Highway 17/417 Twinning
The 'Value' of Partnerships

CSVA – October 23, 2006

VE Team

- Brian Ruck - CVS, TSH – VE Team Leader
- Valerie McGirr, TSH – VE Team Assistant
- Norm Meyers, MTO Eastern – Highway Design
- Mike Pearsall, MTO Northeastern – Planning and Environmental
- Manny Goetz, MRC – Highway Design *(DD Team - PM)*
- Steve Regal, MRC – Highway Design *(DD Team)*
- Michel Vachon, MRC – Structural Specialist *(DD Team)*
- Kevin Rodger, MRC – Highway Design
- Steve Robins, MRC – Structural Design
- Rob Pringle, MRC – Traffic Specialist
- Tom Pepper, Tulloch Engineering – Construction Specialist
- Dan Fanning, Fanning & Co. – Construction Specialist
- Raymond Hache, JWA – Geotechnical/Pavements
- Fred Griffths, JWA - Foundations
- ***Janet Collins – Acting - Director of Public Works – Town of Arnprior***
- ***Keith Blimkie – Boeing Canada (now Arnprior Aerospace)***
- ***Jeff Burnett – Boeing Canada (now Arnprior Aerospace) - Part-time***

Background

- EA study initiated 2002 (Hwy 17 from Arnprior to Renfrew, 30 km)
- EA Approved- 2004
- Recommended Plan – Twin existing (to a 4-lane freeway) with 6 new Interchanges
- Commenced Detail Design in 2005 for first 5.6 km – Arnprior By-Pass Phase 1 (by MRC)
- 4-day VE scheduled after development of staging plans and prior to 30% Design Completion
- Estimated Cost – Arnprior By-Pass Phase 1 - $50 Million

MTO - Goals and Objectives

- Review Constructability including proposed Staging scheme
- Validate / modify / enhance Recommended Plan from the Preliminary Design
- EA has been approved “Is this now a VE constraint?”

Designer's Presentation
Key Issues

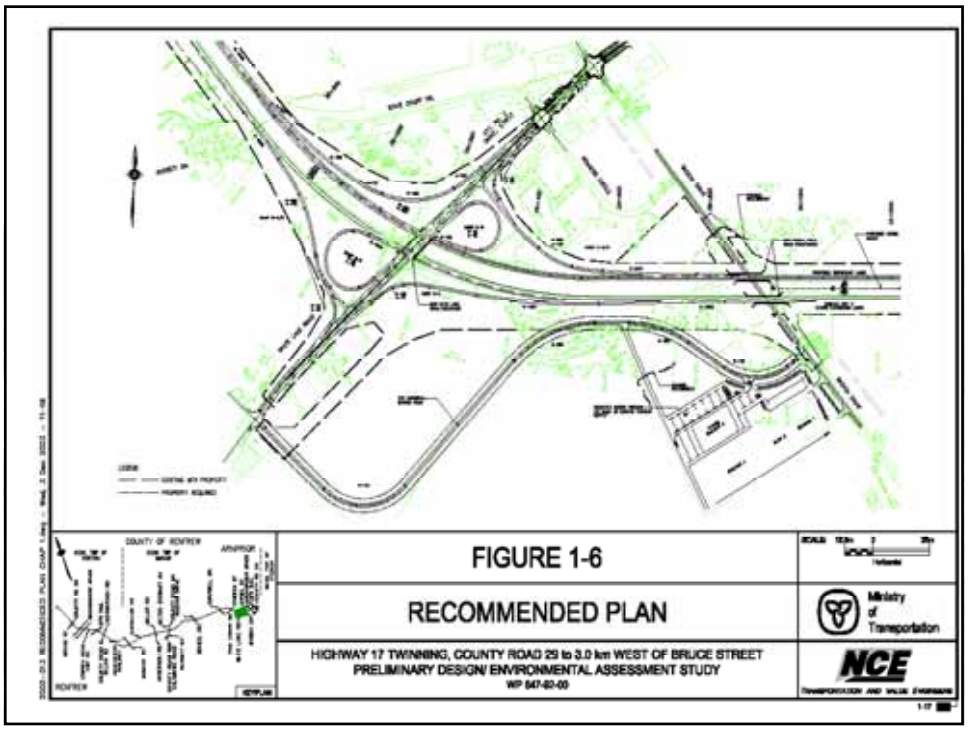
- Project driver is need to twin Highway 17 to improve safety and operations. Existing roadway to be rehabilitated at same time
- Project continues current twinning from south of Arnprior, transitioning back to 2 lanes before Campbell Drive, north of Town.
- New ramps at 29 interchange included in this project (A-2 to A-4)
- Structures required at railway, Madawaska River, Baskin Drive, White Lake Road and Division Street. Seismic requirements to be met

Designer's Presentation
Key Issues (cont.)

- Parclo A4 interchange at White Lake Road (WLR) issues:
  - Compressible soils on south (west) side – preloading required
  - Construction detour at WLR requires temporary signals
  - Superelevation issues where detours cross Hwy 17 on highway curve <1000 m radius
- Fish habitat issues in watercourses/drains
- Drainage from Baskin overpass to Madawaska River includes blasting adjacent to traffic

Designer's Presentation
Key Issues (cont.)

- **Boeing issues:**
  - Service Road from White Lake Road-Baskin Drive, impacts on Boeing parking lot (strongly opposes this Service Road alignment). Prefer service road at edge of property
  - Want functionality at Baskin – major route for employees, couriers, etc.
  - Don't want constraints on truck size for access
  - Municipal Services to Boeing and Public Works Canada require upgrading
  - Boeing a "soft terrorist" target, enhanced security measures are in place
  - Closing Baskin for one season acceptable during construction
  - 350 to 1000+ employees (2-3 shifts)



Designer's Presentation
Key Issues (cont.)

- **Town issues:**
  - Service Road WLR-Baskin provides access to Town lands around the airport
  - Drainage issues at service road / Antrim truck stop
  - Services (forcemains) upgrades required for Public Works (PWGC) and Boeing under Hwy 17
  - 365 days of continuous water to filtration plant (the upstream OPG Dam must operate each and ever day)
  - OK with Division closure during construction
  - Future commercial & residential development near WLR

Designer's Presentation
Key Issues (cont.)

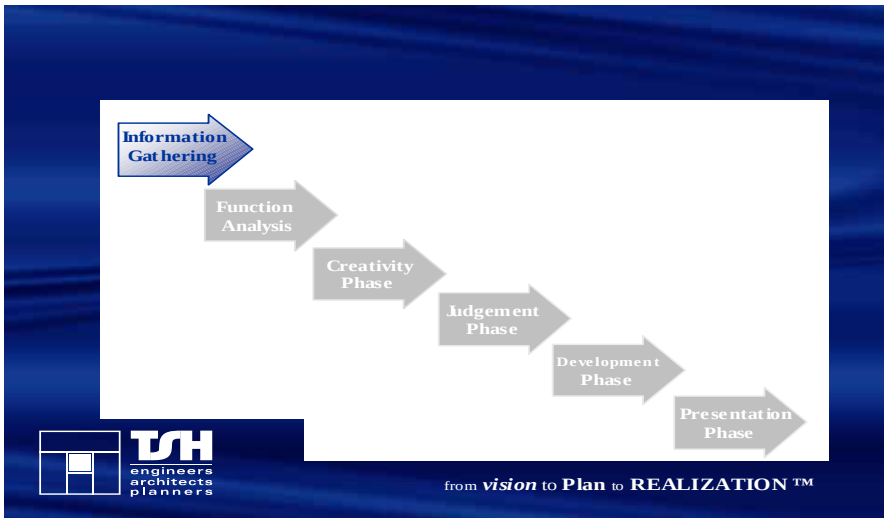
- **Madawaska River issues:**
  - Pier in river rejected by MTO
  - OPG required to operate dam at least 1 hour per day for water supply. March to May 24 hour operation; June to November 2 hour/day operation except August 1 hr/day
  - MRC has modified new WB vertical alignment to move sag off west end of Madawaska approach slab (more rock available for fill)
  - Access/Egress to top of OPG dam must be maintained in the ultimate configuration
  - FAST required for both bridges

VE Team Challenges/Opportunities

- How can we reduce service road impacts?
- Can other construction staging/implementation strategies enhance the project?
- How can safety be enhanced during construction; can Constructability be improved?
- Can the Preliminary Design be improved?

VA Workshop Summary

6 Step SAVE Job Plan



Performance Measures

- Project specific measures used to select a preferred alternative from competing alternatives
- TSH provided draft measures for consideration by VE Team
- VE Team reviewed and revised measures and developed a long list of measures for application after completion of development phase

Performance Criteria	Measure
Public Safety	High, medium, lowest acceptable level of safety
Construction Impacts on the Community	No to major direct and indirect impacts to community
Environmental Impacts	# of additional significant areas affected
Constructability	Most to least desirable in terms of working area, access, staging and traffic
Project Schedule	# of months
Construction Risk	No discernable to extreme risk of claims, change orders, disputes
Business Impacts	Most to least businesses, accesses impacted and out-of-way travel

Creative Ideas

- VE Team identified functions with high cost and/or low worth for idea generation as follows:
  - Span Gaps
  - Connect Roads
  - Build Roads
  - Build Detours
  - Relocate Utilities
  - Drain Road
  - Optimize Construction

Creative Ideas

• Span gaps	• 39 ideas; 16 shortlisted
• Connect roads	• 9 ideas; 6 shortlisted
• Build roads	• 17 ideas; 11 shorlisted
• Build detours	• 8 ideas; 6 shortlisted
• Relocate utilities	• 4 ideas; 4 shortlisted
• Drain road	• 10 ideas; 9 shortlisted
• Optimize construction	• 8 ideas; 5 shortlisted

VE Alternatives/Recommendations

- As individual ideas were developed, they were combined where appropriate to create new alternatives. Ideas were assessed for:
  - Upper access road/structure
  - Madawaska River Bridge
  - Baskin Drive bridge
  - WLR Bridge
  - Division Bridge
  - WLR-Baskin service road
  - Interchange configuration
  - Detours

VE Ideas - Presentation

Application of Performance Measures

- Prior to applying previously identified measures, the VE Team re-visited the measures to determine whether each measure would identify a difference between alternatives
- If not, then the measure was dropped
- Measures were applied to the twinning of the Madawaska River bridge as other recommended ideas were independent of one another
- Construction Impacts on the Community and Business Impacts were two criteria that were not relevant

Criteria Carried Forward with Weights		
Criteria	**Weights**	
Public Safety	36	
Environmental Impacts	11.5	
Constructability	27	
Working area		20
Construction access		25
Complexity of Staging		25
Traffic Impact		30
Project Schedule	12	
Construction Risk	13.5	

Summary of Individual Performance Scoring

Original: Build twin Madawaska Bridge with a 30 m median separating the two bridges
Scenario 1: Widen existing Madawaska bridge to provide two lanes in each direction and a median barrier

Criteria	1	2	3	4	5	6	7	8	9	10	11	12	MIN	MAX	AVE
Original Design															
1 Public Safety	364	364	364	328	364	255	328	364	364	364	364	364	255	364	349
2 Environmental Impact	90	57	68	113	90	79	57	113	79	11	57	79	11	113	74
3 Constructability	268	268	254	254	138	251	194	183	189	268	254	254	138	268	231
Working area for construction	204	204	204	204	20	204	102	164	143	204	204	204	20	204	172
Construction Access	245	245	196	245	25	245	123	245	147	245	245	245	25	245	204
Complexity of Staging (# of stages)	249	249	249	199	199	249	199	124	174	249	199	199	124	249	212
Construction Traffic Impact	302	302	302	302	272	242	302	151	242	302	302	302	151	302	277
4 Project Schedule	60	60	85	60	60	60	97	60	85	60	60	60	60	97	67
5 Construction Risk	81	107	134	107	54	54	67	107	94	134	134	134	54	134	101
TOTAL	863	856	905	862	706	699	743	827	811	837	869	891	699	905	822
VE Scenario 1															
1 Public Safety	73	219	291	73	255	182	255	291	291	109	328	36	36	328	200
2 Environmental Impact	68	90	102	102	102	113	90	113	102	113	113	90	68	113	100
3 Constructability	118	211	243	154	173	121	227	139	200	140	99	132	99	243	163
Working area for construction	41	143	204	102	102	102	102	123	143	102	20	20	20	204	100
Construction Access	49	245	245	123	74	123	245	123	221	123	123	123	49	245	151
Complexity of Staging (# of stages)	199	249	249	199	199	199	199	124	174	149	75	199	75	249	185
Construction Traffic Impact	151	151	211	151	272	30	302	151	211	151	151	151	30	302	174
4 Project Schedule	48	85	121	73	85	97	121	73	109	85	85	73	48	121	88
5 Construction Risk	40	67	121	81	67	107	107	107	121	107	81	107	40	121	93
TOTAL	347	672	878	483	682	620	800	723	823	554	706	438	347	878	644

Performance Rating Matrix

Criteria	Sub-criterion	Criteria Weight	Concept	Score	Total Performance
1 Public Safety		36	Original Scenario 1	9.6 5.5	349 200
2 Environmental Impacts		11.3	Original Scenario 1	6.5 8.8	74 100
3 Constructability	Overall Working area for construction Construction Access Complexity of Staging (# of stages) Construction Traffic Impact	26.8 20.4 24.5 24.9 30.2	Original	8.6 8.4 8.3 8.5 9.2	231 172 204 212 277
	Overall Working area for construction Construction Access Complexity of Staging (# of stages) Construction Traffic Impact	26.8 20.4 24.5 24.9 30.2	Scenario 1	6.1 4.9 6.2 7.4 5.8	163 100 151 185 174
4 Project Shcedule		12.1	Original Scenario 1	5.5 7.3	67 88
5 Construction Risk		13.4	Original Scenario 1	7.5 6.9	101 93
Totals			Original Scenario 1		822 644

Key "Accepted" Recommendation

- Revise South Service Road Alignment to Baskin Drive (Win – Win – Win – Win Scenario)

<u>Value of Partnerships</u>

- Early Stakeholder consultation key (Pre-VE)
- Involvement by two stakeholders (Town and Private Business - Boeing) leads to open dialog regarding all issues/concerns and immediate/early acceptance of VE recommendations

Key "Accepted" Recommendation

Why **Win-Win-Win-Win**

- MTO – same performance for less money
- Boeing – No impacts to existing lands (plus no security revisions required)
- Town of Arnprior / Arnprior Airport Authority – increased development opportunity
- PWGC - has been trying to sell/dispose/lease lands thru internal federal process (thru re-aligned service road) for a number of years


SOUTH SERVICE ROAD
SOUTH SERVICE ROAD
MRC McCORMICK RANKIN CORPORATION
Ontario
Ministry of Transportation


South Service Road Land Impacts
• VE Selected Alternative (Lands Required)
– Total Ha = 2.5 (Airport 1.4 Ha / PWGC 1.1 Ha / Boeing 0.0 Ha)
• PDR / TESR (Lands Required)
– Total 1.2 Ha (Boeing 1.0 Ha / Airport 0.2 Ha / PWGC 0.0 Ha)

Key "Accepted" Recommendation

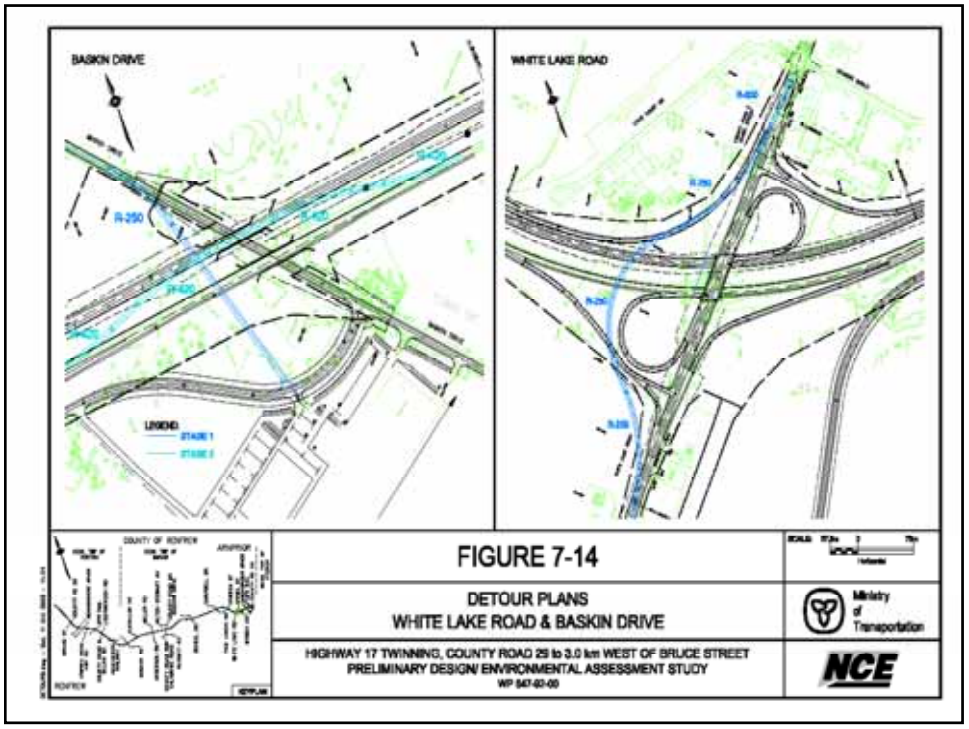
Did we re-open the Approved TESR to get to Win-Win-Win Win?

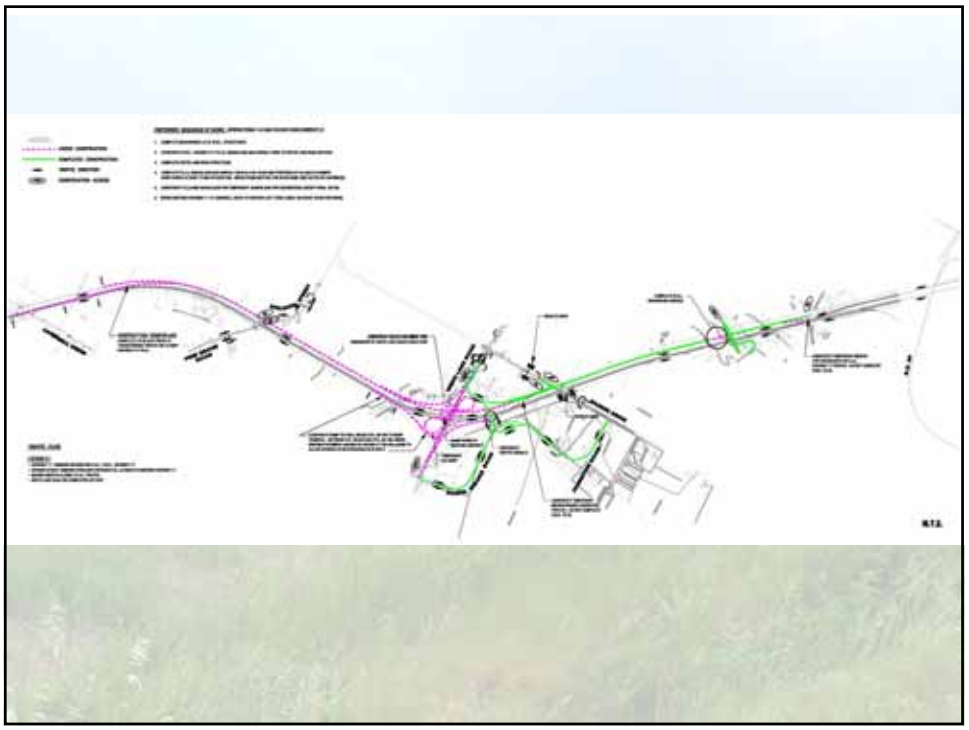
- Yes, Addendum to TESR regarding realigned South Service Road required and currently being finalized
- All parties were involved in Post VE follow-up including further analyses of other SSR alignments
- VE alignment was further revised to bi-sect PWGC property (VE alignment went more southerly).
- All parties continue to support revised SSR alignment

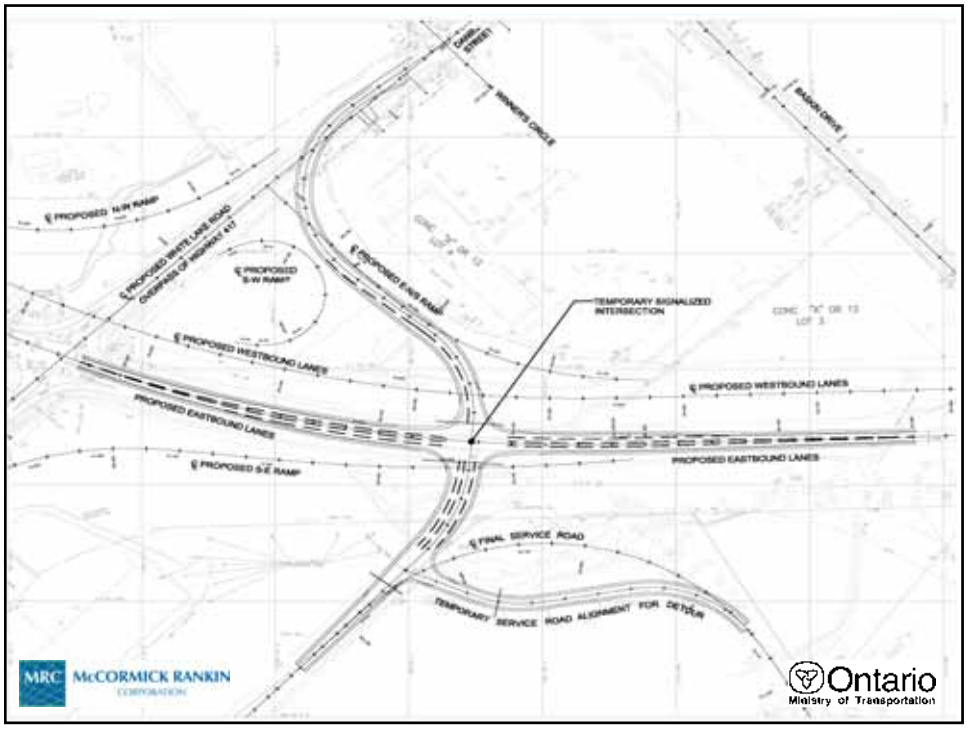
Other "Accepted" VE Recommendations

Constructability Related

- Combine detours for WLR & Baskin
- Eliminate set of cross-overs through staging


BASKIN DRIVE
WHITE LAKE ROAD
R-250
LEGEND
FIGURE 7-14
DETOUR PLANS
WHITE LAKE ROAD & BASKIN DRIVE
HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 547-92-00
Ministry of Transportation
NCE

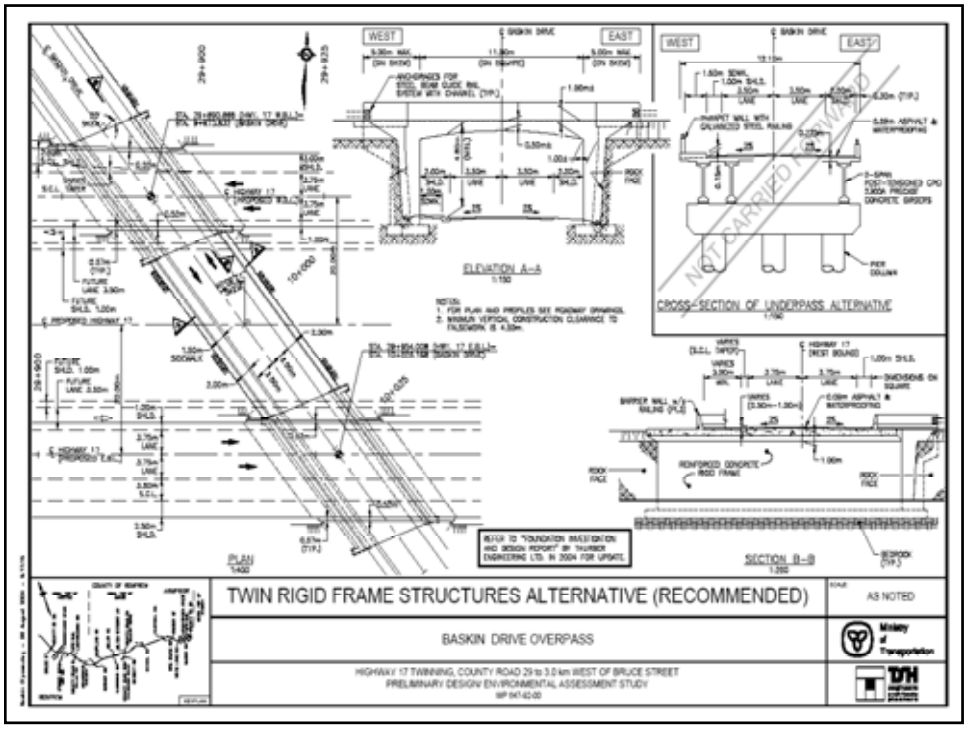




Other "Accepted" VE Recommendations

Improved Design Related

- Defer additional ramps at Co. Rd. 29 interchange (Retain A-2).
- Build Baskin Structures perpendicular to Hwy 417 and add an additional 0.5 m shoulder
- Move ARWIS Tower from median to outside shoulder area (eliminates median turn-around)


WEST
EAST
C BASKIN DRIVE
ELEVATION A–A
1:150
CROSS-SECTION OF UNDERPASS ALTERNATIVE
NOT CARRIED FORWARD
PLAN
1:400
SECTION B–B
1:150
TWIN RIGID FRAME STRUCTURES ALTERNATIVE (RECOMMENDED)
AS NOTED
BASKIN DRIVE OVERPASS
HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 547-92-00
Ministry of Transportation

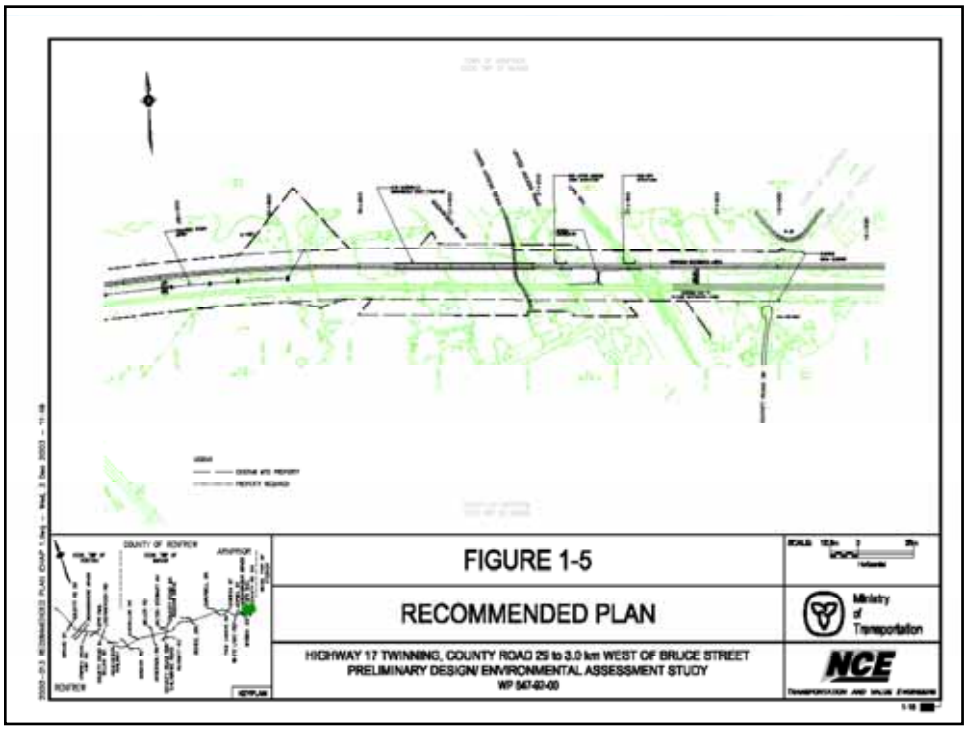
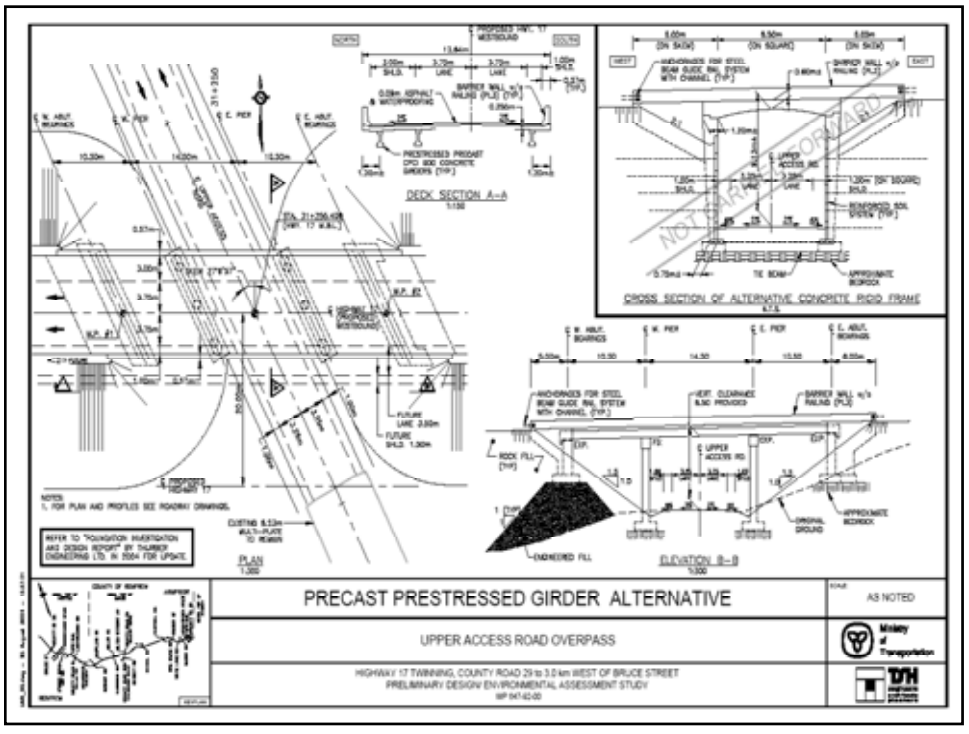
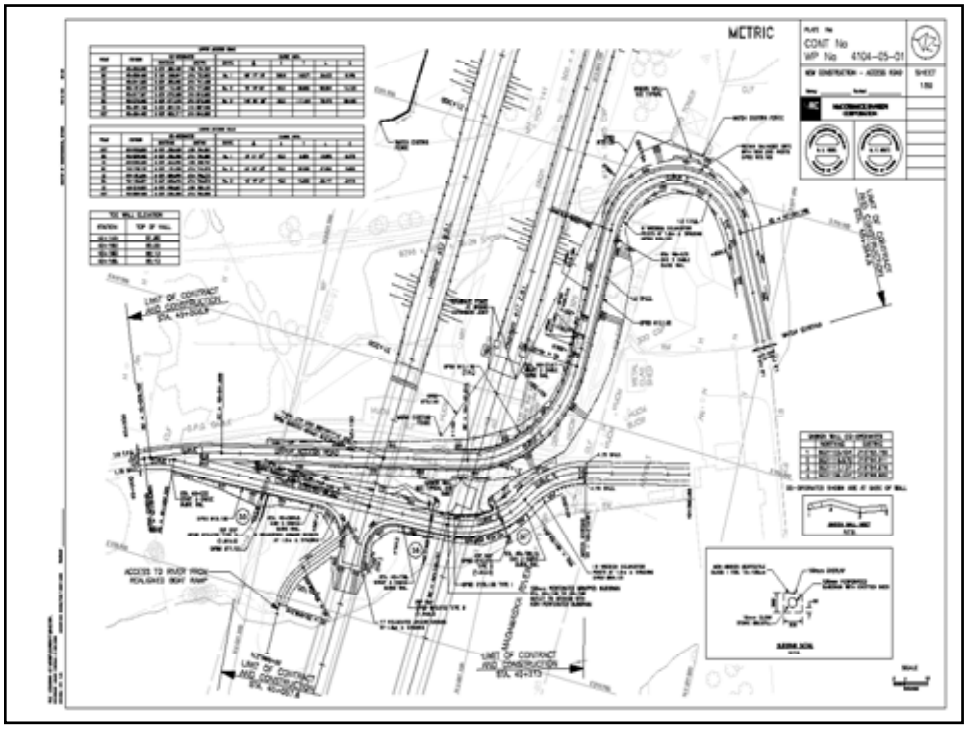


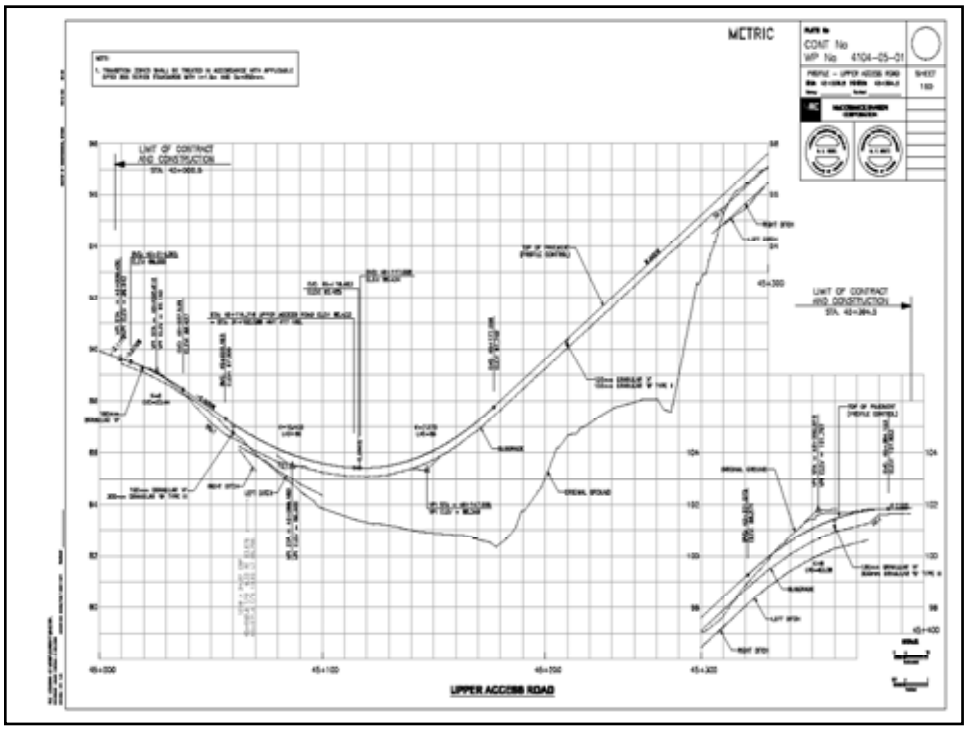
FIGURE 1-5
RECOMMENDED PLAN
HIGHWAY 17 TWINNING, COUNTY ROAD 29 to 3.0 km WEST OF BRUCE STREET
PRELIMINARY DESIGN/ ENVIRONMENTAL ASSESSMENT STUDY
WP 547-92-00
Ministry of Transportation
NCE

Prior to VE Study
Revised PDR by MTO

- Post PDR and prior to commencing the detail design assignment, MTO In-house reviewed how best to "connect roads" in the OPG area of the Lower Access Road (LAR) and Upper Access Road (UAR)
- The PDR called for a new structure at the UAR to "connect roads"
- MTO commenced consultant with OPG and reviewed various alternatives
- OPG accepted the revised alternative; all revision documented under the DCR (i.e., no amendment to TESR)




METRIC
CONT No
WP No 4104-05-01
LIMIT OF CONTRACT
ACCESS TO RIVER FROM
ROUGHES RIGHT RAMP


METRIC
CONT No
WP No 4104-05-01
LIMIT OF CONTRACT
UPPER ACCESS ROAD

Thank You - Discussion