housing and Urban Development (HUD) placed demands upon the city, and the city relied upon us to understand the time factor, plan accordingly, and complete the project within budget. The next challenge was how to repair or replace as much infrastructure as possible with the limited funds. Regulations and restrictions on the use of money and ideas developed during the planning piece of this project, let the City of Joplin to add many design and construction elements to the project at last-minute to achieve the results they wanted.

The Solution: The Olsson team met or exceeded every deadline that was advanced or accelerated. Because the city imposed an accelerated timeline on one of the subprojects, we worked on Christmas Day to make sure we hit our deliverables. We kept the overall project and this particular subproject under our estimate and on time with our schedule and the City of Joplin's schedule. We assisted the city's grant compliance group by making the schedule and budget available and by drafting Job Special Provisions (JSP's) for this and all the subprojects. For the Main Street sub-project Olsson designed in-ground uplighting for the tree plantings to reduce maintenance and installed rubberway surface to allow for pedestrian traffic while maintaining permeability of water to the trees. We also designed and incorporated a watering system, that included modifying a bridge-scupper casting to divert water from the gutter to the trees planted along the right-of-way. We made a conscious effort when executing the other subprojects to only repair/replace infrastructure that was damaged, destroyed, or missing because of the tornado, to help the money stretch as far as possible. We also instituted replanting new trees in areas that were hardest hit, where most of the existing trees were destroyed, making sure the new trees complied with the city's tree policy.

TranSystems, Kansas City

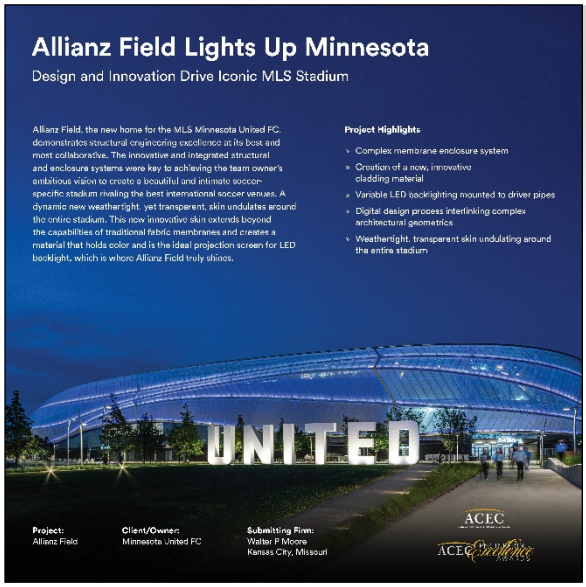
PROJECT TITLE:

South Liberty Project, Phase II

CLIENT/OWNER:

City of Liberty

The South Liberty Project was conceived decades ago and began to take shape in November 2014 when the citizens of Liberty, MO approved a 3/8-cent Economic Development Sales Tax to fund Phase II of South Liberty Parkway and other public improvement projects throughout the city. This long awaited extension completes the east/west connection between I-35 and Route 291, an instrumental infrastructure improvement to help drive economic development in the corridor between east and west Liberty, MO. In 2016, the City of Liberty selected the design/build team of Emery Sapp & Sons (ESS) and TranSystems to complete the South Liberty Parkway connection. In fast-growing Liberty, the new parkway would alleviate congestion and open up more than 1,000 acres for single-family residential and commercial area development. South Liberty Parkway Phase II involved the extension of the existing South Liberty Parkway from Withers Road to Route 291 and included approximately 2.5 miles of four lane roadway, storm water improvements, two major bridges over rail lines and a creek, bikeway/pedestrian trails, four sidewalks, approximately 3.5 miles of 16-inch watermain and 0.4 miles of 12-inch watermain, intersection improvements and signalization at Withers Road and South Liberty Parkway, and intersection improvements and signalization at the intersection with M-291 Highway. In addition, roadway improvements were required to Birmingham Road from Ruth Ewing Road to the Parkway. The design/build team developed a unique inverted roadway section that minimized construction cost, as well as long-term maintenance as part of the two-phased selection process. The team also developed a Guaranteed Maximum Price (GMP). In addition, the team developed a proactive and collaborative design and schedule that accommodated all stakeholders including adjacent landowners, Union Pacific Railroad (UPRR), Canadian Pacific Railway (CPRR), and BNSF Railway. The team leveraged the innovation and flexibility inherent to design-build to mitigate the impacts of delays, exceeded the City's standards for usable life of the completed roadway and ultimately, delivered a final product that surpassed the City of Liberty's expectations.



Walter P Moore, Kansas City

PROJECT TITLE:

Allianz Field

CLIENT/OWNER:

Minnesota United FC

Multiple iterations of professional soccer have existed in Minnesota since the 1970s, however, the state never boasted a dedicated soccer stadium. That changed in April 2019 with the opening of Allianz Field in St. Paul, the new home of Minnesota United FC. At long last, in redeveloping a contaminated, brownfield site, professional soccer finally has a permanent home in Minnesota. The owner desired a home that would compete against the best international venues in the world serving as an iconic piece of art and architecture for the team and state. Creating an iconic, world-class stadium required engineering excellence and showcased the multiple ways structural engineering can influence a project. First was the creation of a new innovative cladding material. The owner desired a material that was weathertight yet transparent; strong yet flexible; and colored. No material met those competing requirements. Walter P Moore collaborated with material manufacturers to develop a clear polytetrafluoroethylene (PTFE) laminate with a fiberglass yarn weave. The result is an iconic façade that changes based on how sunlight reflects off of the material during the day and how variable LED backlighting shines through the skin creating a glowing lantern effect in a myriad of colors and effects at night. Next was a digital design process using a common central geometry file for structural analysis, architectural design, and ultimately material fabrication. The common platform enabled near-real time design iterations between all parties working as one project team, not individual firms. Using a common platform allowed for rapid 3D visualization enabling more informed and timely decisions to be made that were in the best interest of the project as a whole—not one specific discipline. Finally, integrating the structural frame analysis and fabric membrane analysis allowed for the optimization of the entire structural system. This took the complex geometry and interface between materials and loading conditions resulting in an extremely cost-effective design without compromising the owner and architect's ambitious design vision. Ultimately, the engineering excellence and influence of the structural engineering team led to an iconic design to celebrate the world's game in a superlative stadium.

Honor Award

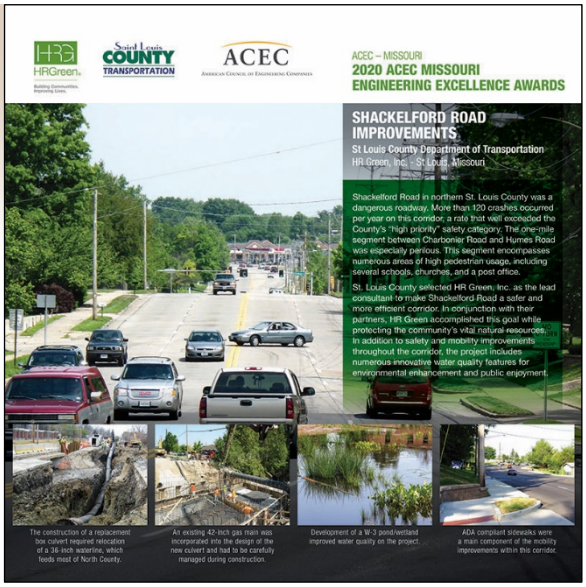
HR Green, Inc., Chesterfield

PROJECT TITLE:

Shackelford Road Improvements

CLIENT/OWNER:

St. Louis County Department of Transportation



Shackelford Road in northern St. Louis County was a dangerous roadway. More than 120 crashes occurred per year on this corridor, a rate that well exceeds the County's "high priority" safety category. The one-mile segment between Charbonier Road and Humes Road was especially perilous. This segment encompasses numerous areas of high pedestrian usage, including a school and a post office. St. Louis County selected HR Green, Inc. as the lead consultant with a mission to make Shackelford Road a safer and more efficient corridor. The team led by HR Green accomplished this goal, while protecting the community's vital natural resources. In addition to safety and mobility improvements throughout the corridor, the project includes numerous innovative water quality features for environmental enhancement and public enjoyment. The project's award-worthy achievements include the following:

- Real, measurable improvement in public safety, confirmed by a dramatic drop in crash rates;
- Increased access to educational, commercial and public transit facilities for persons of all ages and abilities;
- Net reduction in runoff from the project area, to protect stream banks and channels downstream;
- Enhanced water quality through construction of a wetland and other stormwater management features, which also include interpretive panels to inform the public about water issues in their community.

HR Green was proud to work with St. Louis County and other project partners in building communities and improving lives. The team accomplished these aims through the following improvements:

- Transformation of Shackelford Road from a four-lane undivided roadway to a five-lane facility with two-way left turn lanes and medians in appropriate locations;
- Extensive ADA / PROWAG accessibility improvements, including sidewalks, curb ramps, landings, pedestrian pushbuttons, crosswalk signals and striping;
- Elimination of dangerous conflict zones at an offset intersection;
- A water treatment wetland, modular best management practices (BMPs) and permeable pavement in parking areas to achieve a net decrease in stormwater runoff; and
- Minimal disturbance of existing public and private utilities.