



# Value Engineering Workshop

Highway 11 and Madill Church Road  
Interchange at Huntsville

GWP 317-00-00

# Highway 11 and Madill Church Rd

- ⇒ Four-lane highway with at-grade access
- ⇒ Eliminate at-grade access by providing an interchange, flyovers and service roads.
- ⇒ Project includes 3 at-grade access intersections.

# Highway 11

## Madill Church Road Interchange

### ➔ Preliminary Design

- Achieve all design standards
- Full-movement Interchange
- Provide local access

### ➔ Use VE Workshop as a *tool* in the analysis/evaluation of alternatives and selection of Preferred Improvement Plan

# Multi-Discipline VE Team

- ⇒ MTO Project Manager, Environmental Planner
- ⇒ Stantec multi-discipline VE Team
  - Included PM, Structures Eng., Highway Eng., EP
- ⇒ VE Team led by Scot McClintock, CVS
- ⇒ Anna Gall provided *safety* expertise
- ⇒ Brian Gray provided *geotechnical* and *foundation* expertise

# Value Engineering Process

- ➔ Information Phase
- ➔ Function Analysis Phase
- ➔ Creative Phase
- ➔ Evaluation Phase
- ➔ Development Phase
- ➔ Scenario Development Phase
- ➔ Presentation Phase

# VE Process Diagram

## Workshop Activities

Information Phase	Function Analysis Phase	Creative Phase	Evaluation Phase	Development Phase	Presentation Phase
Understand Project, Risks and Issues				Investigate Selected Ideas	
Develop Performance Measures	Understand Purposes of Project Parts	Generate Ideas for Improved Value	Weight Performance Measures Select the Best Ideas	Combine VEPs into Scenarios, Evaluate	Explain Scenarios and Rationale

## Post-Workshop Activities

Evaluate Recommendations

Select Changes

Document Results

Highway 11 and Madill Church  
Interchange, Huntsville

# Information Phase

- ⇒ Background Presentation
- ⇒ Review of material
- ⇒ Develop Performance Measures
- ⇒ Review Cost Model
- ⇒ Create Risk Register

# Information Phase

## ⇒ Alternatives presented to VE Team

- Interchange Alternatives
- Local Access Alternatives

## ⇒ Project cost of \$ 9.8 million

- Parclo B-2 configuration on east side
- Diamond configuration on west side
- Service Road - extend Hares Road to Stephenson Road 12 E
- Extend Lindgren Road W to Bickley Country Drive
- Extend Lindgren Road E to IC
- Flyover at Stephenson Road 12

# Performance Measures

- ⇒ Safety/Operations
- ⇒ Convenience of Access
- ⇒ Natural Environment
- ⇒ Business Impacts
- ⇒ Social Impacts
- ⇒ Constructability

# Some Project Issues

- ⇒ Local Access – Emergency Vehicles
- ⇒ Business Access
- ⇒ Snowmobile Crossing
- ⇒ Wildlife (Deer-Car Collisions, coldwater streams)
- ⇒ Traffic Operations
- ⇒ Distance between interchanges
- ⇒ Soil Conditions

# Risk Register

Figure 3: PROJECT RISK REGISTER											
HIGHWAY 11 and Madill Church Road Interchange, GWP 317-00-00											
Huntsville, Ontario										Risk Allowance	
Date: May 12, 2004										RMS Difference	
										TOTALS	\$11,020,000
No action against Risk						Action against Risk					
RISK NO	RISK	RISK MANAGEMENT	PROB-ABILITY	CONSEQUENCE COST	TIME	TOTAL	PROB-ABILITY	CONSEQUENCE COST	TIME	TOTAL	MAXIMUM COST
1	Accident potential during construction	Traffic Management Plan; reduce construction period	4	5	3	32	2	3	2	10	\$2,000,000
2	Animal strikes	Fencing, reflectors; animal culverts; signage	5	4	1	25	2	2	1	6	\$500,000
3	Negative business impacts	Maintain access; create good alternative access; signage; compensation	3	3	1	12	2	2	1	6	\$500,000
4	Closing access during construction; business access/losses; impacts to local roads	Build access roads first; Traffic Management Plan	5	3	1	20	2	2	1	6	\$500,000
5	Divert people to unsuitable local roads	Improve local roads; create good alternative access; wayfinding	5	2	1	15	1	1	1	2	\$250,000
6	Provide connection that ends up not needed	Use business impact study to aid decisions	1	5	1	6	1	2	1	3	\$1,400,000
7	Increased travel time for emergency vehicles	Measure it - is it tolerable; improve local roads; improve access; consider vehicle routes	3	5	1	18	2	2	1	6	\$1,400,000
8	Move flyover at Lindgren	Show benefits; compensation; L3	3	2	1	9	2	1	1	4	\$250,000
9	NIMBY	Show benefits; define objectives	5	3	3	30	2	1	1	4	\$500,000
10	Impact to future Rowanwood/Allensville IC	Show benefits; consider it in the design	2	4	1	10	2	3	1	8	\$1,000,000
11	Potential settlement	Good design and construction practice	3	2	1	9	1	1	1	2	\$500,000
12	Impact on deer yard	Avoid, reduce footprint	5	1	1	10	2	1	1	4	\$10,000
13	Construction impact on well yield	Monitor; good design and construction practice; inform contractor of locations	1	1	1	2	1	1	1	2	\$10,000
14	Construction impact on buildings/Madill Church	Establish rationale; good design and construction practice	2	2	1	6	1	1	1	2	\$200,000
15	Property Impact	Avoid; plan ahead; pre-purchase	5	5	5	50	3	5	3	24	\$2,000,000

# Function Analysis

⇒ Higher Order Functions are to:

- Move People and Goods
- Preserve Environment

⇒ Basic Functions are to:

- Improve Safety
- Improve Operations
- Avoid/Mitigate Impacts

# Project Cost Analysis

⇒ Separate Traffic	\$ 6.5
⇒ Close At-Grade Intersections	\$ 3.3
⇒ TOTAL	\$ 9.8 x 10 <sup>6</sup>

Includes contingency and engineering

# Function Analysis

## Value Target Areas

- ⇒ Animal Strikes
- ⇒ Interchange
- ⇒ Local Access
- ⇒ Snowmobile Crossing
- ⇒ Structures

# Creative Phase

## 165 Overall Ideas

⇒ Animal Strikes	40
⇒ Interchange	38
⇒ Local Access	20
⇒ Snowmobile Crossing	31
⇒ Structures	36

# Performance Measures

- ⇒ Safety/Operations
- ⇒ Convenience of Access
- ⇒ Natural Environment
- ⇒ Business Impacts
- ⇒ Social Impacts
- ⇒ Constructability

# Performance Measure

## Safety/Operations

- ⇒ (A) Human factors
- ⇒ (B) Snowmobile, bicycle crossing
- ⇒ (C) Interchange Geometrics
- ⇒ (D) Local Road Geometrics
- ⇒ (E) Conflict Points

# Performance Measure

## Convenience of Access

- ⇒ (A) Madill/Gryffin west lands
- ⇒ (B) Madill/Gryffin east lands
- ⇒ (C) Stephenson Road west lands
- ⇒ (D) Stephenson Road east lands
- ⇒ (E) Lindgren Road east lands
- ⇒ (F) Lindgren Road west lands

# Performance Measure

## *Natural Environment*

➔ (A) Number of Stream Crossings

# Performance Measure

## Business Impacts

- ⇒ (A) Current Viability
- ⇒ (B) Number of Businesses Negatively Impacted (property)
- ⇒ (C) Suitability of Access
- ⇒ (D) Potential Future Developments

# Performance Measure

## *Social Impacts*

- ⇒ (A) Highway Noise
- ⇒ (B) Impacts to Agricultural Land
- ⇒ (C) Property Impacts

# Performance Measure

## Constructability

- ⇒ (A) Amount of Excavation
- ⇒ (B) Traffic Management
- ⇒ (C) Social/Enviro Impacts During Construction
- ⇒ (D) Structure
- ⇒ (E) Construction Staging

# Evaluation Phase

## Performance Measure Weight

<u>Performance Measure</u>	<u>Weight (%)</u>
Safety/Operations	53
Convenience of Access	20
Natural Environment	4
Business Impacts	16
Social Impacts	4
Constructability	3

# Evaluation Phase

## VE Proposals and Design Suggestions

⇒ Animal Strikes	16
⇒ Interchange	10
⇒ Local Access	8
⇒ Snowmobile Crossing	3
⇒ Structures	8

# Development Phase

- ➔ Development Phase involved the investigation of the selected Creative Ideas

# Development Phase

## Proposals: Animal Strikes

- ⇒ Fence along entire or part of project length (A-1, A-11)
- ⇒ Reflectors (A-4)
- ⇒ Use fence to direct deer to culvert/overpass (A-14)
- ⇒ Improve signage (amber flashing light) (A-19)
- ⇒ Expand clear zone (A-20)

# Development Phase

## Proposals: Interchange

- ⇒ Move IC 100 m north and use Parclo A configuration (I-1)
- ⇒ Move IC south to Stephenson Road 12 (I-2)
- ⇒ IC at Rowanwood/Allensville now (I-6)
- ⇒ IC at Hares/Gryffin Lodge Road (I-7)
- ⇒ Parclo B on both sides (I-15)
- ⇒ Diamond configuration both sides (I-29)
- ⇒ Shift MC/GL 5 north to save Preston Mechanical (Parclo A on west, Parclo B on east) (I-37)
- ⇒ Parclo A on west; Parclo B on east with L3, S1, partial L1 and flyover at Stephenson Road 12 (I-38)

# Development Phase

## Proposals: Local Access

- ⇒ Turnarounds and right-in and right-out access for emergency vehicles (L-1)
- ⇒ West side Service Road from Stephenson Road 12 to Madill Church Road (L-4)
- ⇒ Flyovers at Stephenson Road 12 and Lindgren Road with interchange at Madill Church (L-7)
- ⇒ IC at Stephenson Road 12, connect Lindgren to Gryffin Lodge Road, Service Road to Madill Church (L-8)
- ⇒ IC at Hares/Gryffin (I-7) plus Access Alternative L1 (L-13)
- ⇒ IC at Hares/Gryffin (I-7) plus Service Road to Madill Church to north (on west side) (L-14)
- ⇒ Eliminate flyover at Stephenson Road 12 (L-19)

# Development Phase

## Proposals: Snowmobile Crossing

- ➔ Dedicated structure between trails, south of ESSO (SC-2)
- ➔ Widen shoulder on Lindgren Road flyover (SC-3)
- ➔ Cross highway with structure using rock ridges in vicinity of Gryffin Lodge Road (SC-8)

# Development Phase

## Proposals: Structures

- ⇒ Open structure type (ST-6)
- ⇒ Use retaining walls on west to minimize property acquisition (ST-16)
- ⇒ Use high performance concrete (ST-26)
- ⇒ Use concrete driving surface (ST-27)
- ⇒ Use weathering steel (ST-32)

# Development Phase

## Scenarios

- ➔ Additional sub-phase in VE process
- ➔ Involves the combination of VE Proposals into Scenarios
- ➔ Includes the integration of ideas and the aggregation of savings

# Scenario 1 – Base Case

## The Present Design

- ➔ Interchange Alternative MC/GL 4B
- ➔ Stephenson Road 12 Access Alternative S1
  - Service Road - extend Hares Road East to Stephenson Road 12
- ➔ Lindgren Road Access Alternative L3
  - extend Lindgren Road East westerly to connect to the Interchange
- ➔ Flyover at Stephenson Road 12
- ➔ Connect Lindgren Road northwest to Brickley Country Drive

# Scenario 2

- ⇒ Parcel A on West; Parcel B on East at MC/GL (I-38)
- ⇒ Stephenson Road 12 Access Alternative S1
  - Service Road - extend Hares Rd East to Stephenson Road 12
- ⇒ Lindgren Road Access Alternative L3
  - extend Lindgren Road East westerly to connect to the Interchange
- ⇒ Flyover 100 to 150 m north of Stephenson Road 12 (L-21)
- ⇒ Connect Lindgren Road northwest to Bickley Country Drive

# Scenario 3

- ⇒ Parcel A on West; Parcel B on East at MC/GL (I-38)
- ⇒ Stephenson Road 12 Access Alternative S1
  - Service Road - extend Hares Road East to Stephenson Road 12
- ⇒ Lindgren Road Access Alternative L1
  - Lindgren Road flyover 110 m North of existing crossover
- ⇒ Flyover 100 to 150 m North of Stephenson Road 12 (L-21)
- ⇒ Connect Lindgren Road northwest to Bickley Country Drive

# Scenario 4

- ⇒ Parcel A on East and West, 120 m North of intersection of Hares Road and Gryffin Lodge Road; extend Gryffin Lodge Road West across structure to Old Muskoka Road (I-7)
- ⇒ Stephenson Road 12 Access Alternative S1
  - Service Road - extend Hares Road East to Stephenson Road 12
- ⇒ Lindgren Road Access Alternative L1
  - Lindgren Road flyover 110 m north of existing crossover
- ⇒ Flyover 100 to 150 m north of Stephenson Road 12 (L-21)
- ⇒ Widen shoulders on Lindgren Road flyover to 3 m for snowmobiles (SC-3)
- ⇒ Connect Lindgren Road northwest to Bickley Country Drive

# Scenario 5

- ⇒ Parclo A on East and West at Stephenson Road 12 (I-2)
- ⇒ Stephenson Road 12 Access Alternative S1
  - Service Road - extend Hares Road East to Stephenson Road 12
- ⇒ Service Road – on west, connect IC to Madill Church Road (L8a)
- ⇒ Lindgren Road Access Alternative L1
  - Lindgren Road flyover 110 m north of existing crossover
- ⇒ Widen shoulders on Lindgren Road flyover to 3 m for snowmobiles (SC-3)
- ⇒ Connect Lindgren Road northwest to Bickley Country Drive

# Evaluation

## Matrix Analysis

⇒ Rank the Scenarios

⇒ Considerations Include:

- Comparison against Performance Measures
- Weight of Performance Measures
- Life-cycle cost

# Evaluation

## Ranking of Scenarios

Scenario	Performance Score (P)	Cost (C)	P/C	Rank
<b>1 Base Case</b>	<b>664</b>	<b>\$ 9.8 x 10<sup>6</sup></b>	<b>68</b>	<b>1</b>
<b>2</b>	<b>657</b>	<b>10.0</b>	<b>66</b>	<b>2</b>
<b>3</b>	<b>672</b>	<b>11.7</b>	<b>57</b>	<b>4</b>
<b>4</b>	<b>724</b>	<b>11.5</b>	<b>63</b>	<b>3</b>
<b>5</b>	<b>727</b>	<b>10.7</b>	<b>68</b>	<b>1</b>

# Results

- ➔ Scenarios 1, 2 and 5 had the best performance over cost ratio.
- ➔ Scenarios 2 and 3 are similar except for access to Lindgren Road East.
- ➔ Scenario 5 offered a completely different option with a complete relocation of the interchange.
  - Scored highest on Safety-Operations, Business Impacts and Constructability

# Implications of Scenario 5

- ➡ The Allensville-Rowanwood (A-R) future interchange may not be required at all.
  - Significant cost savings.
- ➡ The study area would need to be expanded to include the A-R area.

# Decision on Scenario 5

- ➔ Not to proceed with Scenario 5 because:
  - Need to stop project and issue a completely new assignment which would require additional costs and time, and may still recommend 2 interchanges.
  - Geometric configuration of Sc.2 acceptable.
  - Significant out-of-way travel for the residences and businesses located at Madill Church Road. (not very good for local access)
  - Patrol yard would be 2.3 km away from IC.

# Work Following VE Study

- ⇒ Revised the feasible scenarios to ensure accuracy
- ⇒ Scenarios 1 and 2 were taken for further consideration
  - Advantages and disadvantages
- ⇒ Evaluated safety aspects of feasible scenarios
- ⇒ Selected Preferred Improvement Plan
- ⇒ Documented results of VE Workshop

# Conclusion

➔ Scenario 2 was selected:

- Convenient access to adjacent properties and businesses
- Configuration on the east side provides a direct connection to a service road to the south
- Acceptable emergency response
- Suitable access from Stephenson Rd. 12 to the Madill Church IC.



# Questions/Discussion