## Term 8 Civil Engineering Project Memorial University Department of Transportation & City of St. John's

## Health Sciences Centre Clinch Crescent Access Study

**Requirement for ENGR 8700 MVP&O Group** 





#### **Problem Definition**

#### Scope

- Traffic Study
- Route Selection
- Geometric Design
- Environmental Impact
- Cost Estimate

### **Recommendation and Conclusion**





# **Introduction to a Problem**



- Prince Phillip Drive
- University Campus
- Largest Acute Care Facility in NL
- Opened in 1978.
- Significant Expansion
  - Janeway June 21, 2001
  - Cancer Centre
  - Hostels
  - University Campus Expansions
  - Increased patient turn-over
  - Nursing/Pharmacy/Medical School Enrollments
- No Increase in access (Clinch East/West, Arctic ave.)
- Little increase in parking







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# **MVP&O Group to the Rescue**



#### The Goal

- Increase Capacity
- Reduce Traffic Congestion entering and exiting the HSC Facility and surrounding roads (PPDr)
- Who turns left at Clinch East?!?





## **Existing Access**



#### **Clinch Crescent East**

- Mornings...Short Signal
- Hospital/University Traffic
- Pedestrians
- Arctic Avenue Traffic

#### **Clinch Crescent West**

- Longest Left Turn Signal in City
- Recent Upgrade of bridge and road
- Possibility of future expansions









# **Traffic Study**



#### Synchro Model

- Existing Traffic Situation
- Data Supplied by City
- Traffic Counts for Remainder
- Evaluates Traffic Volumes/LOS
- Traffic Light Sequences

#### **SIM Traffic**

- Animates traffic flows
- Provides visual representation of traffic network.
- Evaluates average delays at intersections.













#### Levels of Service (A=Good F=Bad)

|                         | 1      | Ť       | ۲       | L.      | ŧ       | J.       | ,        | 1    | 4    | f     | *           | t   |
|-------------------------|--------|---------|---------|---------|---------|----------|----------|------|------|-------|-------------|-----|
| Lane Group              | NBL    | NBT     | NBR     | SBL     | SBT     | SBR      | NEL      | NET  | NER  | SWL   | SWT         | SWR |
| Lane Configurations     |        | 1       | 1       | 1       | 11      | 17       | 1        | ++   | 1    | 1     | <b>†</b> \$ |     |
| Total Lost Time (s)     | 3.0    | 3.0     | 3.0     | 3.0     | 3.0     | 3.0      | 3.0      | 3.0  | 3.0  | 3.0   | 3.0         | 3.0 |
| Satd. Flow (prot)       | 1750   | 1842    | 1794    | 1652    | 3500    | 2756     | 1652     | 3618 | 1794 | 1652  | 3539        | 0   |
| Flt Permitted           | 0.950  |         |         | 0.387   |         |          | 0.129    |      |      | 0.285 |             |     |
| Satd. Flow (perm)       | 1748   | 1842    | 1766    | 672     | 3500    | 2758     | 224      | 3618 | 1766 | 495   | 3539        | 0   |
| Satd. Flow (RTOR)       |        |         | 249     |         |         |          |          |      | 151  |       |             |     |
| Volume (vph)            | 197    | 452     | 225     | 19      | 688     | 860      | 421      | 733  | 134  | 217   | 825         | 3   |
| Lane Group Flow (vph)   | 235    | 538     | 268     | 22      | 782     | 977      | 473      | 824  | 151  | 238   | 910         | 0   |
| Turn Type               | Prot   |         | Perm    | Perm    |         | pt+ov    | pm+pt    |      | Perm | pm+pt |             |     |
| Protected Phases        | 7      | 4       |         |         | 8       | 85       | 5        | 2    |      | 1     | 6           |     |
| Permitted Phases        |        |         | 4       | 8       |         |          | 2        |      | 2    | 6     |             |     |
| Total Split (s)         | 20.0   | 49.0    | 49.0    | 29.0    | 29.0    | 59.0     | 30.0     | 45.0 | 45.0 | 16.0  | 31.0        | 0.0 |
| Act Effct Green (s)     | 17.0   | 46.0    | 46.0    | 26.0    | 26.0    | 56.0     | 58.0     | 42.0 | 42.0 | 41.0  | 28.0        |     |
| Actuated g/C Ratio      | 0.15   | 0.42    | 0.42    | 0.24    | 0.24    | 0.51     | 0.53     | 0.38 | 0.38 | 0.37  | 0.25        |     |
| v/c Ratio               | 0.87   | 0.70    | 0.30    | 0.14    | 0.95    | 0.70     | 1.01     | 0.60 | 0.20 | 0.74  | 1.01        |     |
| Control Delay           | 76.1   | 32.2    | 4.3     | 35.9    | 62.4    | 23.9     | 61.9     | 21.5 | 4.8  | 33.0  | 73.8        |     |
| Queue Delay             | 0.0    | 0.0     | 0.0     | 0.0     | 0.0     | 0.0      | 0.0      | 0.0  | 0.0  | 0.0   | 0.0         |     |
| Total Delay             | 76.1   | 32.2    | 4.3     | 35.9    | 62.4    | 23.9     | 61.9     | 21.5 | 4.8  | 33.0  | 73.8        | -   |
| LOS                     | E      | С       | A       | D       | E       | С        | E        | С    | A    | С     | E           |     |
| Approach Delay          |        | 34.9    |         |         | 40.9    |          |          | 33.0 | -    |       | 65.3        | 12  |
| Approach LOS            |        | С       |         |         | D       |          |          | С    |      |       | E           |     |
| Intersection Summary    |        |         |         |         |         |          |          |      |      |       |             |     |
| Cycle Length: 110       | 110    |         |         |         |         |          |          |      |      |       |             |     |
| Offect: 72 (85%) Refer  | - nood | to ohes | a 2.NE  | TI and  | 8-SW/T  |          | of Gree  | -    |      |       |             |     |
| Control Type: Actuated  | Coord  | linated | C 2.14L | r c ano | 0.000   | E, Otai  | t of one | =11  |      |       |             |     |
| Control Type. Accorded  | 11     | mareo   |         |         |         |          |          |      |      |       |             |     |
| MENTION IN CHATLO!      |        |         |         |         |         |          |          |      |      |       |             |     |
| Intersection Signal Del | av: 42 | 0       |         |         | ntersea | tion I O | S D      |      |      |       |             |     |

Splits and Phases: 6: Allandale Road & Crosstown Arterial

| f pl | ≠ #2 | 1 p4      |  |  |  |  |
|------|------|-----------|--|--|--|--|
| 18 s | 45 s | 43 s      |  |  |  |  |
| ¢ µ5 | ¥ øs | An #7 #8  |  |  |  |  |
| 30 a | 31 a | 20.8 29.6 |  |  |  |  |





# **Possible Solutions**



Larkhall Link

Schools

- Advantages
  - Extra option other than Parkway
- Disadvantages
  - Primary/Elementary Schools
  - Cut through Traffic
  - Outspoken Neighborhood
    Committee

Link

Mosdell F

WarnersiRd

### Clinch Crescent West (Double Left)

- Advantages
  - Increases left hand turn capacity
  - Reduces Congestion on Parkway
  - Already in place, but not commissioned
- Disadvantages
  - Cost







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#### Pippy Park Link (1&2) – West/Center Clinch

- Advantages
  - Avoids issues with Autism Center
  - Quick Access to Outer Ring
  - Easy Access to PPDr West
  - Direct Access to Parking Lots
- Disadvantages
  - Pippy Park Green Space
  - Walking Trails
  - West Lose Parking
  - Center Interfere Helipad
  - University Traffic Cuts Across Hospital Traffic
  - Center May need Traffic Signal







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# **Possible Solutions cont...**

### Pippy Park Link (3) – East Clinch

- Advantages
  - Quick Access to Outer Ring Road
  - Convenient for Student Traffic
  - Less road/Less Cost
- Disadvantages
  - Pippy Park Green Space
  - Walking Trails
  - Autism Center
  - Wetlands

### **Tunnel from Outer Ring Road**

• 16 Million Dollars +/- 25%





ENGI 8700 – Mid Term Presentation – Clinch Crescent Access Study



# **QRSII Simulation**



#### What is it?

- State of the Art Planning Package
- Regional Forecasting, site impact analysis

#### How it works?

- Input our current data
- Add Pippy Park Link
- Run Simulation
- Develop Factors to
  Redistribute Traffic Volumes

#### **Select Alternatives**

- New AM/PM Traffic Models
- New LOS tables
- Outline where existing roadways and intersections may need upgrading.





## **Possible Upgrades**



#### Allandale/Outer Ring Road On-Ramps

• Double Right

### Allandale/Ridge Road/Mt Scio Road

 Add LHT Lanes/ Increase RHT Capacity to and from Mt Scio

### Prince Phillip Drive/Clinch Crescent West

- Double Left
- Addition of Exterior Lane

### Morissey Drive

• LHT to Engineering Building













## **Geometric Design**



#### **TAC Manual & Design Standards**

- Horizontal Curves/Vertical Curves for New Roadway
- Design Speeds, etc.
- Intersection and Interchange Design Standards











## **Selecting a Route**

#### Possible Routes through the Park

- Clinch Crescent East vs. Center vs. West Access Point
- Mt. Scio Remains Major / Add intersection for New Link
- Mt. Scio becomes a minor roadway / New Link becomes Major Roadway





# **Environment/Park/Trails**



#### Environmental Study for link though Pippy Park

- Considerations during construction
- Consideration in design for after construction
- Particular attention to crossing of Pippy Park trail system





# <u>Cost Estimate</u>



# Cost estimation for all route design and intersection upgrades calculated using unit prices.

- Clearing & Grubbing
- Excavation (Roads, Ditches, Cut/Fill)
- Borrow (Gravel Class A,B)
- Hot Mix Asphalt Concrete
- Guide Rails
- Utilities
- Culverts
- Indirect Costs





### **Deliverables**



#### Deliverables for the client will include:

- Project report including methods and recommendations
- Traffic model of each alternative and results
- Design and CAD drawing of all roadway and intersection changes
- Cost estimation of all designed changes
- Environment consideration of all designed changes





### Any Questions?







