



Value Management: Diversity, Equity and Inclusion are key to developing best value solutions

MARCH 21, 2023

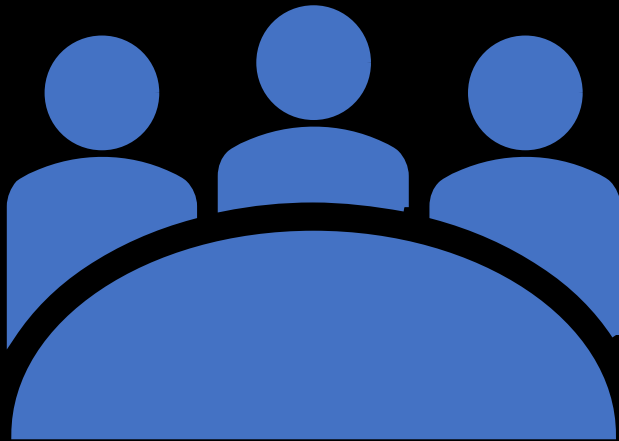




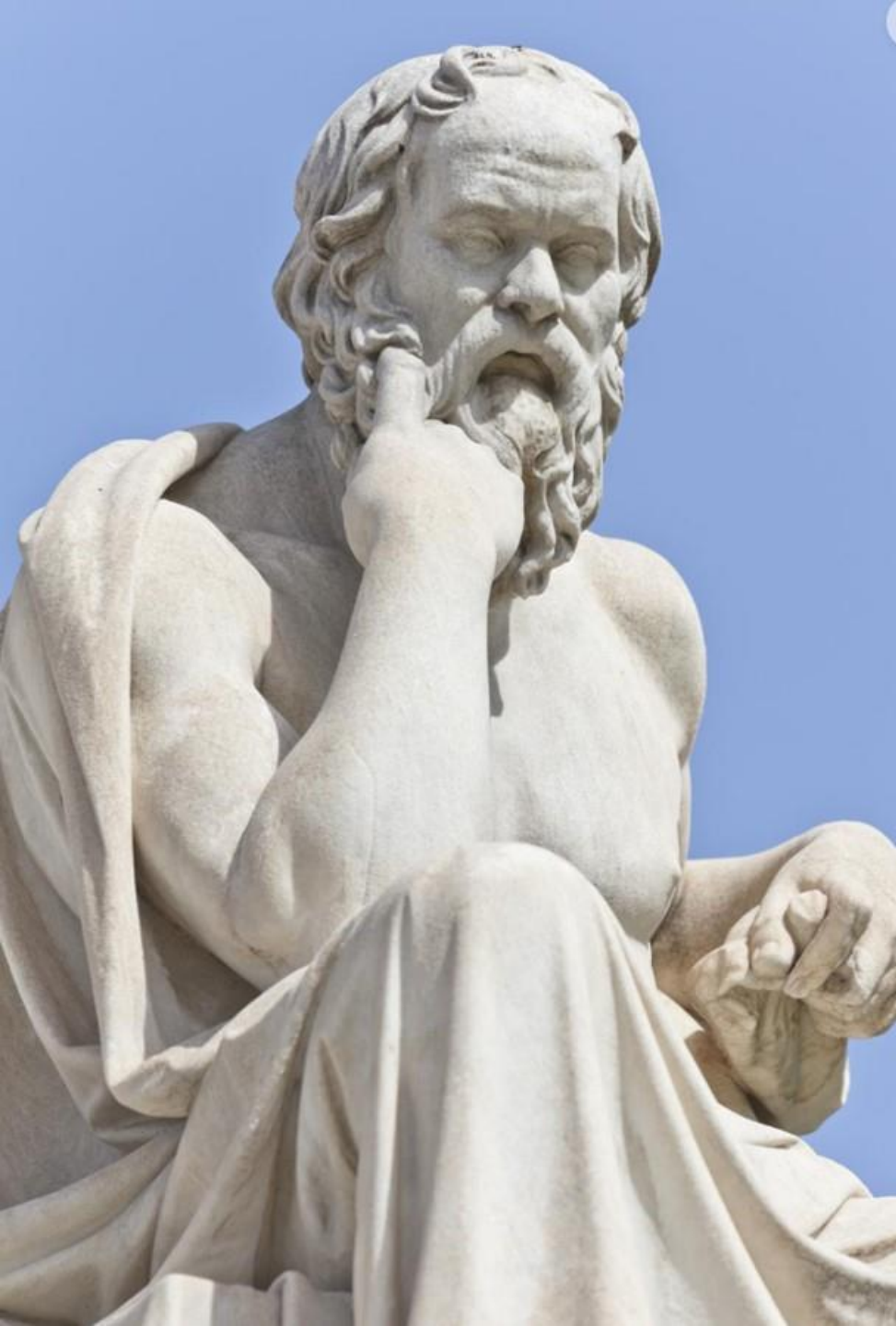
Background/Experience

- CVS-Life
- Transportation Background with approximately 1500 projects
- VE projects have included Transportation, Transit, Buildings, Water and Sewage Plants, Patent Applications, Planning for Business (Hockey Team) etc.
- Today's Talk will focus on 3 approaches that allow Diversity, Equity and Inclusion in developing best value solutions :
 - Value Planning
 - Community Café/World Café events
 - Multi-criteria evaluations
- All focused-on inclusion of stakeholders in decision-making

Presentation Outline



- Paradigms
- Tools for inclusion of Stakeholders/Rights Holders
 - Value Planning
 - Community Café / World Café Events
 - Multi-Criteria Evaluations



Basis of Value Engineering

Ask Critical Questions

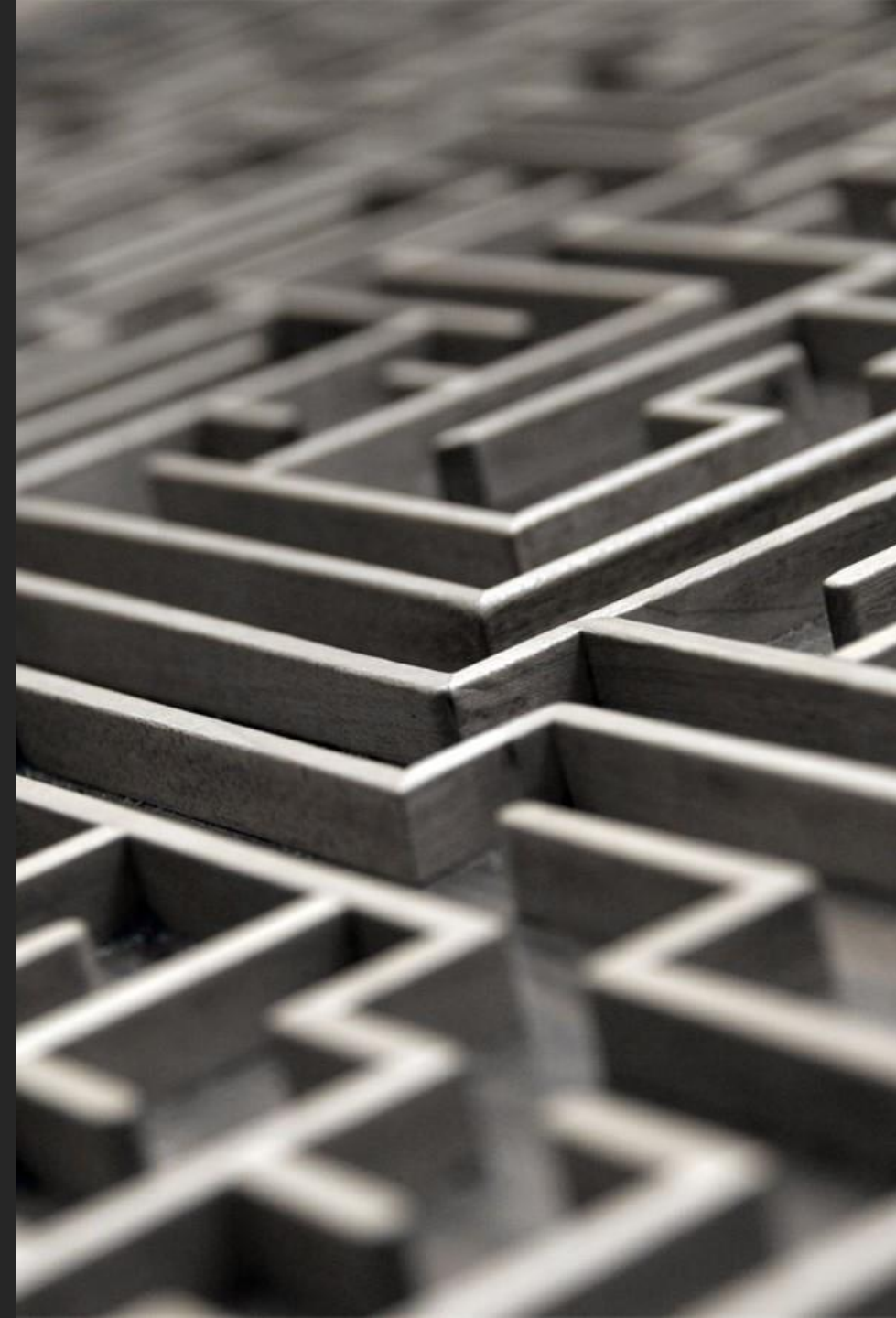
- Socrates known as the father of father of philosophy
- He fostered Critical Thinking by asking exploratory questions
- He taught by asking questions, a method known as the Socratic method, which aimed to expose contradictions and stimulate critical thinking
- Enquiring questions to reason - Value Engineering and World Café use common tools to lead to greater understanding
- What is our primary purpose as the facilitator?
 1. Generate innovative ideas/solve problems; or
 2. Have solutions implemented
- Question 2 leads to the need for stakeholder Diversity, Equity and Inclusion as keys to developing value solutions that get implemented



Paradigms – New Ways of Seeing

Change

- Fundamental changes have occurred in society – the basic ways we do things
- What would have been thought impossible became ordinary



What is a Paradigm?

- Accepted examples of actual scientific practice (research based on shared paradigms are committed to the same rules and standards for scientific practice)
- A set of shared assumptions (give us the advantage of being able to set a valid set of expectations)

Paradigm – Joel Barker

- A set of rules and regulations that does two things:
 1. establishes or defines boundaries
 2. Tells you how to behave inside the boundaries in order to be successful
- A paradigm shift is a change to a new set of rules

Last Weeks Paradigm

- Roundabouts always have less conflicts than signals



Unintentional blindness

- Researchers looking at data unintentional disregard data that does not fit the paradigm
- Focused groups do not see the edges

Who are these paradigm shifters

1. Young person fresh out of training – Albert Einstein!
2. An older person changing fields – Dr. Alex Mueller, Nobel Prize winner: a physicist goes to superconducting
3. Someone who really does not understand the existing paradigm in all its subtleties or at all

General Electric Example

1930's had a joke for new incoming engineers:

- turning on an incandescent light bulb – the Director would ask “do you see the hot spot (filament) – your job is to develop a new coating that smooths out the bulb glow”
- What everyone knew was it could not be done
- In 1952 a young engineer returns – “is this what you wanted sir”
- “Ah yes”



Value Planning

VE Work Plan Phases

- Information
 - What is the purpose of the projects or project elements?
- Function Analysis
 - What must it do
 - What does it cost?
 - What is it worth?
- Creative
 - What else will do it?
- Judicial
 - How well does it do it?
- Development
 - What will it cost?
- Presentation



Value Engineering



Value Planning

Steve's
Definition
division
Value
Planning vs.
Value
Engineering

- Value Engineering – Do the Project Right
- Value Planning – Do the Right Project

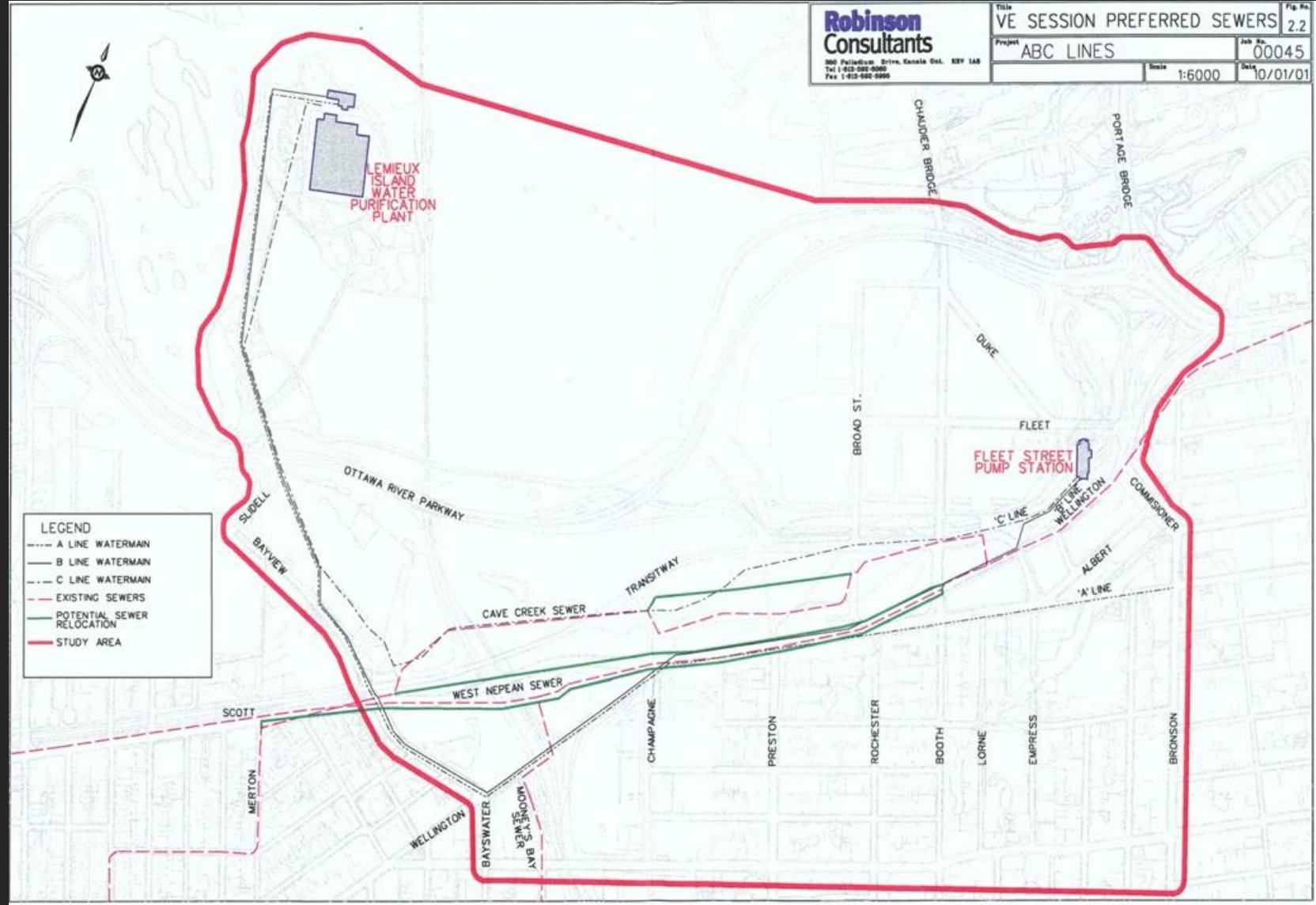
Testing Boundaries

- Use Value Planning early in the Project Development
- Fast Diagramming to test abstraction move to the left of the accepted scope line
- We use this as the starting point in a planning study, EA study

Value Analysis

Project A →  → **Project A' or B**

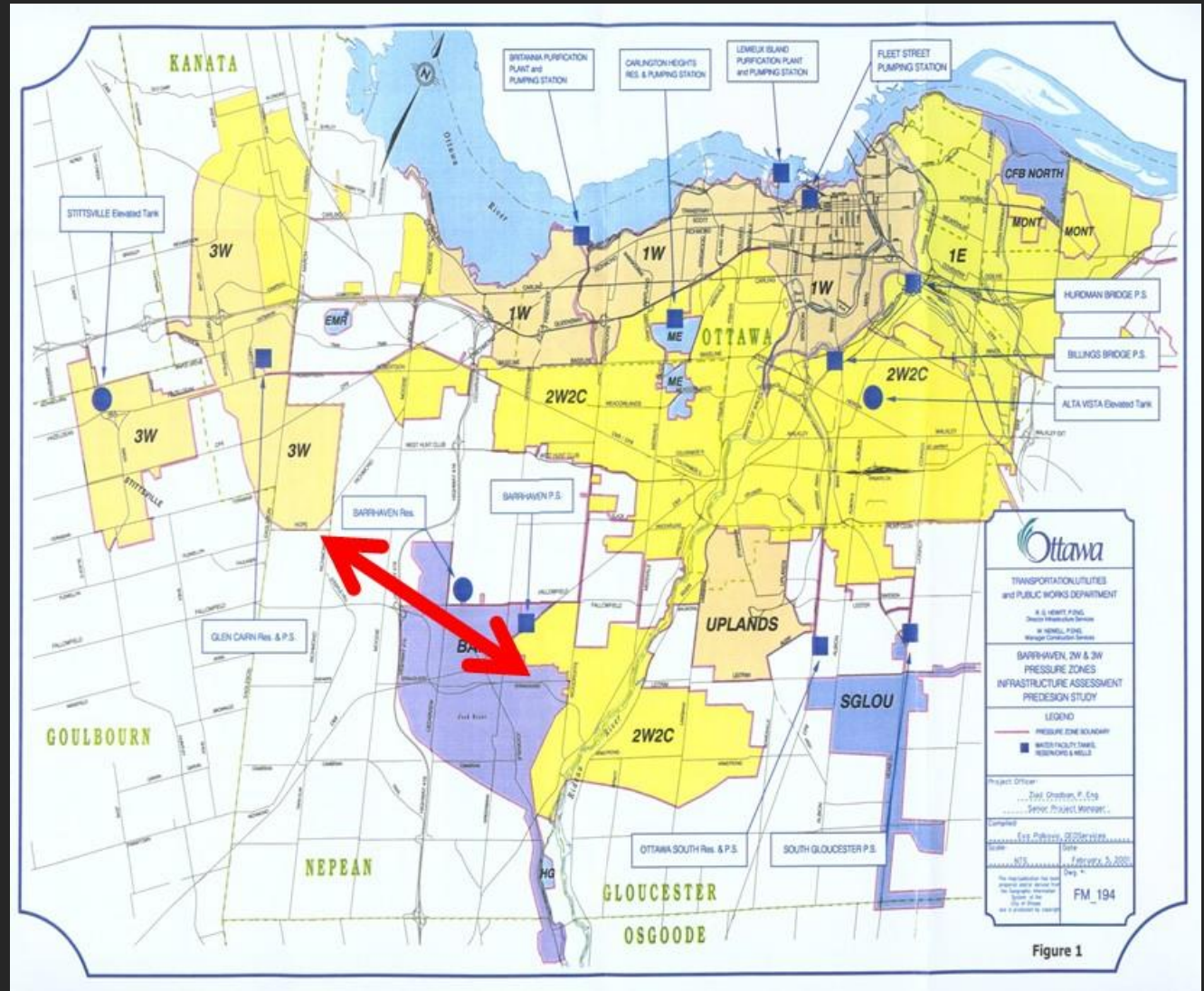
Case Study No. 2 Lemieux Island ABC Water Lines



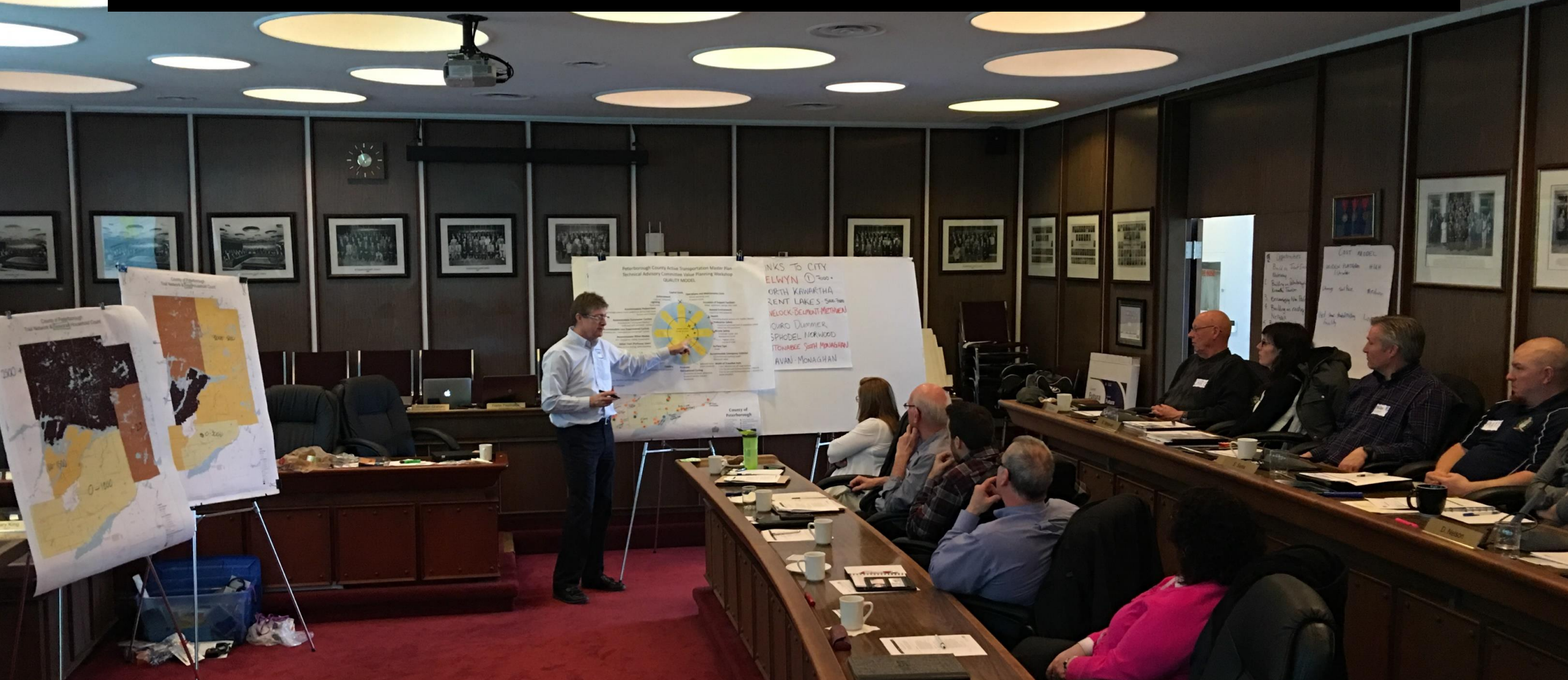
A, B, C Lines City of Ottawa



Case Study No. 4 Barrhaven Pressure Zones (2W & 3W)



Peterborough ATMP Value Planning Workshop



Community
Café / World
Café Events



Community Café



Café Process

- Participants will be divided into small groups to allow conversations and dialogue
- At the conclusion of a discussion period, participants will be asked to change tables and mix between topics
- Participants are free to sit out a session
- A recorder will make notes of the discussion of problems and potential solutions, and invoke questions to generate discussion

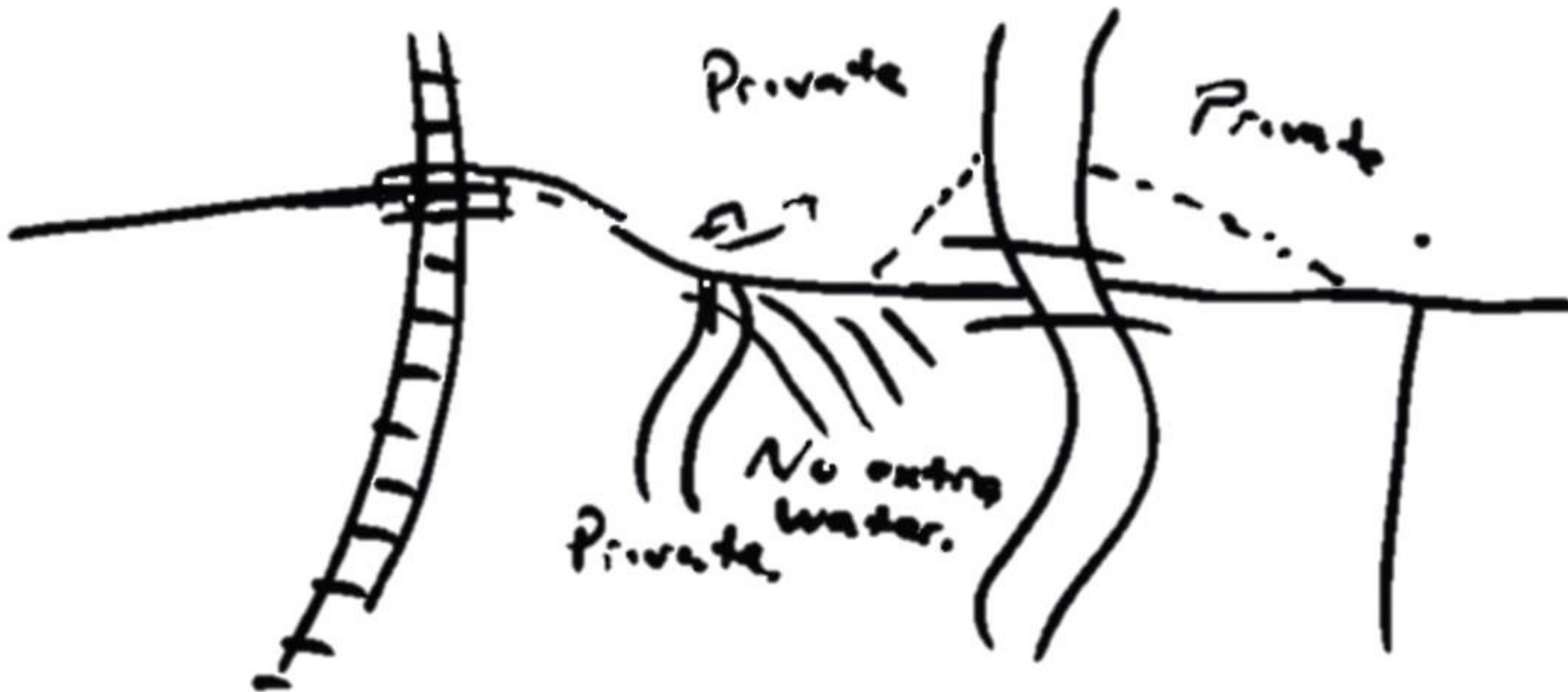
Café Approach

- Focus on dialogue between neighbours
- We are here to listen to your values and priorities
- Informal discussion of topics
- Encouraged to doodle sketches
- Build consensus of perspectives
- Discussion will be recorded

Small Group Discussions Curve Lake First Nation Cafe



2019. 3. 18



Sample Doodle

Café Discussion Topics



Vehicle safety and delays



Active Transportation



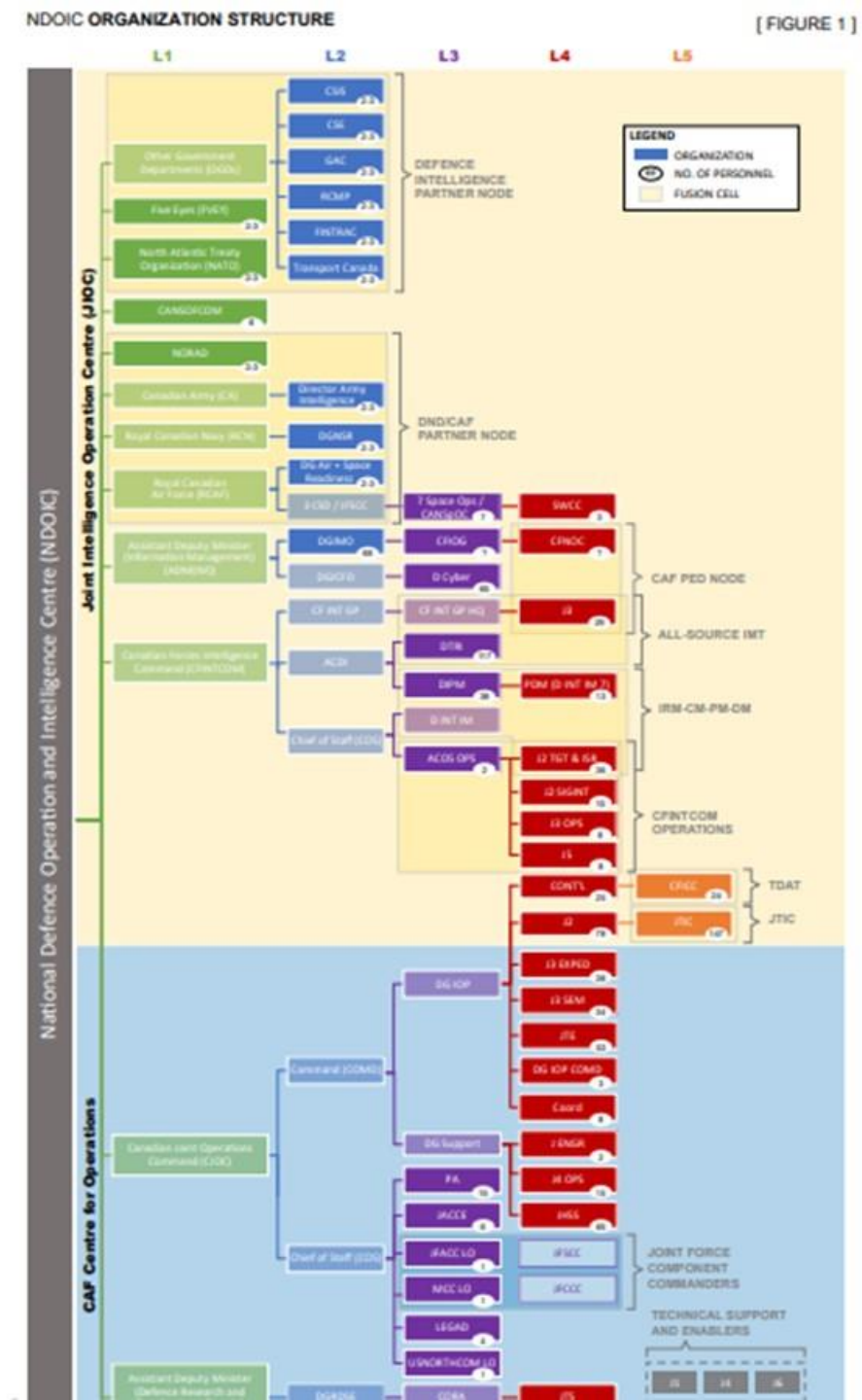
Route Alternatives and Shoreline
Protection



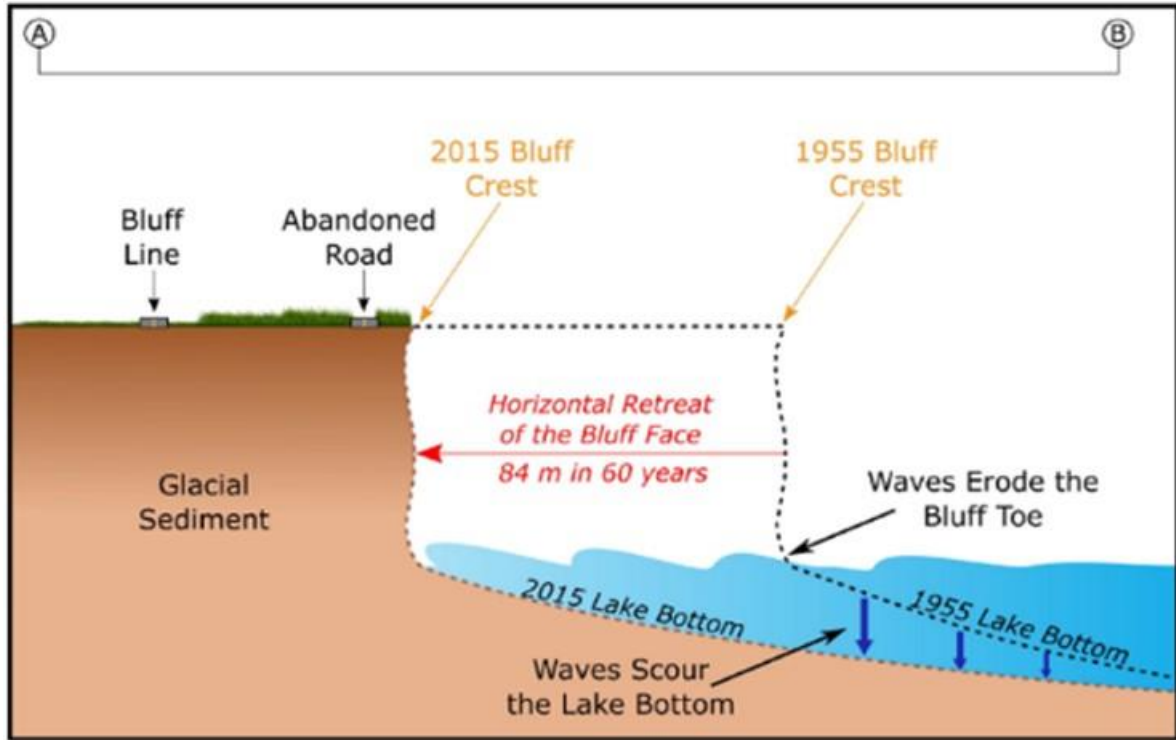
Property Access

National Defense Operation and Intelligence Centre Café Event

- Café Tables including multitude of stakeholders up to and including Generals and Commodores (Navy)
- Rotation of tables/discussion topics
- Allows open discussion in an organization that information only goes upward
- Consensus building
- Key fundamental decisions including the size and format of the NDOIC from the floor
- Final session was a closed meeting of key senior leaders (closed room decisions)
- Project moving forward passes key decision milestone for Billion-dollar project







Chatham Kent Lake Erie Coastal Erosion Café Event



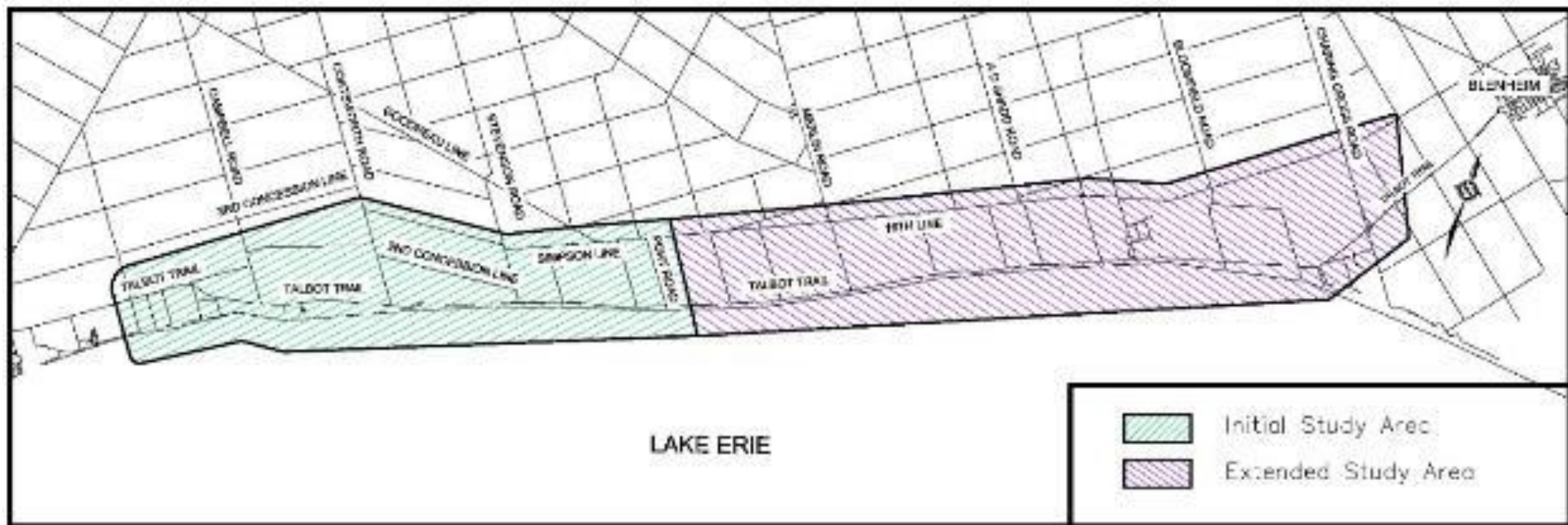


2020. 2. 27 19:16

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Multi-Criteria Decision-Making



Quantitative Evaluation Methodology

- Key principles of the EA Act and MECP's Guidelines on Environmental Assessment Planning and Approval are that there be accountability and traceability. A quantitative evaluation method allows both of these key principles to be addressed. A quantitative method based on the "Weighted Additive Method" will be used for this study and is also referred to as the "Multi-Attribute Trade-off System" (MATS).
- The Weighted Additive Method has proven to be well suited for the evaluation of complex groups of alternatives. The methodology allows for sensitivity testing and the ability to answer "what if" questions. It is used on projects where alternatives are to be evaluated and the decision-making process is faced with either a large number of alternatives or a large number of competing criteria for the alternatives being evaluated.

Quantitative (Detailed Evaluation)

- Based on weighted additive method;
- Addresses complexity of base data and number of alternatives;
- Traceable decision-making process;
- Defensible;
- Ability to answer what-if questions; and
- Allows sensitivity testing.

Evaluation Process (Quantitative)

- Develop long list of potential evaluation criteria/ performance factors/ alternatives
- Focus group meetings to prepare short list of criteria/ performance factors/ alternatives
- Collection of data/environmental inventories
- Establish Social Utility Functions (performance factors)
- Weighting of Evaluation Criteria
- Rate Alternatives
- Select Technically Preferred Alternatives (TPAs)

Long List of Sub-factors

- The analysis and evaluation of the Short-Listed Alternatives is proposed to be undertaken using the qualitative method and a comprehensive evaluation methodology referred to as the Multi Attribute Trade-off System (MATS) method.
- Potential evaluation factor groups can be considered:
 - Transportation
 - Natural Environment
 - Cultural Environment
 - Socio-Economic Environment
 - Land Use and Property
 - Cost
- The factor groups are made up of measurable criteria (sub-factors) used to identify relevant benefits and impacts. They define a unit of measure and the relative differences between alternatives. Evaluation data will be collected from literature reviews of background documentation and environmental inventories completed for this project.
- The Preliminary Long List of Evaluation Criteria for the qualitative evaluation is shown on the following exhibits.

Utility Functions

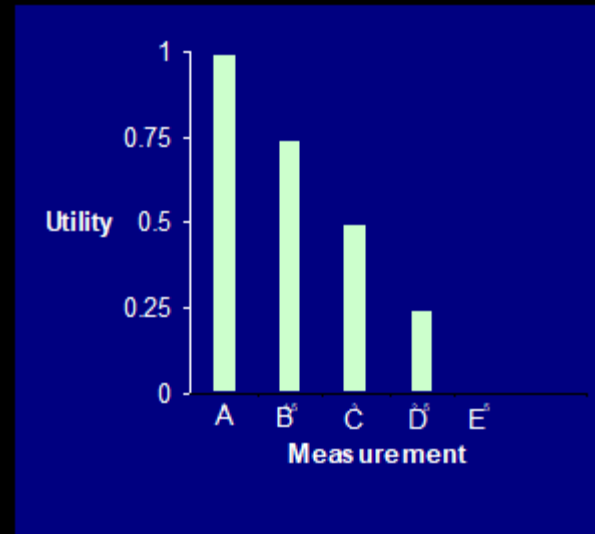
- The comparison of the performance uses a mathematical relationship.
- The performance is described by either a linear, stepped or a dichotomous utility function. These utility functions assign a dimensionless score between 0 and 1 to an alternative for each sub-factor. A score of 1 represents the best performance.

Performance Factors/Utility Functions

- For each criteria carried forward for analysis and evaluation, there is an associated utility function – why?
 - Effects are not mathematically the same units;
 - Need to compare apples to apples;
 - Need dimensionless measure of utility; and
 - Mathematically correct.

Stepped Utility Function

- The stepped utility function permits the decision maker to assess the criterion when the sub-factor presents more than one level of impact.

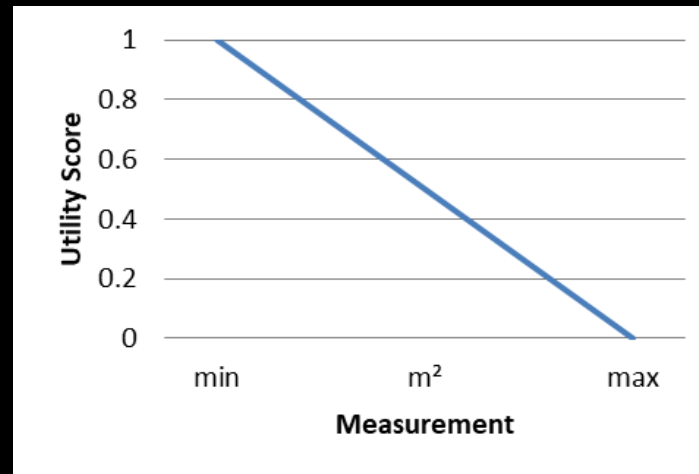


Anchored Decisions

- Decision-making must be anchored to the relevant facts (i.e. the actual range of measurable effects)
- Weights must be based on range of measured effects
- Consider magnitude and range of effects, relative to competing alternatives

Sample Sub-Factor Social Environment

- Definition: This sub-factor measures the temporary loss of green space for staging sites. Temporary loss will be for approximately 1 year for the bridge staging sites and would be a loss to the local community. Alternatives impacting the least area are preferred.



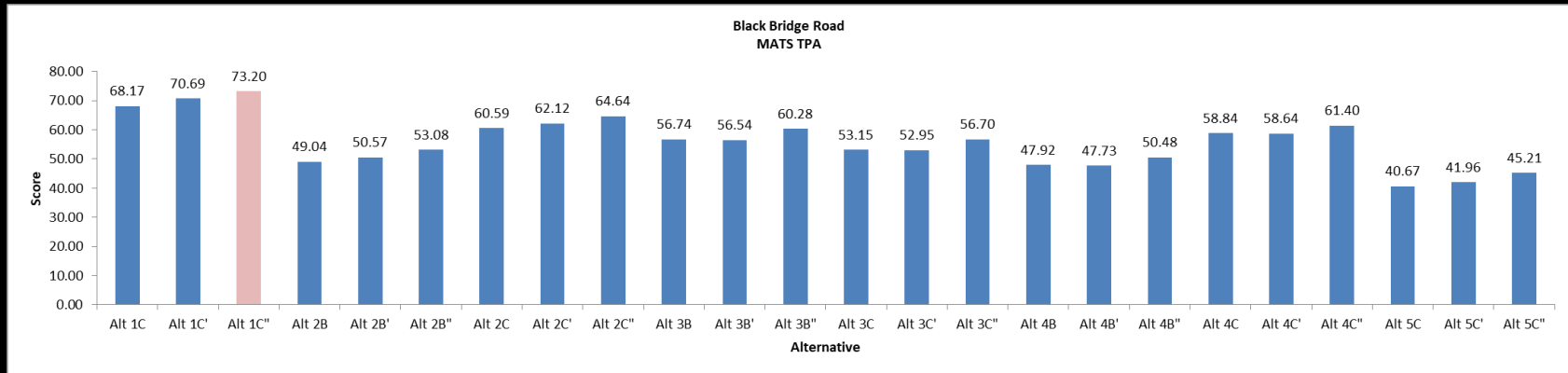
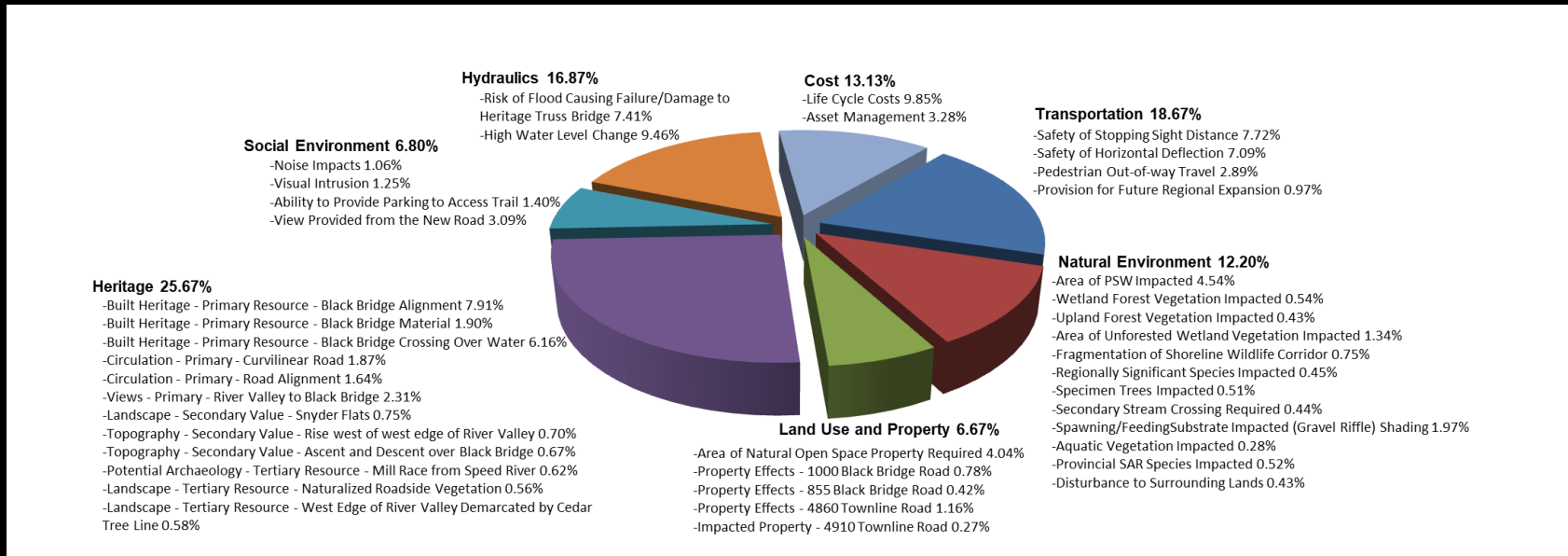
Alternative	m ²	Utility Score
Alternative A-A1 Rapid Rehabilitation	1,282	1
Alternative A-A2 Conventional Rehabilitation	1,282	1
Alternative B-B1 Conventional Replacement	1,282	1
Alternative B-C1 Rapid Replacement	2,565	0

Weighting of Evaluation Criteria

- Each member of study team assigns their own weights to each global factor and sub-factor:
 - What is the variation of measured effects? Is it meaningful?
 - Is this an impact that can be mitigated?
 - Is this a localized or global factor?
 - Will the effects be short-term or long-term?
 - What are the views of the public?
- Weighted scores are determined by multiplying the points available (Sub-factor weight/Factor weight) by the un-weighted Social Utility

Sub-Factor	Pts. Available	Social Utility Function	Weighted Score
Design Consistency	3.25	Yes (1)	3.25
Commercial Property Required	1.15	0.63 ha (0)	0

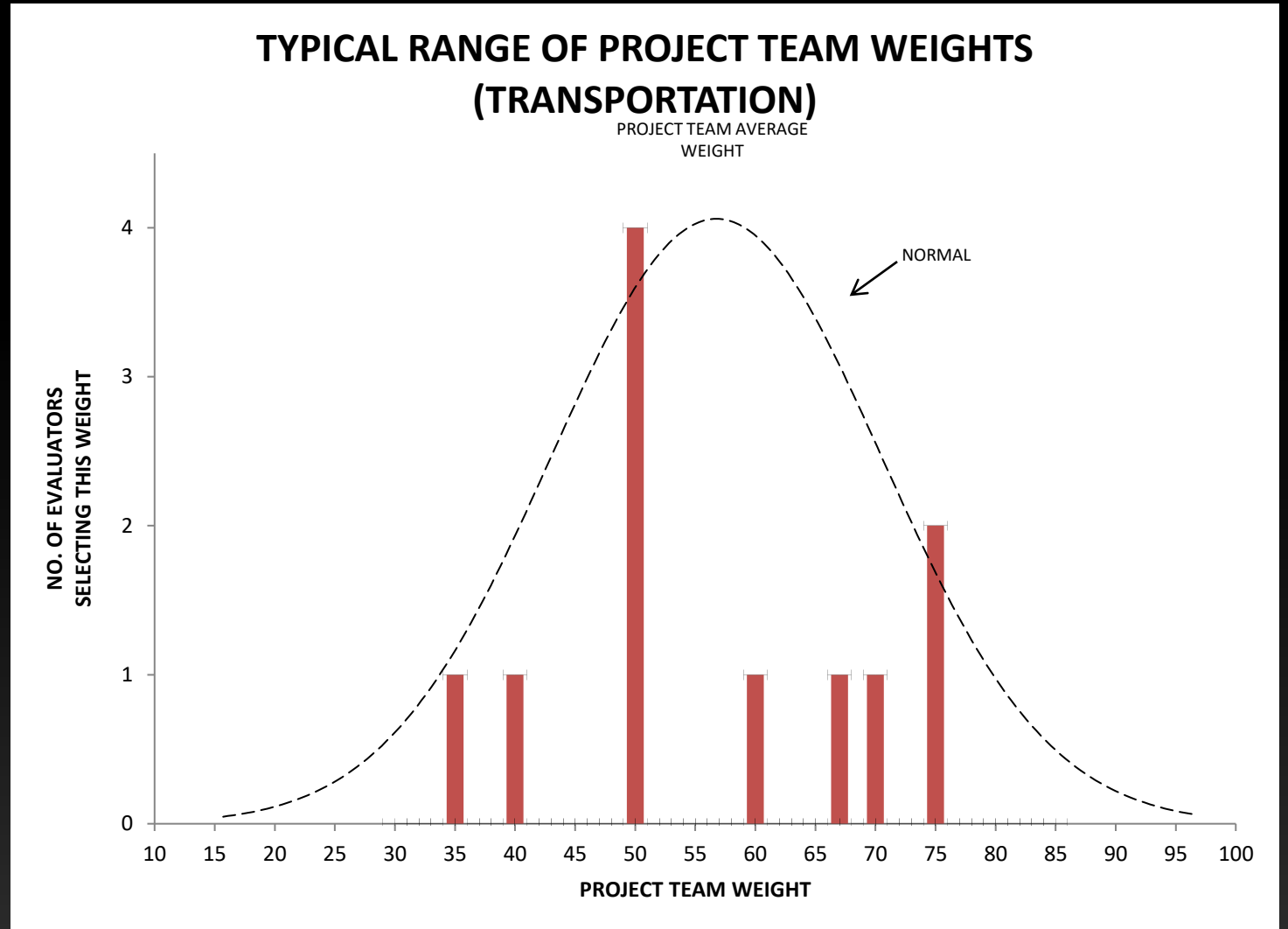
Black Bridge Road EA Ranking



Sensitivity Testing

- Individual weights are a matter of professional judgment/life experiences
- Sensitivity testing assesses if outcomes are sensitive to weights selected
- Answers the “what-ifs”
- Assesses study team’s “average weights”
- Assesses how robust the solution is

Example



Alternative 1

Signalized Intersection and at grade pedestrian crossing



Pedestrians crossing Franklin Boulevard with signals

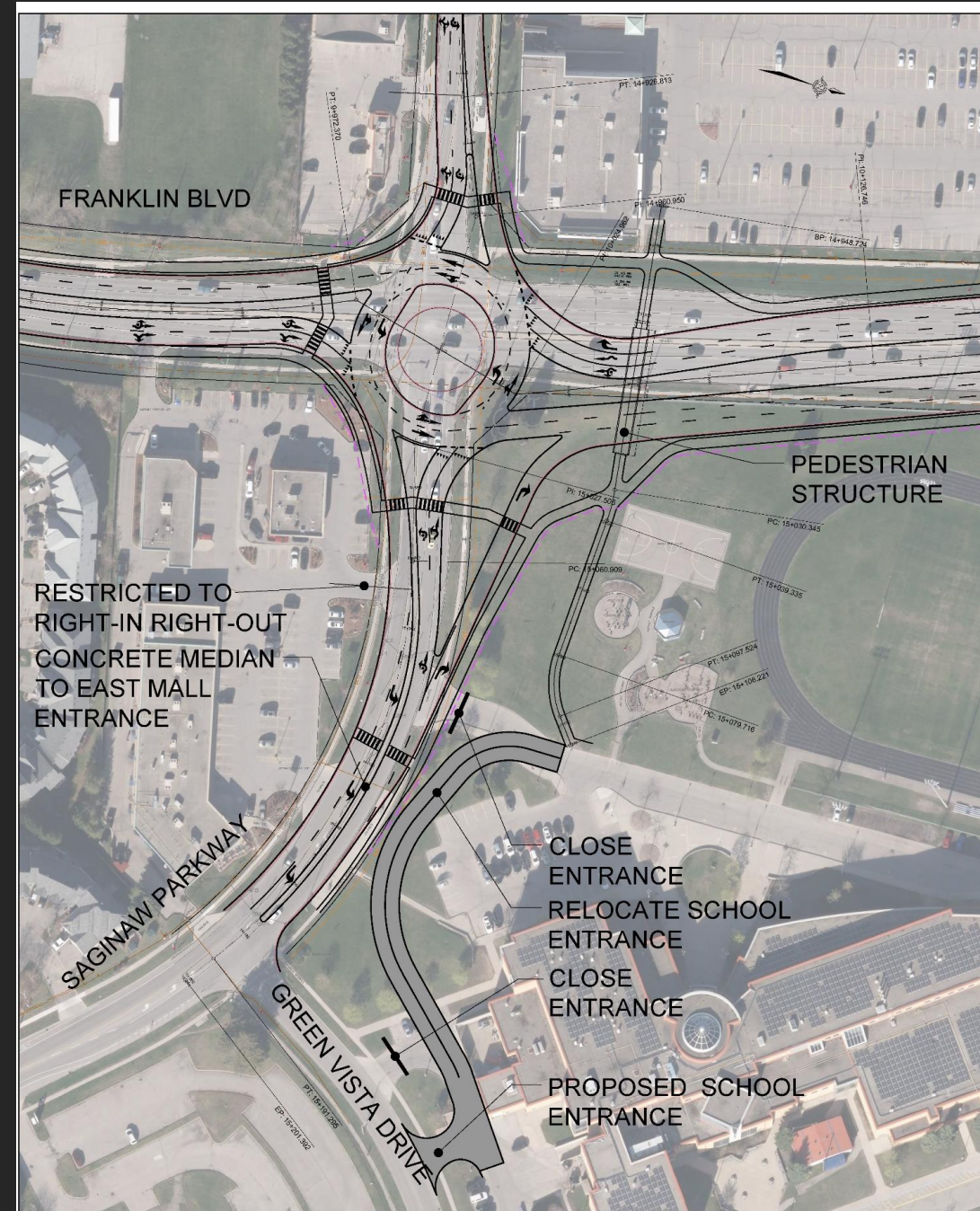


Alternative 5

Roundabout/ Active Transportation Grade Separation (north leg)
Pedestrian Bridge under Franklin Blvd.



Pedestrian Bridge under Franklin Boulevard



Transportation

Delays to Pedestrians and Cyclists



Definition: This criterion measures the delay to cyclists and pedestrians. Alternatives that reduce the delays to pedestrians and cyclists and shorten crossing distances are preferred.

Alternatives 5 and 6 provide a direct crossing from the school entrance to reduce delay. (Low)

There are increased delays at signalized intersections due to traffic and turning movements compared to roundabouts. (Moderate)

Signalized intersection delays are considered high.

Utility function is based on the average person delay measured on all four legs.

Mitigation: None.

Alternatives:

Alternatives		Average Delay per Person (sec)	Utility Score
Alternative 1 Signalized Intersection At - Grade Pedestrian Crossing	Assume APS	High Delay 71	0
Alternative 2 - Signalized Intersection At - Grade Pedestrian Crossing Conestoga-Elgin Connection	Assume APS	High Delay 71	0
Alternative 3-1 Roundabout with At-Grade Pedestrian Crossing - (Signal North Leg)	PXO Type D 3 legs	Moderate Delay 27	0.66
Alternative 3-2	PXO Type C/B 3 legs	Moderate Delay 27	0.66
Alternative 3-3	PXO Type C with APS 3 legs	Moderate Delay 27	0.66
Alternative 4-1 Roundabout with At-Grade Pedestrian Crossing - (Signal North Leg) - Conestoga-Elgin Connection	PXO Type D 3 legs	Moderate Delay 27	0.66
Alternative 4-2	PXO Type C/B 3 legs	Moderate Delay 27	0.66
Alternative 4-3	PXO Type C/B with APS 3 legs	Moderate Delay 27	0.66
Alternative 5-1 Roundabout with Grade Separated Pedestrian Crossing (North Leg)	PXO Type D 3 legs	Very Low Delay 4	1

Alternatives		Average Delay per Person (sec)	Utility Score
Alternative 5-2	PXO Type C/B 3 legs	Very Low Delay 4	1
Alternative 5-3	PXO Type C/B with APS 3 legs	Very Low Delay 4	1
Alternative 6-1 Roundabout w Grade Separated Pedestrian Crossing (North Leg) - Conestoga-Elgin Connection	PXO Type D 3 legs	Very Low Delay 4	1
Alternative 6-2	PXO Type C/B 3 legs	Very Low Delay 4	1
Alternative 6-3	PXO Type C/B with APS 3 legs	Very Low Delay 4	1
Alternative 7-1 Roundabout w Grade Separated Ped Crossing (N Leg) At-Grade Pedestrian Crossing - (Signal South Leg)	PXO Type D 2 legs	Low Delay 11	0.9
Alternative 7-2	PXO Type C/B 2 legs	Low Delay 11	0.9
Alternative 7-3	PXO Type C/B with APS 2 legs	Low Delay 11	0.9
Alternative 8-1 Roundabout w Grade Separated Ped Crossing (N Leg) - At-Grade Pedestrian Crossing - (Signal South Leg) Conestoga-Elgin Connection	PXO Type D 2 legs	Low Delay 11	0.9
Alternative 8-2	PXO Type C/B 2 legs	Low Delay 11	0.9
Alternative 8-3	PXO Type C/B with APS 2 legs	Low Delay 11	0.9

Accommodates People Living with Vision Loss

Score out of 10

Signals crossing 8-9 lanes	5
Signals crossing 4-6 lanes	7
PXO Type D	2
PXO Type C/B	5
PXO Type C/B with APS	7
Pedestrian signal	9
Pedestrian bridge	10

Scenarios (north leg weighted x2)

Alternatives 1 + 2 (signalized intersection)	
Assume APS	29
Alternatives 3-4 (roundabout with mid-block signal)	
PXO Type D	24
PXO Type C/B	33
PXO Type C/B with APS	39
Alternatives 5-6 (roundabout with bridge)	
PXO Type D	26
PXO Type C/B	35
PXO Type C with APS	41
Alternatives 7-8 (roundabout with signal and bridge)	
PXO Type D	33
PXO Type C/B	39
PXO Type C/B with APS	43

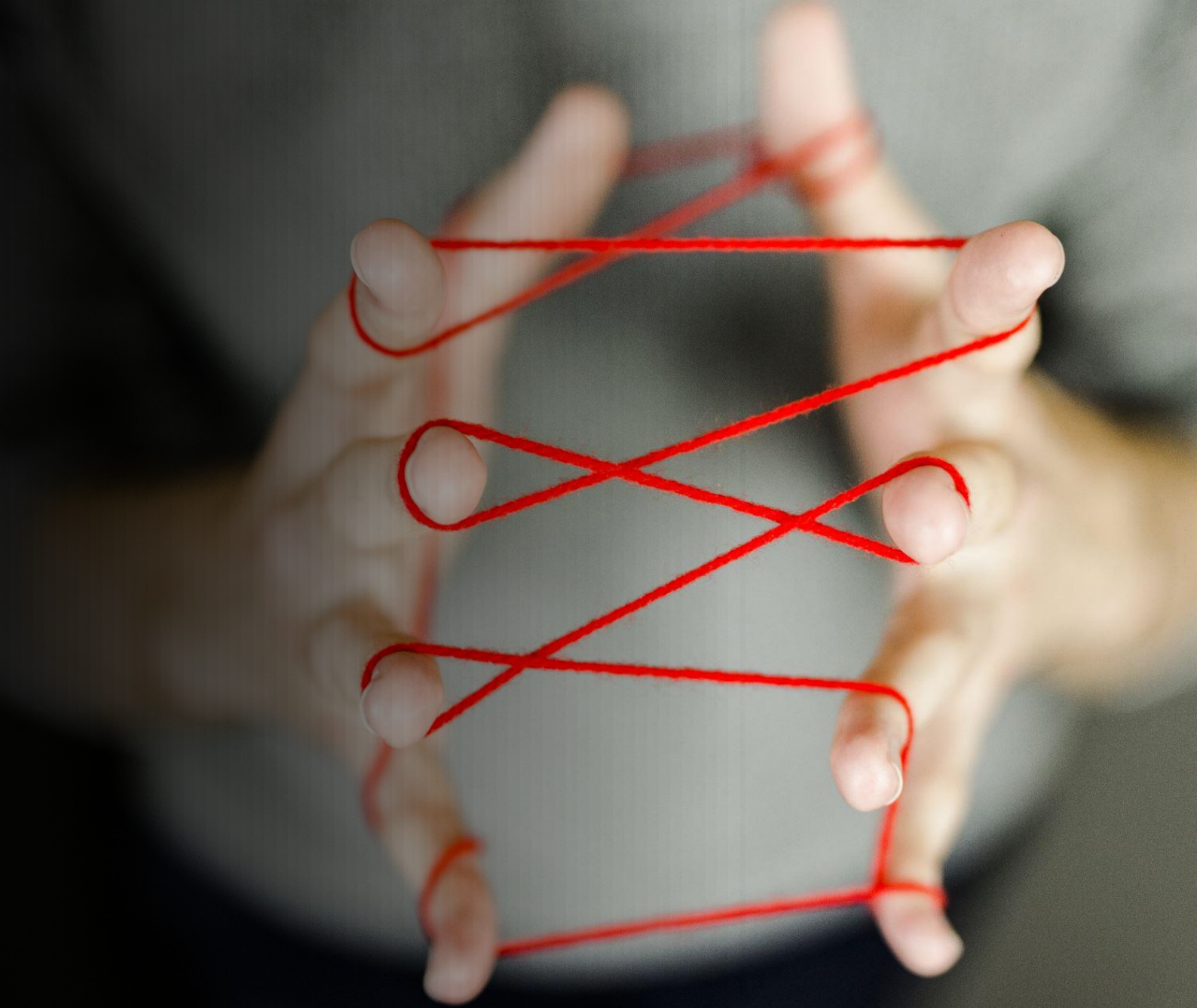
**Under discussion: If the pedestrian crossing has RRFB's and audio or if the pedestrian crossing does not include a RRFB's and audio. See slides at end of presentation.

Alternatives:

Alternatives		24 to 43	Utility Score
Alternative 1 Signalized Intersection At - Grade Pedestrian Crossing	Assume APS	29	0.26
Alternative 2 - Signalized Intersection At - Grade Pedestrian Crossing Conestoga-Elgin Connection	Assume APS	29	0.26
Alternative 3-1 Roundabout with At-Grade Pedestrian Crossing - (Signal North Leg)	PXO Type D 3 legs	24	0
Alternative 3-2	PXO Type C/B 3 legs	33	0.47
Alternative 3-3	PXO Type C with APS 3 legs	39	0.79
Alternative 4-1 Roundabout with At-Grade Pedestrian Crossing - (Signal North Leg) - Conestoga-Elgin Connection	PXO Type D 3 legs	24	0
Alternative 4-2	PXO Type C/B 3 legs	33	0.47
Alternative 4-3	PXO Type C/B with APS 3 legs	39	0.79
Alternative 5-1 Roundabout with Grade Separated Pedestrian Crossing (North Leg)	PXO Type D 3 legs	26	0.11
Alternative 5-2	PXO Type C/B 3 legs	35	0.58
Alternative 5-3	PXO Type C/B with APS 3 legs	41	.89
Alternative 6-1 Roundabout w Grade Separated Pedestrian Crossing (North Leg) - Conestoga-Elgin Connection	PXO Type D 3 legs	26	0.11
Alternative 6-2	PXO Type C/B 3 legs	35	0.58
Alternative 6-3	PXO Type C/B with APS 3 legs	41	.89
Alternative 7-1 Roundabout w Grade Separated Ped Crossing (N Leg) At-Grade Pedestrian Crossing - (Signal South Leg)	PXO Type D 2 legs	33	.47
Alternative 7-2	PXO Type C/B 2 legs	39	.79
Alternative 7-3	PXO Type C/B with APS 2 legs	43	1
Alternative 8-1 Roundabout w Grade Separated Ped Crossing (N Leg) - At-Grade Pedestrian Crossing - (Signal South Leg) Conestoga-Elgin Connection	PXO Type D 2 legs	33	.47
Alternative 8-2	PXO Type C/B 2 legs	39	.79
Alternative 8-3	PXO Type C/B with APS 2 legs	43	1



Conclusions



Conclusions

- Engagement to gain acceptance of large-scale ideas
- Engagement to see greater implementation of ideas
- Inclusion part of the consultation requirement of Class EA
- Early facilitation techniques to gain creativity