A (Brief) History of Regional Modelling

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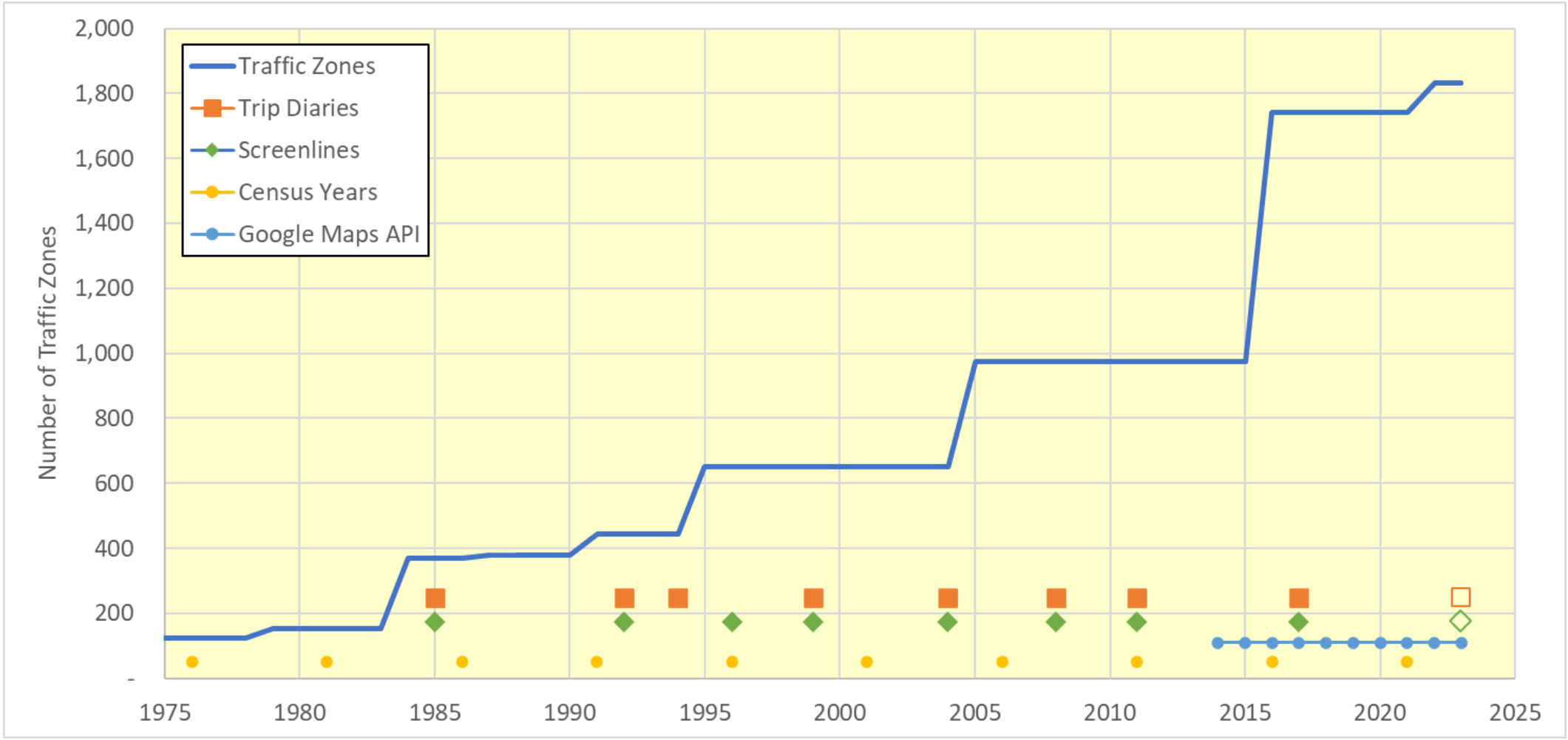
CANADA BEST MANAGED COMPANIES

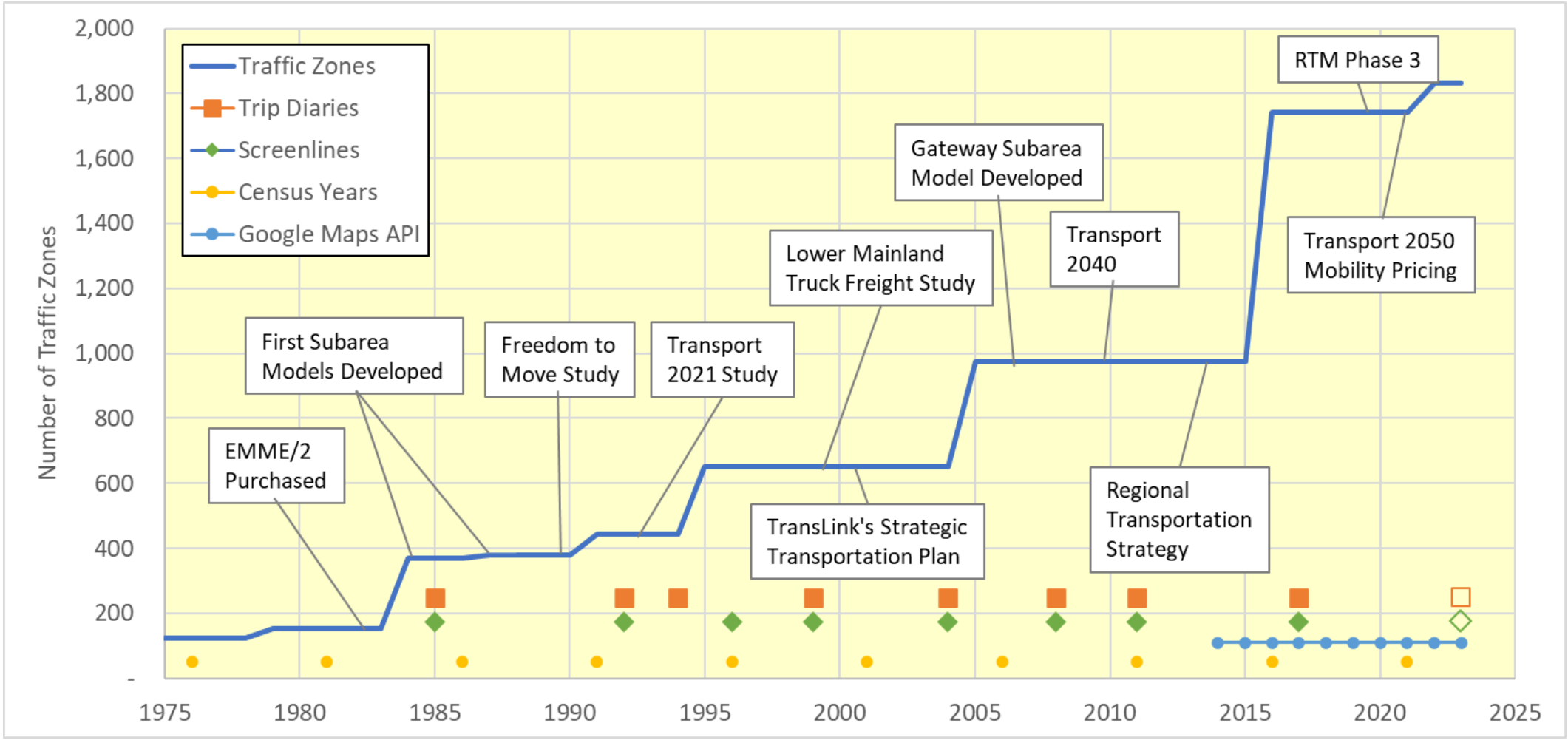
Today's Presentation

- Modelling Timeline
- The Models
- Modelling Principles

Regional Modelling Timeline



Regional Modelling Timeline

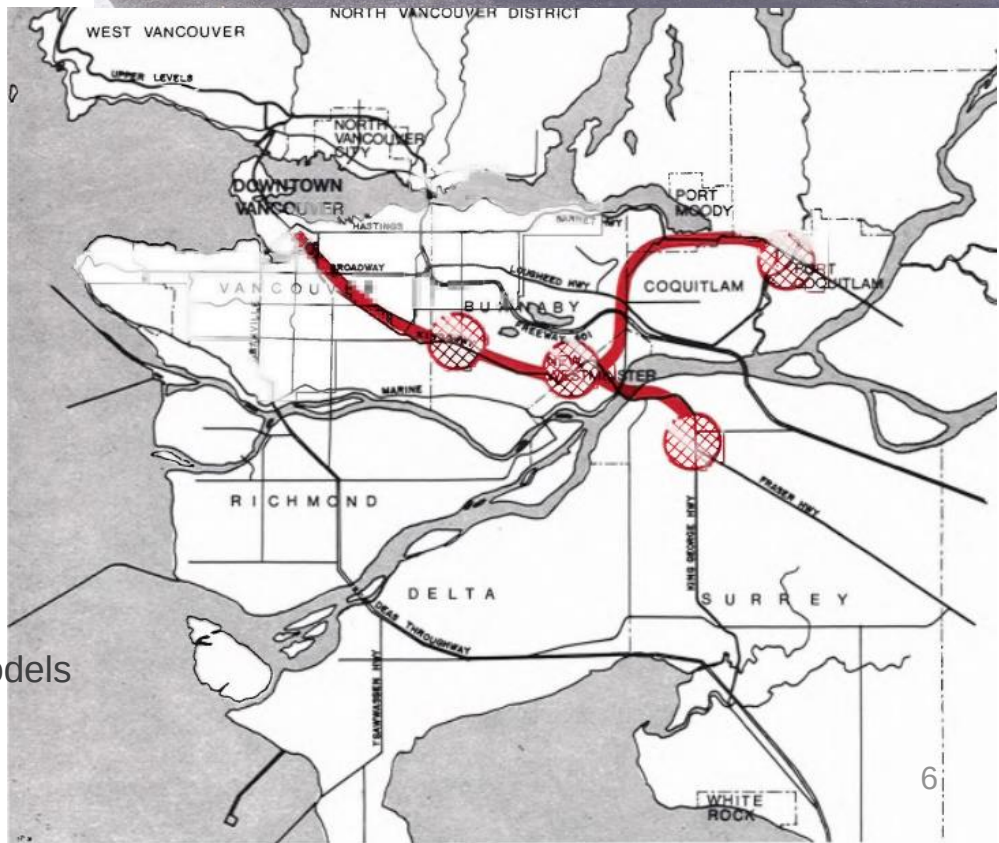


The Models

The Early Days

The 1970s

- Ford Foundation funded urban modelling project at UBC
  - Academics – Transport Planners, Demographers, Economists
  - Municipal, Provincial and Regional Officials
- Inter-Institutional Policy Simulator (IIPS)
  - Based in the Institute of Animal Resource Ecology
  - Goal: Bring the policy people and researchers and explore the interconnectedness of policy and process
  - Model was not a prominent feature, but tested interconnected effects
  - Land use, Econometric and basic spatial models
    - FORTRAN/Punch-card based on the UBC mainframe
    - Models not linked, but could accept scenarios developed in other models



The Early Days

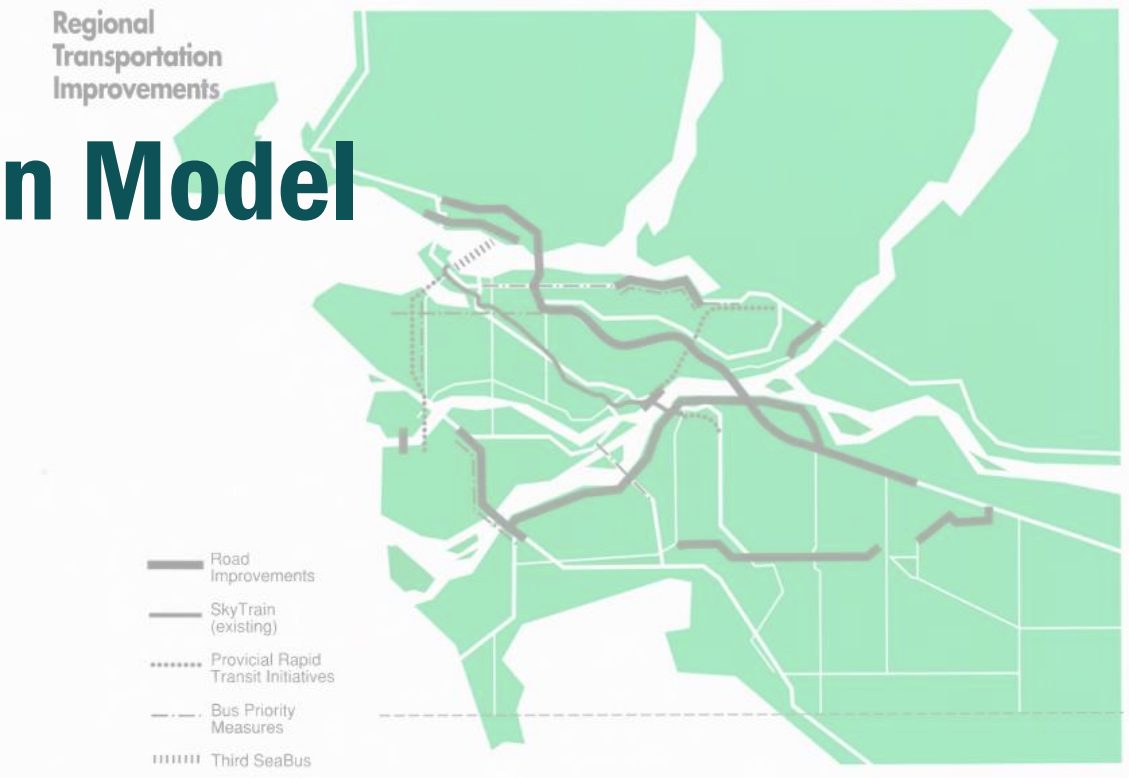
The 1980s

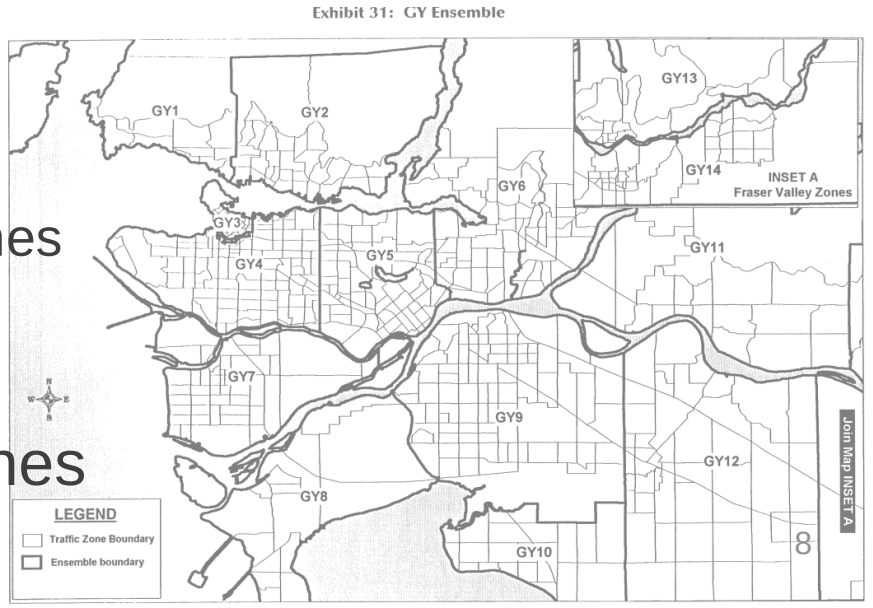
- Transit planning moved from BC Hydro
  - Greater Vancouver Regional District (Transit Policy and Planning)
  - Urban Transit Authority (Provincial interests in public transit)
  - Metro Transit Operating Company (Transit Operations)
- GVRD Rapid Transit Project
  - Working group of stakeholders (Municipal Planning and Traffic, Consultants, UBC and SFU)
  - Evaluate technologies, major bus/rapid transit options, land use scenarios

First Regional Transportation Model

The 1980s

- Four-step AM Peak period model (7-9am)
  - Generalized Cost Based
- 152 Zones, 10 spatial areas
  - FORTRAN Based, almost no graphical components
  - Origin/Destination, Mode Shares
  - *NEW* Screenline and Link Level Auto and Transit Volumes
  - Benefits in addition to service costs
- Shortlist of Expo Line and Vancouver-Richmond Lines

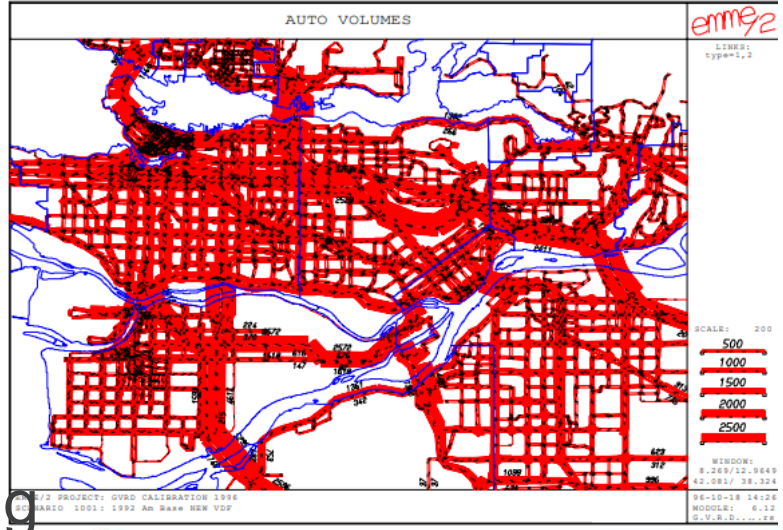


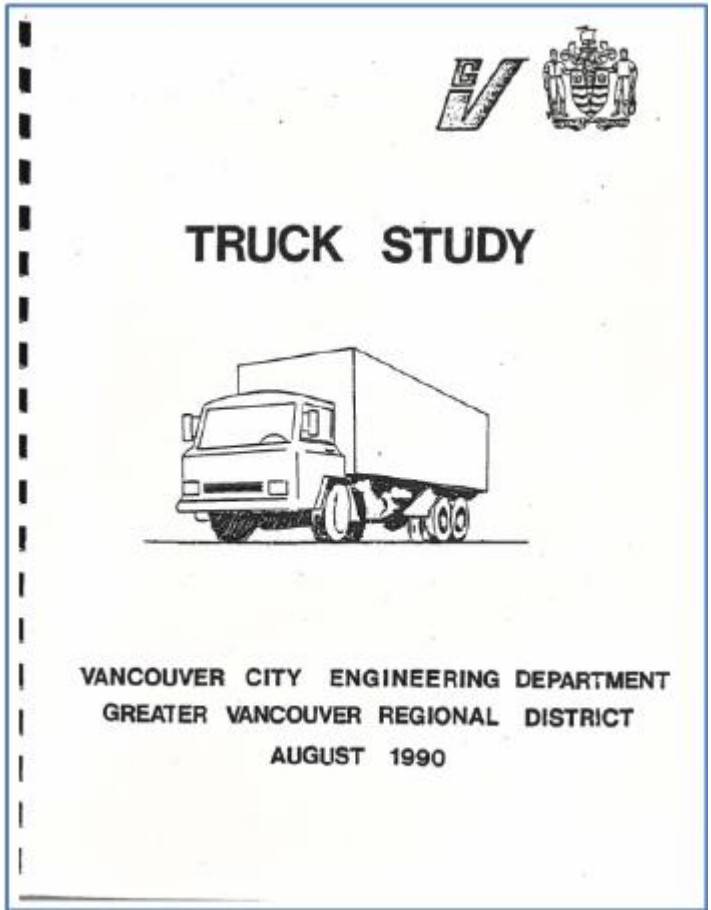


Model Review

The 1980s

- GVRD didn't have specific mandate for transit planning
- Appetite from municipal User Group as an outcome of Rapid Transit Project
- Comprehensive review of regional modelling
  - UBC Model, Urban Transportation Planning System, EMME/2
  - Review of each modelling component
  - Patchwork of information sources
- 1985 Screenline and Trip Diary Survey

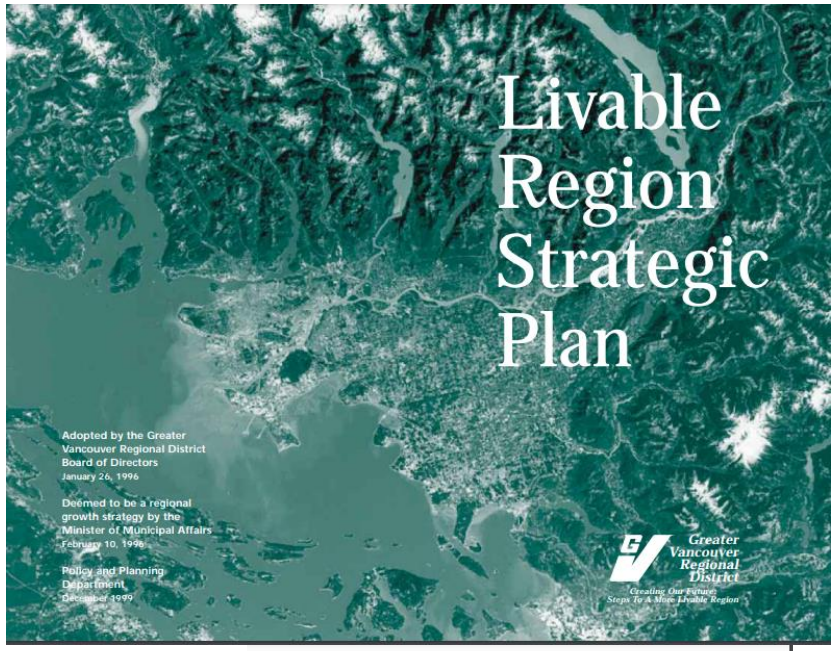


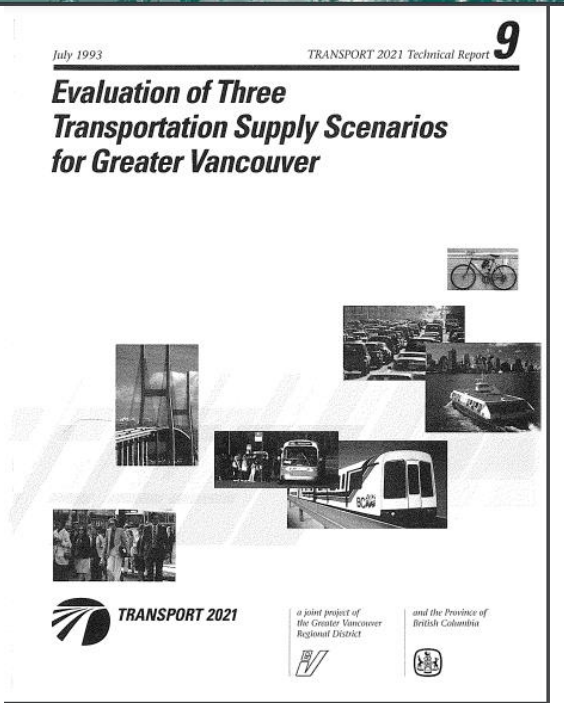


Model Review

The 1990s

- EMME/2 Enabled much wider audience
  - Transition from mainframes to minicomputers to PCs
- Over 30 agencies had models or model application capability
  - Widespread municipal subarea models (Vancouver, North Shore, Burnaby, Tri-Cities)
  - Many PM models for individual municipalities, regional PM model late 1990s
- Truck Model, Park and Ride, More Trip Purposes, Combined Impedance
  - Current VDF formulation replaces BPR
- Transportation Model Enhancement Program

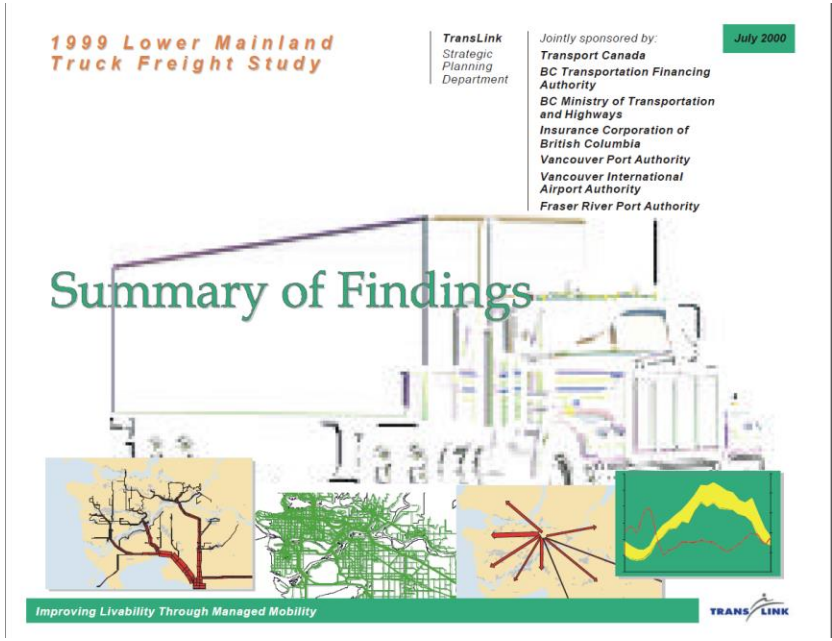




Model Review

The 2000s

- Incremental Model Enhancements (Gateway, RM08)
  - HOV Model
  - Pricing/Tolling Studies
  - Regional PM Model
- Major Studies
  - Millennium Line, Evergreen Line, Richmond-Airport-Vancouver (RAV)
  - South Fraser Perimeter Road
  - Gateway Project Modelling - Integration with microsimulation models and operational models



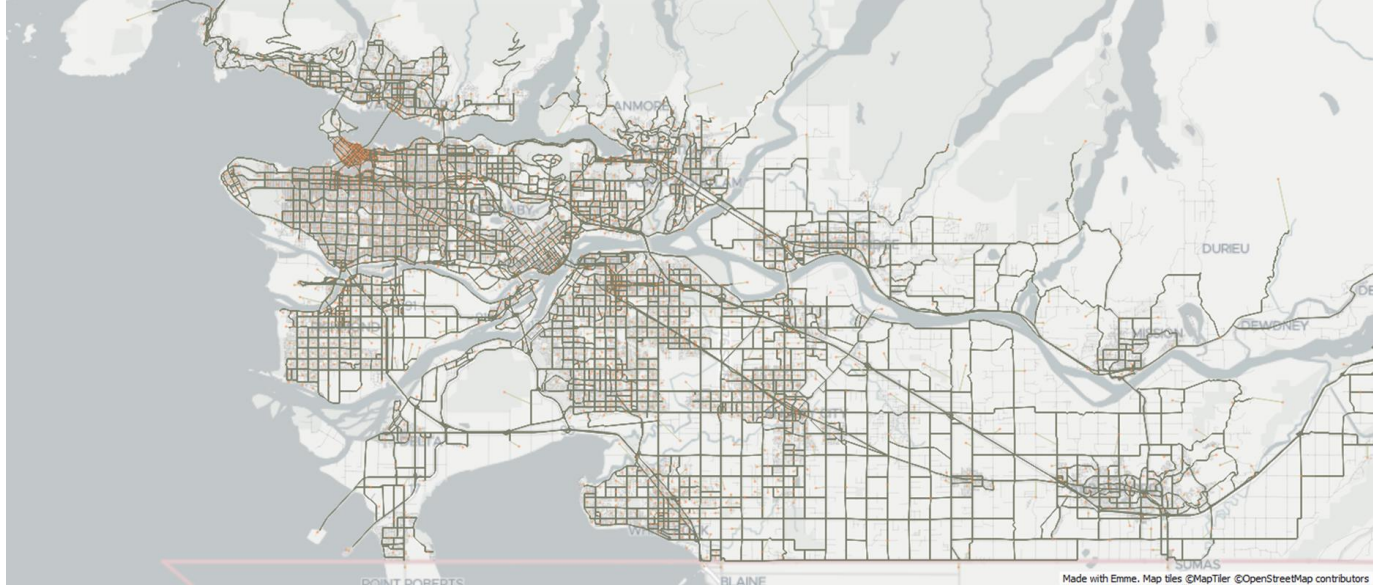
Model Review

The 2010s

- Move to 24 Hour Models – RTM2
- Mode Shares and High Level Policy Evaluation
  - Representation of active modes
  - Regional representation vs project representation
- Desire to model new initiatives
  - Value of Time Segmentation
  - Time Slicing
  - Auto Ownership
  - Household Income
  - Car-share

The Modern Era

The 2015-Present



- RTM 3.x
  - Increased availability of travel time data
  - Increase in Zone resolution to better represent active modes
  - Off-peak travel validation (Production-Attraction)
  - Model sensitivity
    - Accessibility
    - Non-Auto Modes
  - Business Case consistency
    - Reliability
    - Agglomeration
- New Questions
  - Equity, New Mobility

Modelling Principles

Regional Modelling

Transparency is Key

- Early User Groups / Stakeholders
  - Perception of ‘Black Box’
  - Develop a shared understanding in the regional stakeholder group
    - What can the model do?
    - What do people want it to do?
  - Purpose driven model development
- Interface with Policy (makers)
  - Skepticism of model results requires high degree of technical certainty
  - Explanations of why interventions do/do-not perform as anticipated
  - Gap between desired outcomes and desired interventions

Regional Modelling

A Collection of Models

- Many project and municipal models built on top of regional model
- Early lot choice Park and Ride Models
- Toll Choice Models and Crossing Choice Models
- Land use models
- Stated preference models
- Econometric models, direct demand models
- ActivitySim
- Microsimulation Models (Paramics, Vissim, Aimsun, etc)

Volume Delay Functions

- Bureau of Public Roads (BPR)
  - Required interpretation of road type and operation
  - Difficult to document for wider application
- Other approaches
  - Vancouver CBD model with explicit capacities for each turn movement
  - Evergreen-line corridor study with turn-based delays based on green time
  - Port Mann ‘Queue-functions’

Volume Delay Functions

Intersection Control	Normind Capacity (vph/Lane)
Stop Sign	400
Traffic Signd - no additiond lanes @ intersection	600
Traffic Signd - 1 additiond lane @ intersection	800
Traffic Signd - 2 additiond lanes @ intersection	1,000
Free Flow	1,600

```
FUNCTION DEFINITIONS
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transit time          ( timau l

 ft1   = timau + 2 * length
 ft2   = timau + .8 * length
 ft3   = timau + .45 * length
 ft4   = timau + .2 * length
 ft5   = timau
 ft6   = length * 1
```
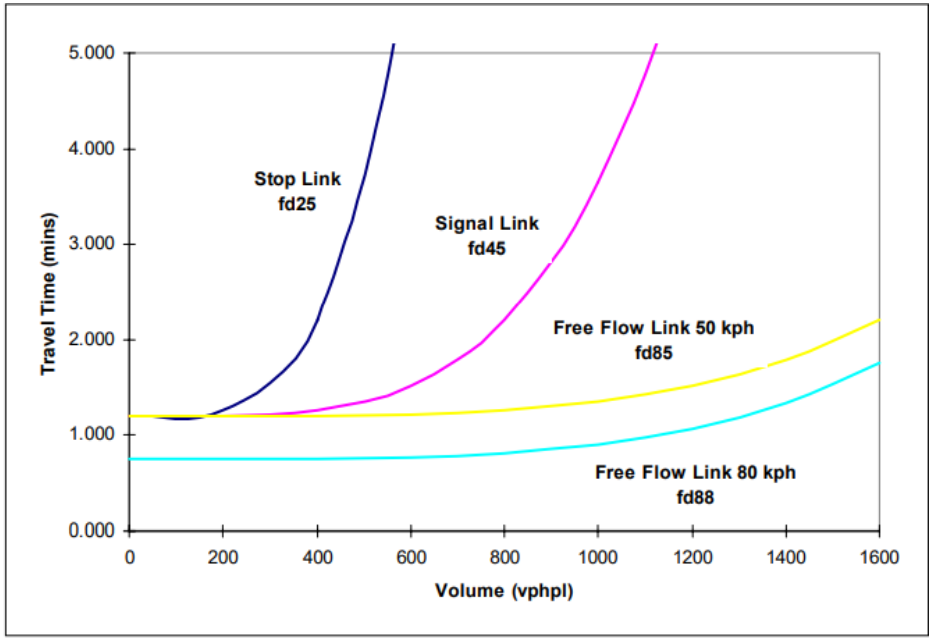

		Nominal Capacity (vph/lane)						
Posted Speed Kph		400	600	800	1000	1200	1400	1600
20		22	32	42	52	62	72	82
30		23	33	43	53	63	73	83
40	1	24	34	44	54	64	74	84
50		25	35	45	55	65	75	85
60		26	36	46	56	66	76	86
70		27	37	47	57	67	77	87
80			38	48	58	68	78	88
90			39	49	59	69	79	89
100			30	40	50	60	70	80
110			31	41	51	61	71	81

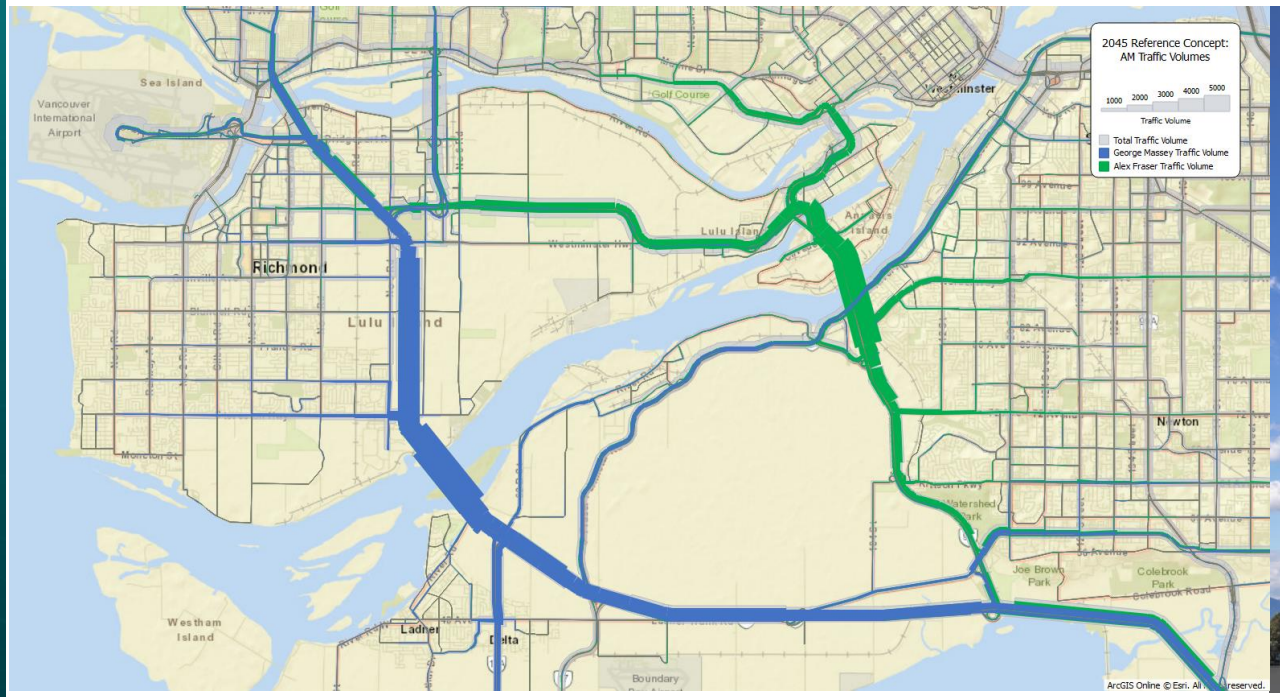
Volume Delay Functions

- Current System (RTM 3.x)
  - Depends on physical lanes and control type, easy to interpret
  - Travel time validation has shown good fit to local conditions
  - Able to adjust behavior for local areas while preserving regional scale model
- vdf = 11: Centroid Connectors
- vdf = 12: Bowen Island Ferry Link
- vdf = 13: Merge Functions
- vdf = 14: Controlled Intersection (Stop Sign, Roundabou
- vdf = 15: Free-flow link posted speed < 80 km/h
- vdf = 16: Free-flow link posted speed >= 80 km/h



Select Link

- Annacis Island Crossing Study
  - Concerns about impacts to municipal road networks from additional regional capacity
  - Visualizations of select link volumes provided confidence in addressing concerns



Seeing Further

Standing on the shoulders of giants

Special Thanks

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Thank-you

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