New Mexico Rail Runner Phase 2
Design-Build Project

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BACKGROUND

Phase I of the New Mexico Rail Runner Express project, between Belen and Bernadillo, started in 2005 and has been a major success. Phase II extends the route 20 miles north to the state capital of Santa Fe. The project will address the transportation needs of the rapidly-growing Albuquerque and Santa Fe metropolitan areas. Interstate 25, the only major highway that connects the Santa Fe and Albuquerque metropolitan areas, is often congested with local traffic as many state employees live in Albuquerque. Commuter rail service will reduce traffic congestion, provide more reliable travel times that are unaffected by weather or accidents and reduce driving costs.

This project is an important component of Governor Richardson's Investment Partnership (GRIP), a $1.6 billion statewide transportation expansion and infrastructure improvement project that was supported by nearly 100 cities, counties, business groups and chambers of commerce across New Mexico. In order to complete the project in less than four years, no federal funds are being used. The design-build contractor (Twin Mountain/Herzog, was selected in August, 2007; the project is to be substantially complete in November, 2008.

PROJECT DESCRIPTION

This design-build project includes 18 miles of new single track rail line with two passing sidings. The new alignment, called the Santa Fe Subdivision, connects with existing Burlington Northern Santa Fe (BNSF) line at the south end of the project and with Santa Fe Southern line on the southern boundary of Santa Fe. The terminal in Santa Fe is near the historic plaza and adjacent to the New Mexico Department of Transportation (NMDOT) headquarters.

Key components of the project are:

- 18 miles of new 136lb welded rail on concrete ties
- Two passing sidings
- Six concrete girder, ballasted deck railroad bridges
- One new highway bridge overpass
- Six concrete box undercrossings (CBR)
- Six load transfer structures over existing concrete box culverts (LTS)
- Crash walls for overhead highway bridges

While the commuter rail service on the existing BNSF line shares tracks with both BNSF freight trains and Amtrak service, the new alignment will be dedicated to commuter rail. The new alignment diverges from the BNSF line at the bottom of Waldo Canyon; the first four miles of the alignment run on a 3% grade through Waldo Canyon, with 40-foot cuts and fills, before reaching I-25. At this point, the alignment enters the median through the South CBR, beneath NB I-25, and continues for 14 miles in the median of I-25. It exits beneath SB I-25 through the North CBR before tying into the Santa Fe Southern Railway. As opposed to the flyover structures chosen in the original concept,
these CBRs are a safer, more cost effective alternative that requires less maintenance and reduce visual impacts.

The project was a collaboration of the NMDOT and the Design-Builder. Through weekly task force meetings, over the shoulder reviews and a co-located team of project leads, all parties identified solutions in real-time, before a design package was officially submitted to NMDOT.

One of the primary means of collaborating was the use of the 3D model created for all aspects of the design, including all cut/fill slopes, walls, bridge substructures, CBR's and drainage systems. Using our 3D model, we refined the excavation and embankment to balance the earthwork. This 3D model identified an area where we could waste this material and keep the earthwork balanced. Furthermore, the team eliminated more than 200,000 cu. yd. of Mancos Shale within Waldo Canyon, identified as being too unstable for use within the railway prism.

To reduce costs and avoid damage to the existing I-25 drainage system as structures are relocated, the LTS was developed. An LTS is a small bridge built over an existing box culvert to handle the train loads. No permitting was needed, and the easily-constructed concept eliminated significant schedule risk.

Major project quantities:

- Two million cu. yd. of earthwork
- 59,000 sq. ft. of MSE wall
- 3.5 million lb. of rebar
- 25,000 cu. Yd of structural concrete
- 124,000 tons of subballast
- 139,000 tons of ballast
- 50,000 concrete ties
- 98,000 track feet of rail
- 72 bridge girders

**Trackwork**

The original project proposal called for the alignment to go over NB I-25 using a long viaduct structure. After evaluating schedule risks and the high price of the this structure, the team chose the cut-and-cover structure for the southern tie-in to I-25. Beyond the obvious advantages of schedule and price, the aesthetics of the tunnel are far superior to the viaduct. The track structure meets the operating requirements of Class IV track and achieves a maximum track design speed of 80 mph over the corridor (operating speed of 79 mph), with the exception of three curves in the north end of the project. While the CTC signalization of the line is being performed under a separate contract, the civil work to accommodate the signal houses and signal foundations was included in this contract. The track will be 136lb welded rail on concrete ties laid on 12 inches of ballast.
**Excavation and Embankment**

The approach to excavation and earthwork allowed us to construct the subgrade using corridor material with no off-site borrow. Excavated Mancos Shale will be wasted along the corridor. This approach minimizes the number of retaining walls and closed drainage systems required, as well as the number utility relocations needed. We used a 3D design model of the entire corridor to balance excavation and embankment work along the corridor. Not only did this model greatly reduce the time to adjust and complete the design, it also compressed construction time by providing electronic 3D data directly from the design model to the earthmoving and paving equipment.

**Structures**

Structures are simple and deliver superior long-term performance. We used concrete box structures for the north and south entrances to the I-25 median, minimizing their lengths to eliminate the need for fire/life/safety systems. The bridges are simple-span precast concrete girders with composite cast-in-place decks to support E80 live load, reduce long-term maintenance costs, and greatly reduce construction time (versus steel girders). Piers and abutments are cast-in-place concrete supported by driven steel H-piles and spread footings. Culverts are protected using concrete reinforced slabs or Load Transfer Structures. Retaining wall structures are a mix of cast-in-place supported on either driven piles or spread footings. Soil nail walls, MSE and precast gravity bearing blocks enabled us to keep the walls short.
All excavated materials, with the exception of the Mancos Shale, were incorporated into finished subgrade and embankment along the corridor. The grade of the alignment was adjusted so that no import fill material was required. The Mancos Shale was wasted along the corridor rather than used in the embankments; this decreased the risk of slope settlement, reduced long-term maintenance costs, and shortened the earthwork schedule. By using soil nail retaining structures to construct the deep excavations for the I-25 concrete box structures, we were able to minimize disruption to I-25 traffic.

Providing appropriate drainage is crucial to maintaining the integrity of the track structure and reducing long-term maintenance costs. Our drainage design provided positive drainage, adhered to all local storm water pollution and prevention requirements and minimized construction and long-term maintenance costs.

Surface drainage is provided by a combination of open earthen-lined V-ditches and rock lined V-ditches constructed along each side of the track structure. The use of armored gabion drop structures along with these V-ditches in Segment 2 I reduces runoff velocity. To speed construction progress, the drainage system in the I-25 median was modified to incorporate existing structures. Existing inlets were replaced with two inlets, one on each side of the track structure.
Maintenance of Traffic and Access

Safe maintenance of traffic flow throughout the project was of primary importance. Requirements included maintaining two lanes of traffic in each direction along I-25 from 5:00 a.m. to 9:00 p.m. each day, as well as maintaining continuity of travel on ranch roads, cross roads, frontage roads and ramps. Safety for construction workers and traffic on I-25 was ensured by clear zones with temporary barriers, as well as lighting and Class 3 reflective vests for nighttime work. Temporary detours maintained I-25 traffic during construction of north and south undercrossings where the Rail Runner track enters the median.

Utilities

Overhead high voltage power utilities (including the high voltage structure at the north undercrossing and the overhead line at Straight Street) were protected in place. This was consistent with our general approach to utility relocation, which was to avoid or mitigate locations wherever possible to minimize cost and schedule-sensitive relocations. We identified 94 utilities within the corridor and, using 3D modeling, we identified potential impacts early to avoid costly delays.

Right-of-Way

All construction work, including grading, excavation, drainage, trackway, and structures, will be fully contained within the limits of the right-of-way defined by the contract documents. Our construction schedule accommodates the right-of-way availability restrictions associated with our chosen alignment option, including the archeological investigation site at the Frontage Road, which will not be available until January, 2008. We will maintain access to adjacent properties and eliminate interference with nearby ranch and mining operations by building a fence at the start of construction to protect livestock from conflict with construction.

Stations

The design and construction of a passenger station at the NM599 site is to be added to the project.

Design elements include a 400-foot-long station platform in the median of I-25, a pedestrian walkway bridge over NB I-25, a 300-stall parking lot and a new access roadway from NM599 into the parking and drop-off site.

Proposed NM599 Station
CONCLUSION

The design-build delivery method allowed for an accelerated schedule and innovative design solutions. Key innovative solutions and design practices included:

- Use of a 3D design model to balance earthwork and identify conflicts
- Use of Concrete Boxes for Rail (CBRs) vs. Long Flyover Structure
- Use of Load Transfer Structures (LTS) to protect existing drainage structures
- Accelerated design review process – same-day turnaround

Notice-to-Proceed (NTP) was received in late August, 2007. The project is to be complete in December, 2008. With only 16 months for design and construction, an integrated team of designers, builders and owners is crucial to success. Substantial completion of design was accomplished in the first five months; construction began within weeks of NTP.