



Region of Waterloo & Grand River Transit



## Using GIS in the Implementation of New Transit Technologies



URISA Ontario Chapter  
Municipal Update

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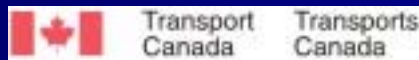
# Agenda

- Introductions
- Region of Waterloo / Grand River Transit
- UTSP Project
- Transit Technology Project Overview
- GIS & Transit
- GIS Data Requirements for Transit Technology & Data Analysis
- Expected Project Benefits
- Closing Remarks



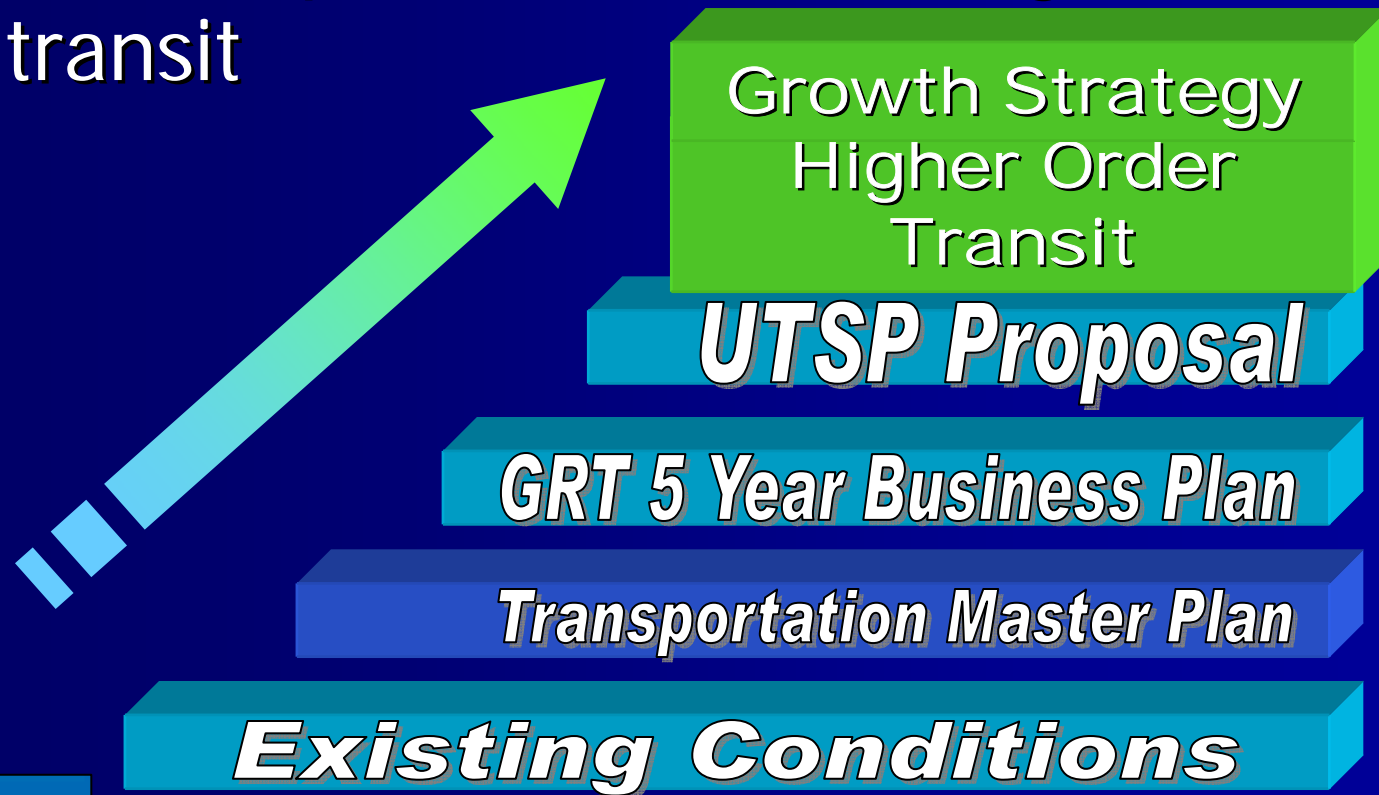
# UTSP – What is it?

- Urban Transportation Showcase Program
  - Showcase initiatives that reduce greenhouse gas emissions by reducing single occupant vehicles
  - 8 projects selected out of 48 across Canada
    - Halifax, NS
    - Greater Vancouver
    - Whitehorse, Yukon
  - Program runs from 2004 to March 2007
  - Transport Canada
    - <http://www.tc.gc.ca/programs/environment/UTSP/menu.htm>

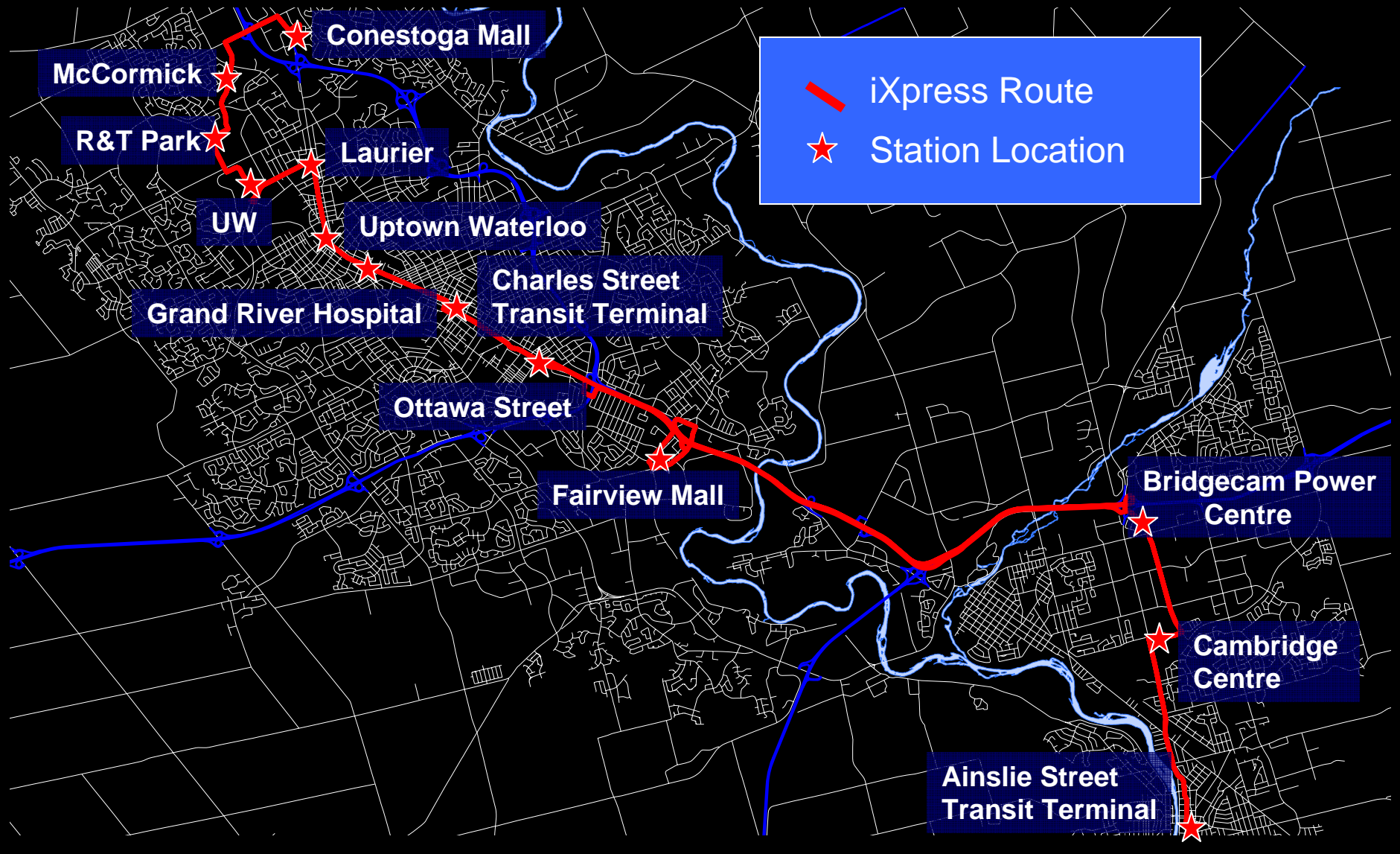


# Project Objectives

- One step towards future higher order transit



# iXpress Route



# Objectives: *Transit Technology*

- Implementation of Intelligent Transportation System (ITS) technologies
  - To reduce transit travel times (reduction of delays at intersections)
  - Improve mode share through enhanced customer information (including new media & formats)
  - Enhance data collection & information processing for improved service planning & market research



# The Case for New Technology

- What are the main things that need to be improved:
  - service policies and schedules?
  - communications and control technology?
  - passenger information?
- Identify the technology changes required to successfully implement and operate new ITS technologies and systems



# GIS and Transit

- Base map attributes that support transit applications:
  - Centerline and topology
  - Street names, address ranges, Unique ID, PC, direction (one- or two-way)
  - Street name alias table
  - Road restrictions (height, weight, direction of travel)
  - Road classification, speed limits and number of lanes
  - Political boundaries
  - Transfer points to other modes (e.g. rail service transfer points)



# GIS and Transit

- Additional attributes:

- Walking paths with obstacles to walking and curb cut locations
- Bicycle paths
- Rail alignment and tracks
- Turn impedances
- Grade
- Landmarks
- Demographics and land use by political boundary



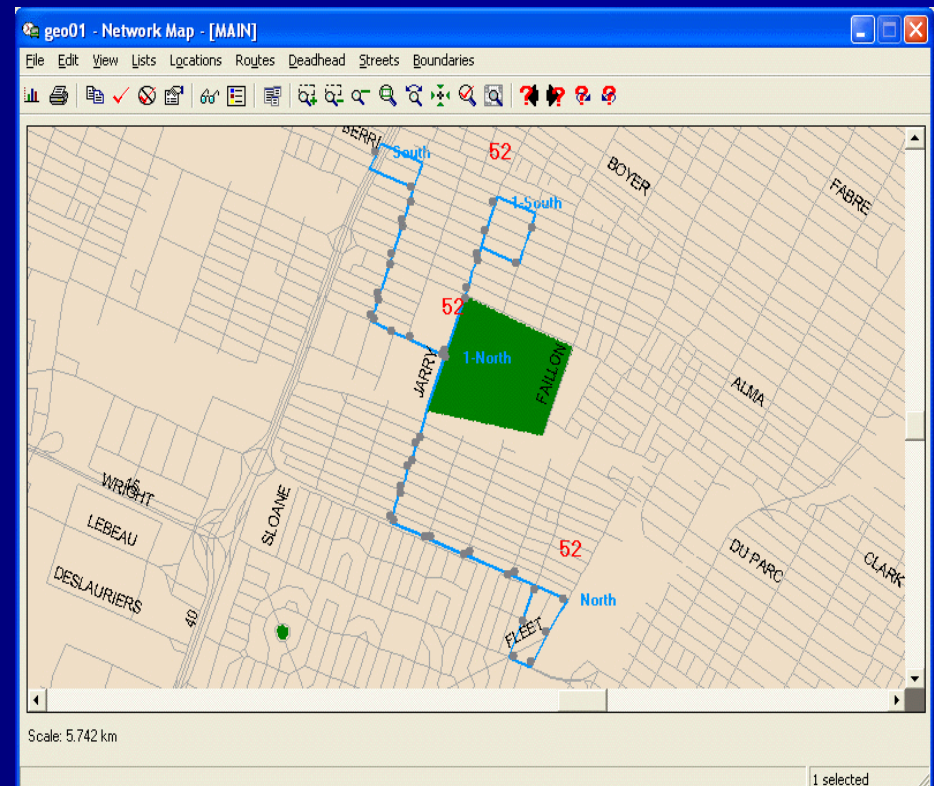
# Data Requirements for Key Transit Technologies

- Route Planning & Scheduling
- Bus Stop Database
- Transit Signal Priority
- Automatic Passenger Counting
- Passenger Information
  - Real-time and Message Signs
  - Web-Based Trip Planning
- Service & Capital Planning



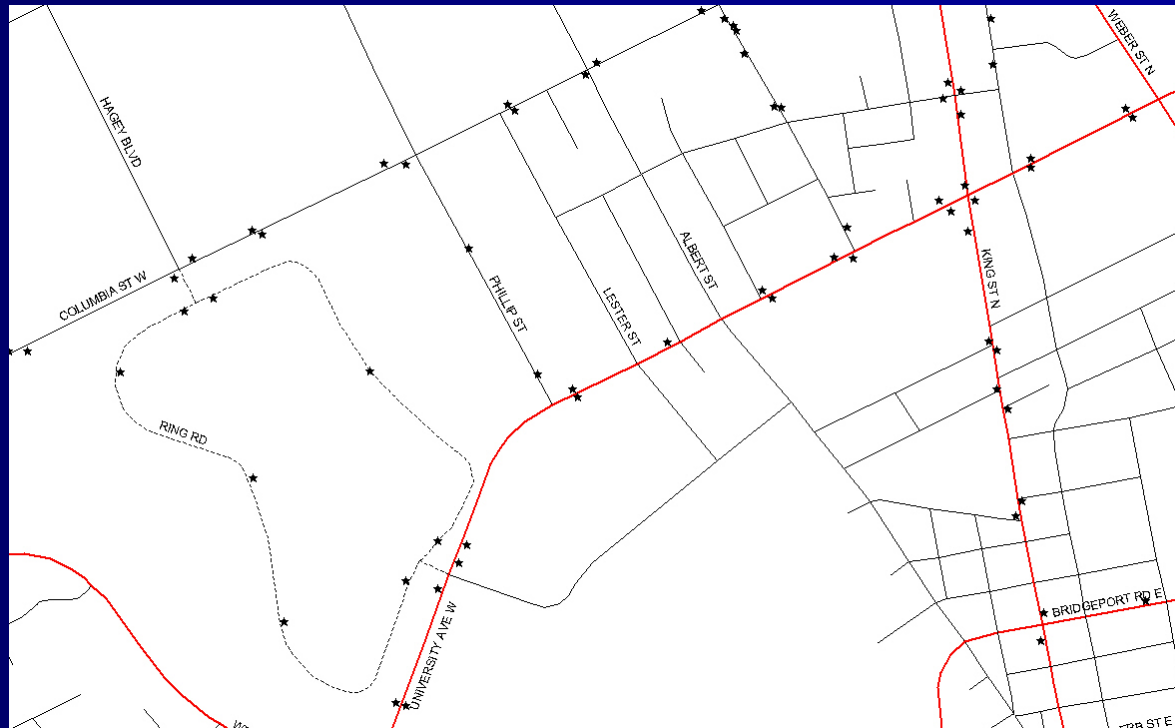
# Route Planning & Scheduling

- HASTUS
- GIS Data Requirements
  - Single Line Street Network
  - Bus stop database



# Bus Stop Database

- Over 2500 GRT stops on almost 60 routes using approximately 200 vehicles

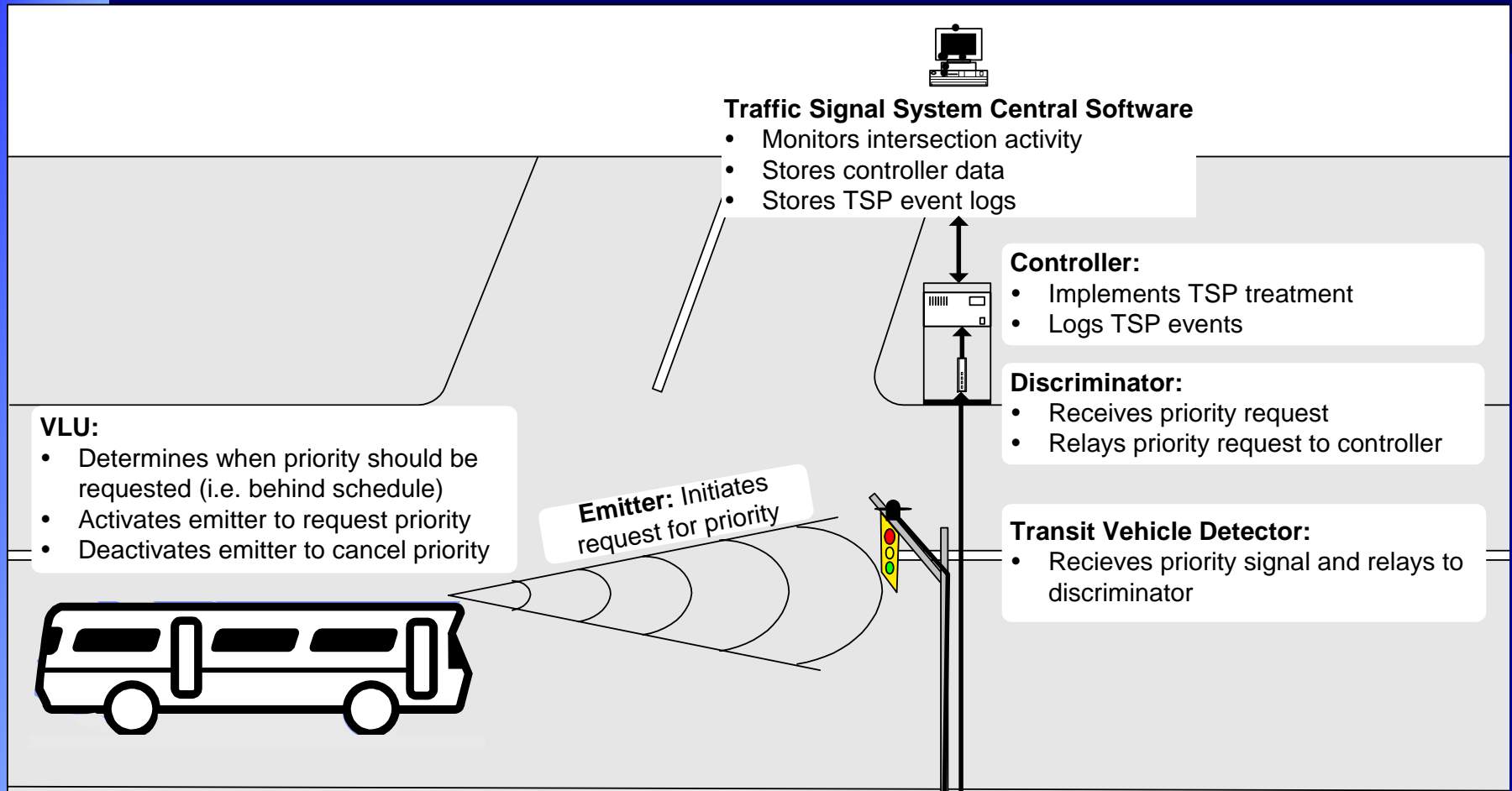


# Transit Signal Priority

- GIS Application / Function
  - Determine need for priority treatment (based on schedule adherence, load, etc.)
- Transit Features
  - Single Line Street Network
  - Time Service Desired and Time Estimated Departure
  - Intersection (signal) stop bar
  - Location of end of queue
  - Need for priority treatment criteria (schedule adherence; load, etc.)
  - Traffic impedance



# TSP – System Overview



# Automatic Passenger Counters

- Count passengers as they board and alight
- Reduced data collection cost
- Increased quality (and quantity) of data
- Interface with Automatic Vehicle Locator (AVL)



# Automatic Passenger Counters

- GIS Application / Why Collect APC data?
  - Aggregate boarding and alighting information at bus stop location and other locations.
  - Provide load information between stops (intervals along route).
  - Identify peak load location.
  - Marketing
- Transit Features
  - Roads
  - Bus stop location/area
  - Route pattern
  - Trip (vehicle assignment or operator)



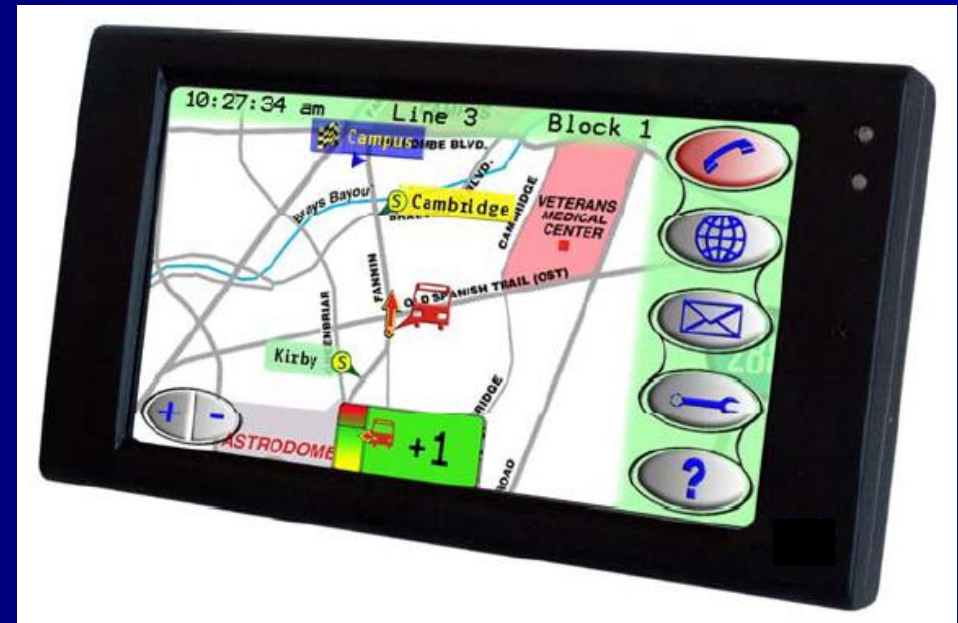
# Real-Time Information

- Computer Aided Dispatch / Automatic Vehicle Location (CAD/AVL)
- Interactive Voice Response (IVR) System
- Mobile Data Terminal
- Variable Message Signs (VMS)
- Real-Time Information on Mobile Devices
- Web-Based Trip Planner



# Mobile Data Terminal

- Communication between transit centre and vehicle operators via digital display panel



# Variable Message Signs

- Multi-line signs showing all arrivals or departures listed in order of time and showing the scheduled and actual time for the activity.



A variable message sign display showing arrival information for two routes. The display is a black rectangular panel with a white border, containing yellow text on a grid background. The text is organized into two rows, each representing a different route. The first row shows '03' on the left, '54th St - 11th Ave' in the middle, and '3min' on the right. The second row shows '03' on the left, '57th St - Broadway' in the middle, and '8min' on the right.

03	54th St - 11th Ave	3min
03	57th St - Broadway	8min

# Real-Time Information on Mobile Devices

- Wireless phones
- Web-enabled PDAs
- Other devices (two-way pagers, Blackberry)



# Web-Based Trip Planner

- Provides real-time information via the internet
- Operates in conjunction with AVL, IVR, etc.
- Examples of information that can be displayed:
  - Static schedules for Rapid Transit Buses;
  - Static schedules for Local Buses;
  - Fare Information;
  - Route Maps with Stop locations; and
  - Other (lost & found location, static tourist information [e.g. area attractions])



# Web-Based Trip Planning

## ■ Other Data Requirements

- Amenities @ stops
- Transfer Points
- Patterns / Routes
- Address Ranges
- Landmarks
- Parking
- Walking distances
- Accessibility
- Obstacles to walking
- Fares
- Schedules



# Web-Based Trip Planning

- Required data in place
  - Streets & address ranges
  - Bus Stops (amenities in progress)
  - Routes / patterns (from HASTUS)
  - Schedules
  - Parking



# Web-Based Trip Planning

- Required data to be (being) collected
  - Landmarks (attractions, offices, sports venues, etc). Partial list used in GIS Locator already exists
  - Walking distances (based on road segments)
  - Obstacles to walking
    - Attribute on road segment “walking permitted – yes/no”
  - Pedestrian pathways
  - Accessibility (Curb cuts, etc)



# Web-Based Trip Planning

OC Travel Planner - Microsoft Internet Explorer

Reset Map Print... Close window

● Click on the arrows to navigate around the map.  
 ● Click on the zoom bar beneath the map to zoom in and out.  
 ● Click on the map to re-center.  
 ● Click on the "Reset Map" button to reset the itinerary map.

★ Origin  
 ● Destination

**OC Travel Planner**

FROM ✓ RIDEAU CENTRE TO ✓ 615 BOOTH ST TIME ✓ Monday October 24, 2005 Arriving at 8:30 AM TRIP

**This is the QUICKEST TRIP**

Depart at 8:06 AM	Regular fare	No transfers
Arrive at 8:30 AM	Duration: 24 minutes.	Total walking: 8 minutes

Depart at 8:06 AM

At 8:06 AM, walk to station MACKENZIE KING STOP / ARRÊT 2A (5 min.).

At 8:11 AM, take Bus route 85 direction Bayshore and get off at stop CARLING / BOOTH, street CARLING following street BOOTH. Last intersections: BELL ST, LEBRETON ST, BOOTH ST. Arrive at 8:27 AM.

Walk to 615 BOOTH. Arrive at 8:30 AM (3 min.).

Click on a bus stop to see more passing times

8:06 AM DEPARTURE

○ RIDEAU CENTRE

● MACKENZIE KING STOP / ARRÊT 2A (3000)

● CARLING / BOOTH (8011)

○ 615 BOOTH ST

8:30 AM ARRIVAL

Earlier Later

Quickest Trip

Fewest Transfers

Least Walking

Return Trip

Change Options

Start Over

Print

View MAP

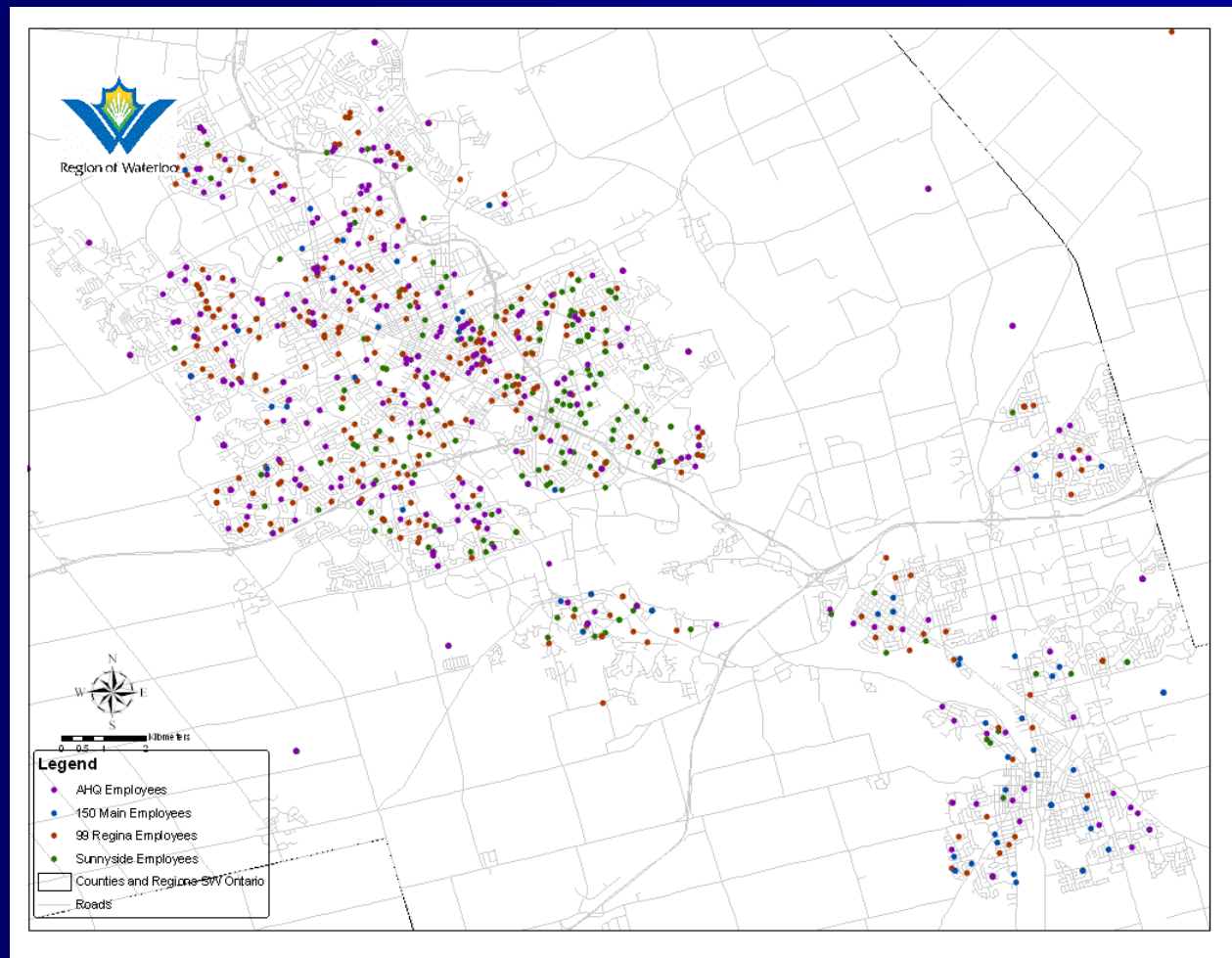


# Service & Capital Planning

- Produce service change materials.
- Presentations to Council, community groups.
- Prepare analyses of the service operating environment for use in planning changes to transit service.



# Service & Capital Planning



# Overall Project Benefits

- Improved transit service with enhanced customer information
- Reduction in greenhouse gas emissions
- Improvements to public safety and quality of life



# Integrated Strategy

**GHG Reductions due to modal shift**



# Closing Remarks

- This project represents a Multi-departmental GIS related project
- Demonstration of the important contribution of GIS data creation and analysis for transit planning and development
- Seamless (to the customer) integration of GIS technologies into amenities used by the public (trip planner, etc.)

