

Heartland Corridor Clearance Improvement Project

Investigative Probing Program (IPP)

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Heartland Corridor Overview

- **Purpose of the Project:**

- To achieve “double-stack” - 21’-0 vertical clearance along the Heartland Corridor

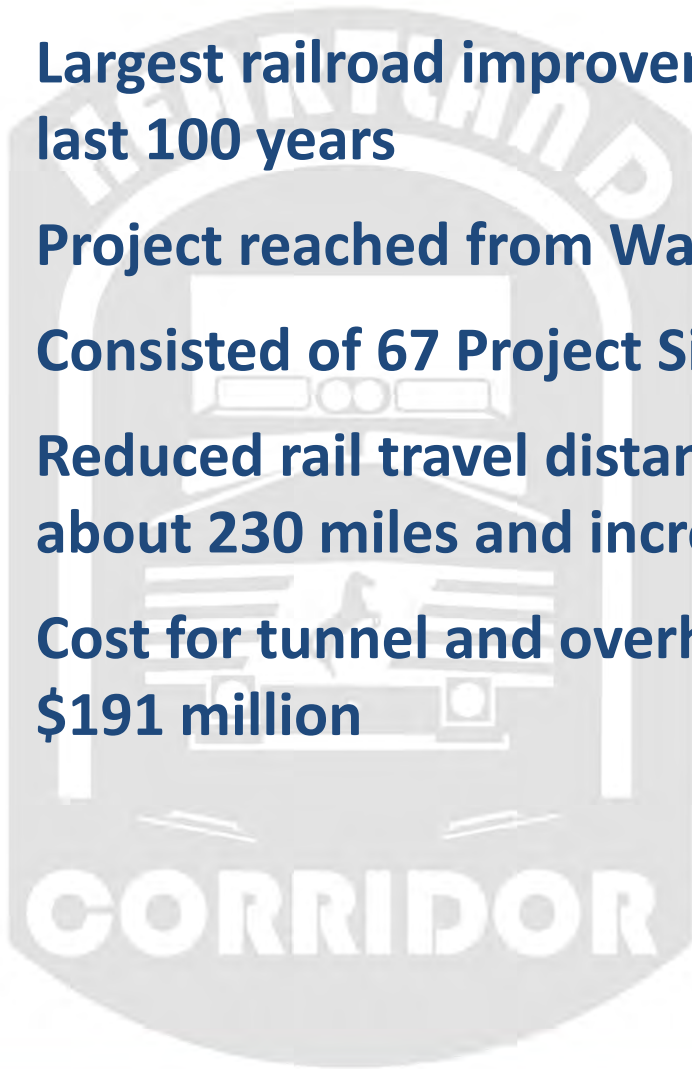
- **Benefits:**

- NS – increased corridor capacity and allowed for more efficient use of assets
- Rail Customers – cut transit time between Norfolk to Chicago from 4 days to 3 days and improved reliability of service.
- Ocean Carriers – more efficient access to nation’s heartland
- Port of Virginia – makes port more attractive to ocean carriers
- Public – reduces number of trucks on congested highways and reduces fuel consumption and greenhouse emissions

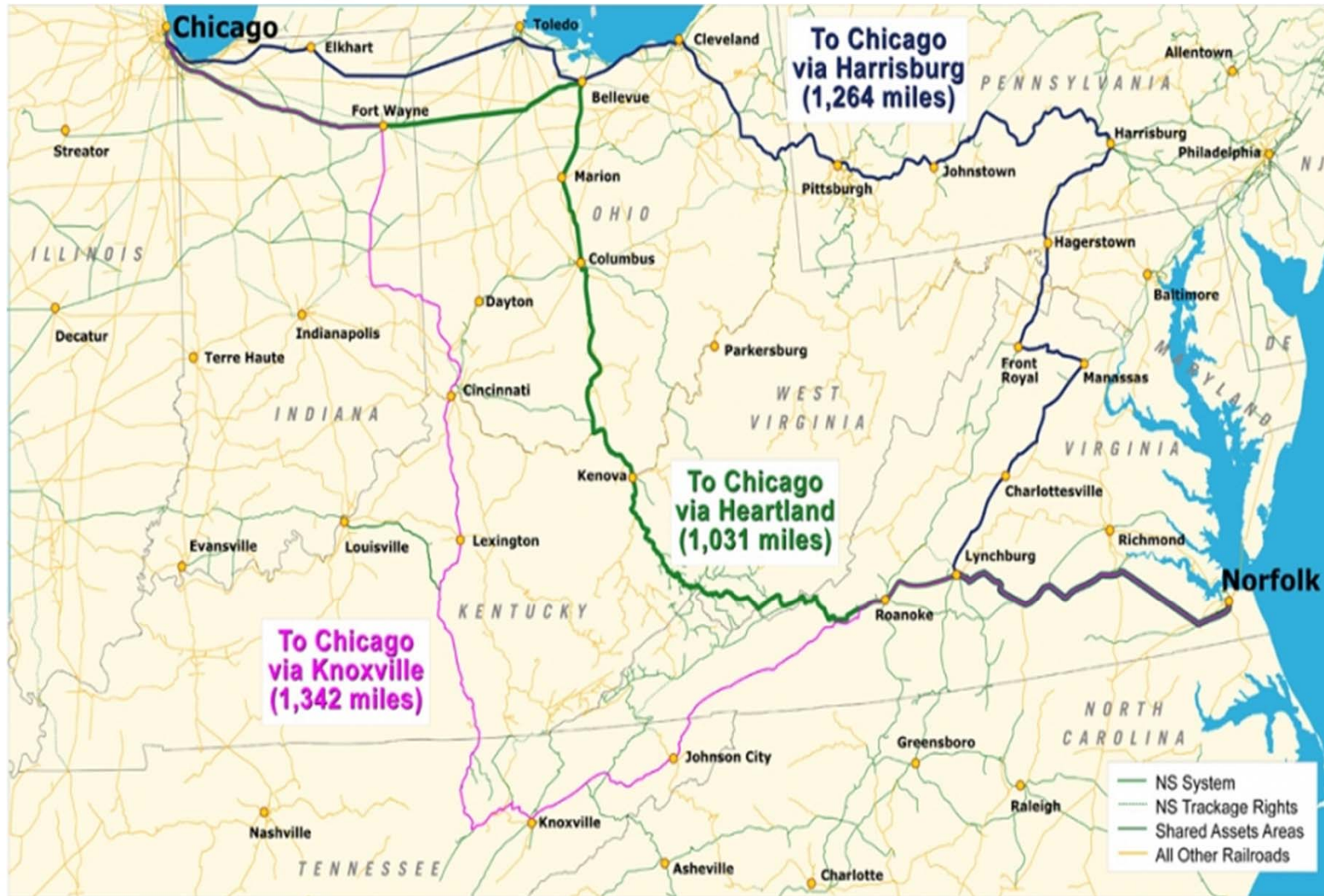


Heartland Corridor Overview

- Largest railroad improvement project of this caliber with the last 100 years
- Project reached from Walton, VA to Columbus, OH
- Consisted of 67 Project Sites over 379 miles of track
- Reduced rail travel distance for “double-stack” freight by about 230 miles and increased freight capacity
- Cost for tunnel and overhead obstruction modifications - \$191 million



Heartland Corridor Route



Heartland Corridor Construction Team

- **Design Firm**
 - Hatch Mott McDonald
- **Construction Management Team**
 - STV (Prime Contractor)
 - AMEC
 - Jacobs Associates
- **Contractors**
 - Johnson Western Gunite, Inc.
 - R.J. Corman Railroad Construction
 - LRL Construction



Heartland Corridor Modifications

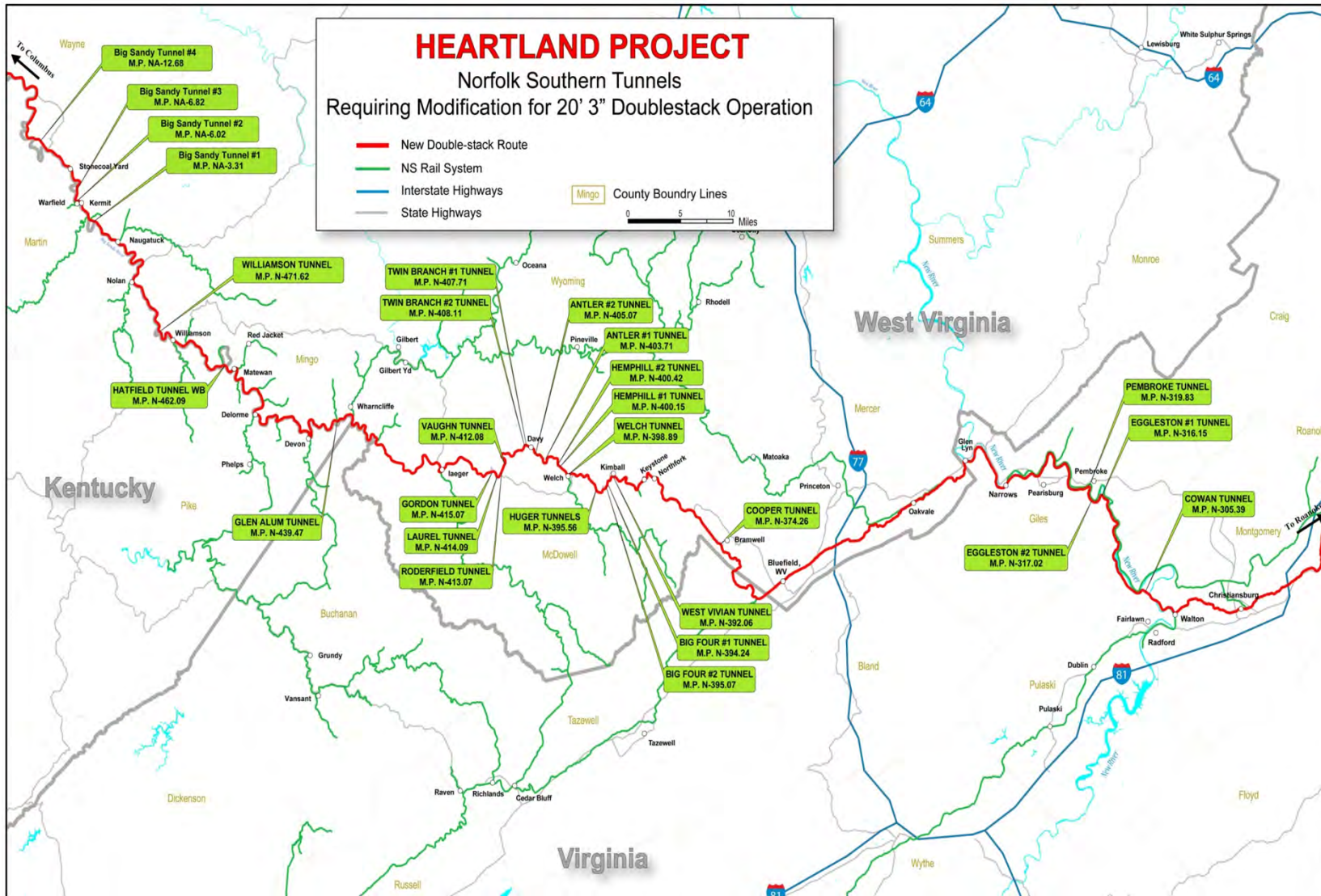
- 28 Tunnels located over 3 states (5.7 miles)
- 8 Through Truss Bridge Modifications
- 3 Overhead Bridges requiring track lowering
- 8 Slide Fence Modifications
- Construction performed during a modified work schedule
 - Saturday thru Wednesday – 2:00AM to 12:00pm (noon)
- Construction period – October 2007 to September 2010

A large, faded version of the Heartland Corridor logo, which is a shield-shaped emblem containing a stylized bridge and the word "CORRIDOR" at the bottom.

CORRIDOR

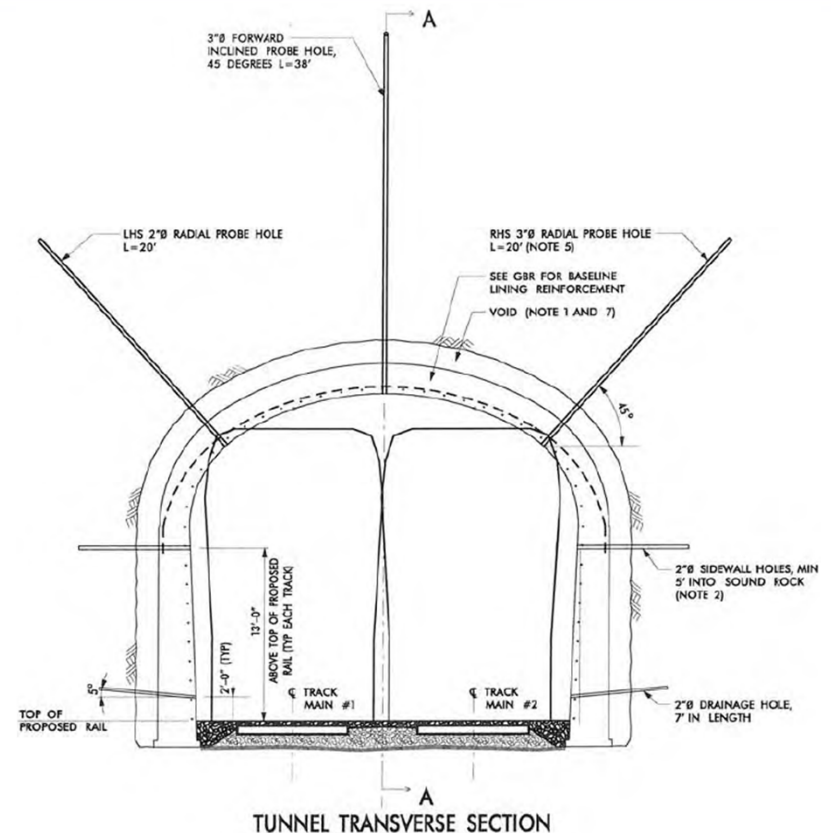


Heartland Corridor Tunnel Locations



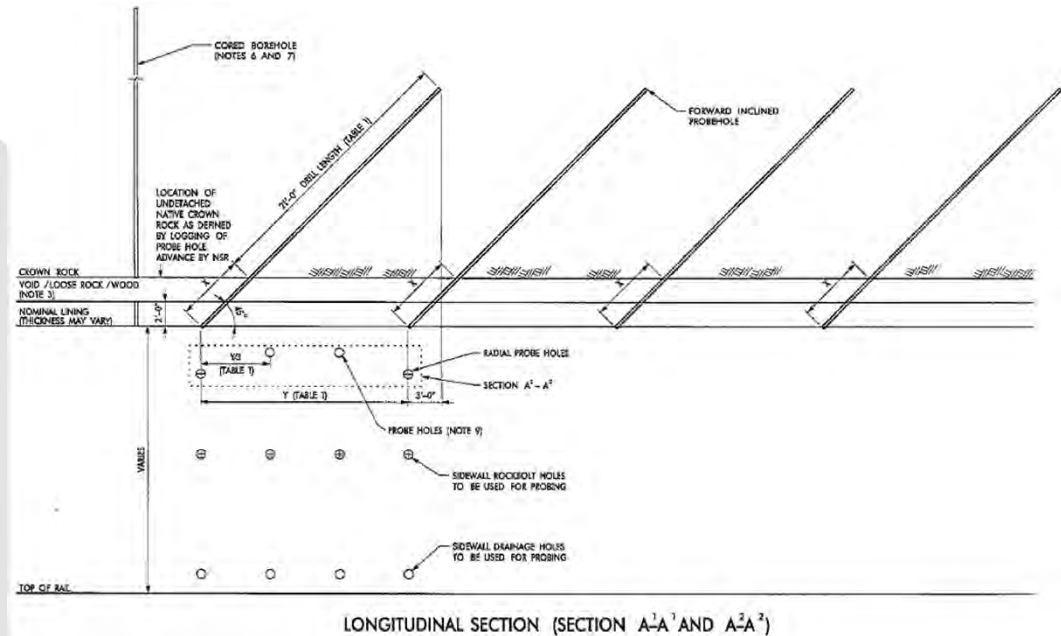
Investigative Probing Program (IPP)

- 3 Probe Holes within the crown
 - Radial probes 20 feet deep (2 and 10 o'clock position)
 - Crown probes 45° and 40 feet deep (12 o'clock position)
- 8 notch probes per probe bay, spaced 5 foot c/c
- Rock cores 50 feet in from portals and evenly spaced throughout (apprx. 250')



Investigative Probing Program (IPP)

- Crown probes spaced 25 feet apart
- Drilling logs were recorded for each probe hole
- Each probe was camera logged (written log and video recorded)
- A total of 2,642 crown probes, 105 vertical rock cores, and 5,150 notch probes
- Overall total of 20 miles of exploratory drilling



IPP Design Parameters

- 3 Ground Classification Types (GCT)

- Type A – good sound rock quality, minor discontinuities, bolt zone clean.
- Type B – rock quality moderate, moderate discontinuities, bolt zone minor.
- Type C – rock quality poor, major discontinuities, bolt zone weak.

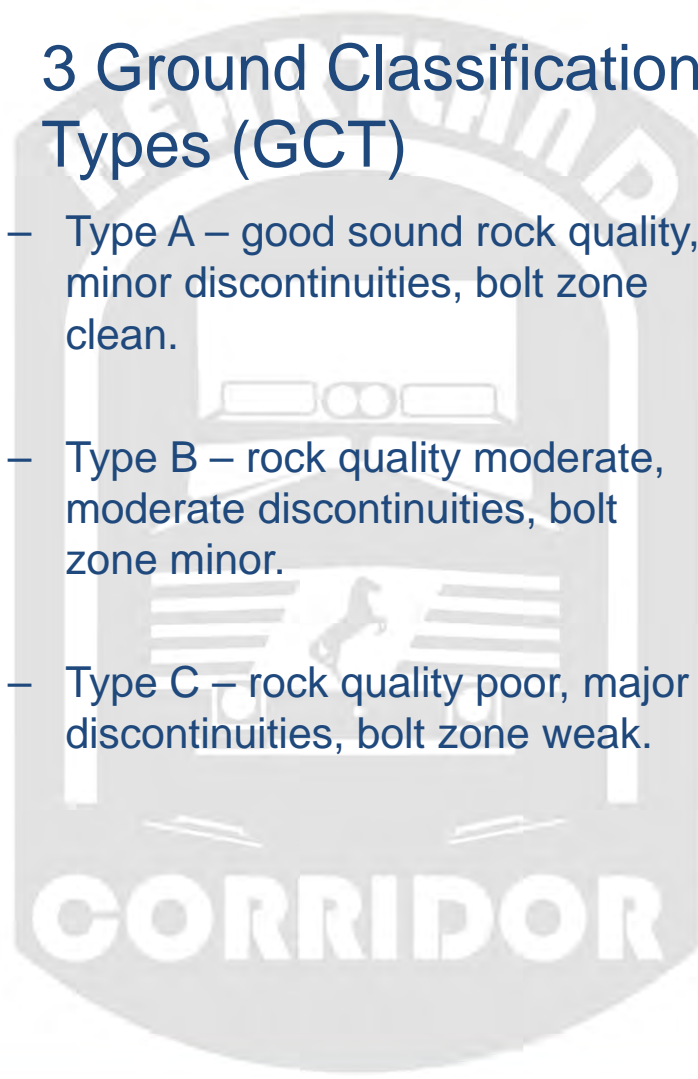


Table 1 Data Gathered for Ground Classification Type Assessment

Criteria	Obtained from:			
	Recovered Core	Probe Drilling	Camera Inspection	Water Pressure Test
Rock Type	X		X	
Estimated Strength of Intact Rock	X	X*		
RQD	X			
Spacing of Discontinuities	X		X**	
Condition of Discontinuities	X		X**	X
Groundwater Conditions		X	X	
Bedding Orientation			X**	
Bedding Dip	X		X**	
Joint Orientation			X**	
Joint Dip	X		X**	
Changes in rock condition from adjacent holes		X	X	
Liner Quality	X		X	

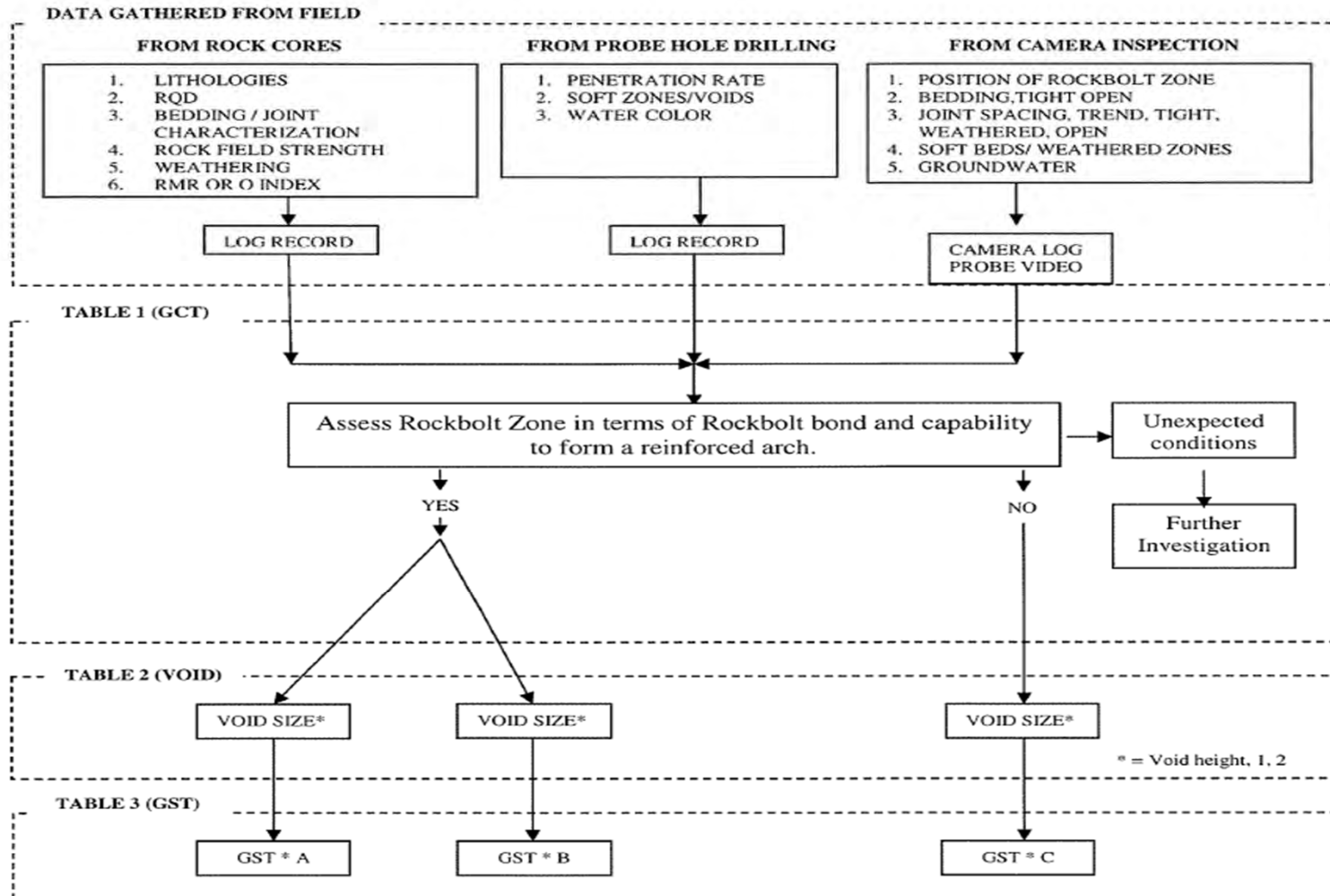
* Provides indications only of possible strength increase/decrease not estimated value

** For Significant features only to such extent such features are readily apparent.



IPP Design Parameters

Ground Condition, Classification and Support Flow Chart



IPP Design Parameters

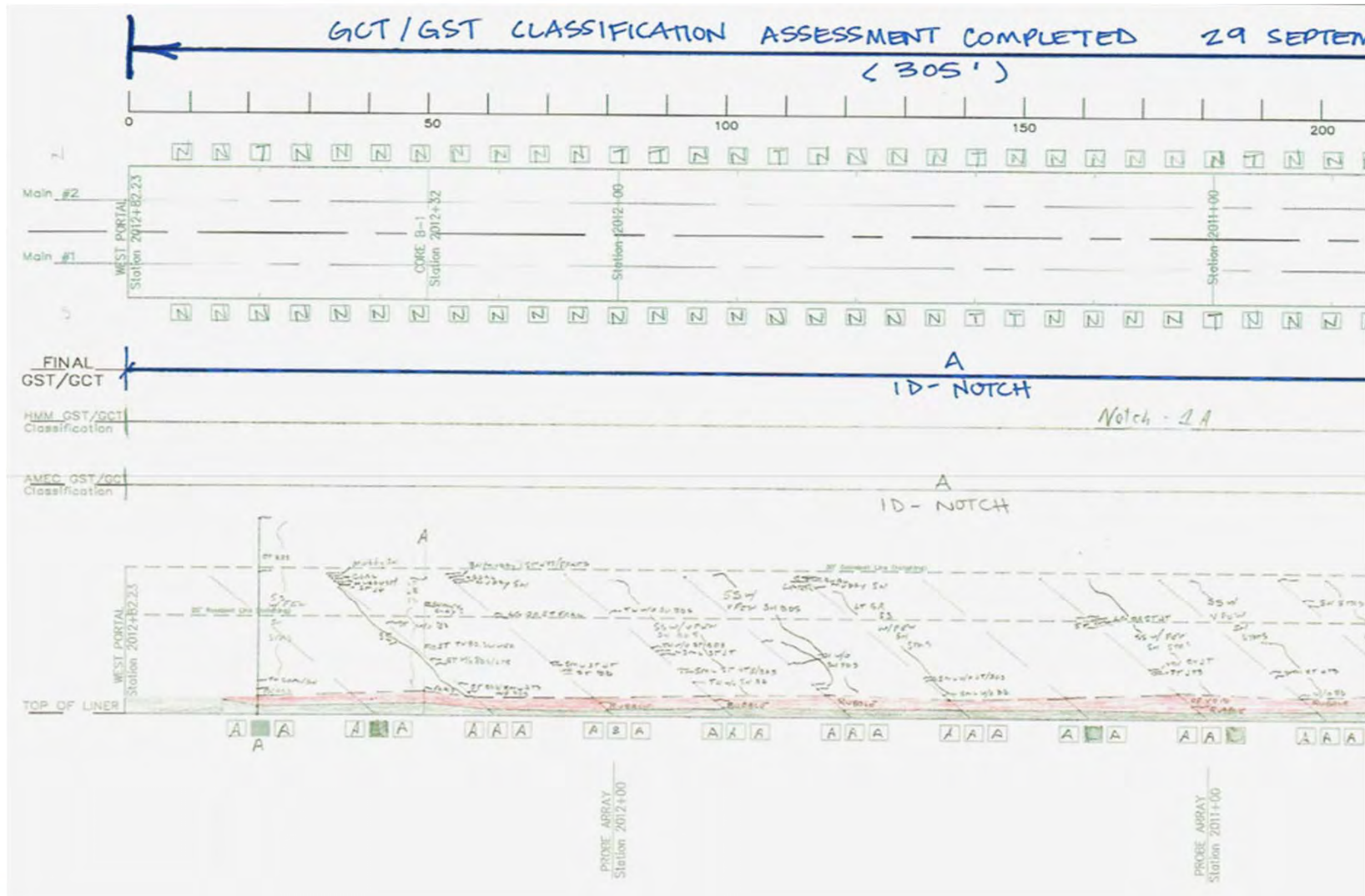
- 3 Ground Support Types (GST)

Table 3 Double Track Tunnel Summary of Ground Support Types (GST)

Ground Classification Type	Ground Support Type	Tunnel Notching	Tunnel Lining Removal
GCT A	GST 1A** or 2A**	N/A	8 DCP rockbolts*, 16.5' long at 6.5' longitudinal spacing with 11,000 lbs pretension. 4" lining shotcrete.
	GST 1D	8 DCP rockbolts*, 20' long at 6.5' longitudinal spacing with 11,000 lbs pretension.	N/A
	GST 2D**	9 DCP cable bolts, 22'-30' long at 5' longitudinal spacing with 11,000 lbs pretension.	N/A
GCT B	GST 1B or 2B	N/A	8 DCP rockbolts*, 16.5' long at 4' longitudinal spacing with 11,000 lbs pretension. 4" lining shotcrete.
	GST 1E	8 DCP rockbolts*, 20' long at 4' longitudinal spacing with 11,000 lbs pretension.	N/A
	GST 2E	9 DCP cable bolts, 22'-30' long at 4' longitudinal spacing with 11,000 lbs pretension.	N/A
GCT C	GST CV*** or CH***	N/A	Initial array – 30 groutable bar spiles, 2" dia., 26.25' long at 1'-2" radial spacing. Subsequent arrays – 18 groutable bar spiles, 2" dia., 16' long at 2' radial spacing, 10' longitudinal spacing.



Investigative Probing Program (IPP)



Construction Photos



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Construction Photos



TUNNEL

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Construction Photos



HEMPHILL TUNNEL

BENTLER TUNNEL



QUESTIONS?

