BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

RWIS/VMS Integration

Ministry of Transportation and Infrastructure
AVALANCHE AND WEATHER PROGRAMS

Topics

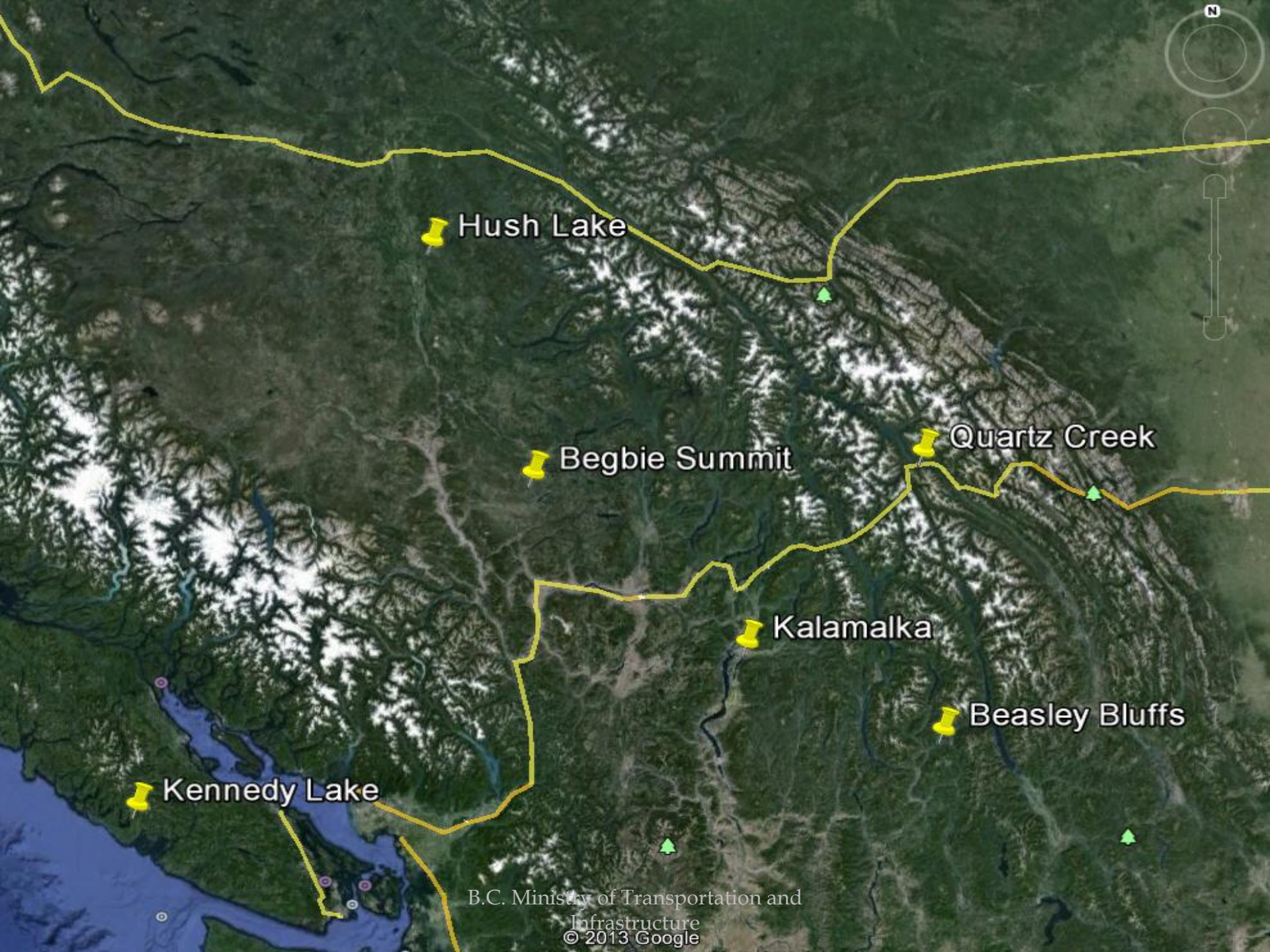
- Objectives
- Geography and distribution of systems
- Focus on Quartz Creek, Hwy 1 east of Rogers Pass (simplest system, arguably best success)
- Template for other systems (versatility)
- Future enhancements

System Objective

To improve highway safety at specific locations where various factors combine to create potentially hazardous conditions related to winter weather.

- Highway geometry
- Local geography and micro-climate

“To influence drivers’ behaviour by putting RWIS information directly into their field of view at the appropriate time and place.”


Hush Lake
Begbie Summit
Quartz Creek
Kalamalka
Beasley Bluffs
Kennedy Lake
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6 Systems installed to date

- Kennedy Lake – 2010
- Quartz Creek – 2011
- Beasley Bluffs – 2012
- Hush Lake – 2013
- Begbie Summit – 2013
- Kalamalka – 2013

Spread over large geographical area with varying climatic conditions – "local effects" dictate some degree of tuning the systems to the micro-climate.

Quartz Creek

- Bad history – frequent weather and road condition related crashes
- Simplest system
  - Curved bridge deck prone to icing (one problem)
  - One message on signs, either on or off (BRIDGE SLIPPERY / SLOW DOWN)
  - Simplified Road Wx Station (minimal instrumentation)
  - Embedded Pavement sensors + Optical Pavement sensors
  - Limited power budget (no AC power, relies on solar panels / batteries)

Quartz Creek eastbound

Long downhill straightaway, followed by curved bridge deck

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Simple Road Wx Station

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Limited Insrumentation

- CR1000 datalogger
- 2 embedded Vaisala DRS511 pavement sensors (bridge deck and approach)
- Vaisala DST / DSC aimed at bridge deck
- RM Young anemometer
- Rudolph Logic Systems IRS88 precipitation detector
- HMP45C Air Temperature / Humidity

VMS System

- Datalogger runs 2 programs
  - Regular hourly RWIS data
  - 15 minute integration for VMS evaluation (“on” or “off”)
- VMS trigger algorithm only uses ‘Road Status’ data from either pavement sensor
  - Any ‘Warning’ or ‘Alarm’ surface condition
  - Any surface condition that includes ‘Frosty’, ‘Snowy’, ‘Slushy’, or ‘Icy’
  - 45 minute lag for sign de-activation

VMS Hardware

- Addco 4 x 2 Full Matrix signs with controllers
- Station datalogger to sign controllers via Spread Spectrum radio (900 MHz)
- 460 W solar panels at each sign
- 660 AHr batteries at East side sign, 1360 Ahr at West side sign (less solar exposure for panels)
- 6 day continuous duty cycle "challenges" the power supply
- Considering EFOY Fuel Cell for November through February backup power

Improved Safety

- System commissioned in January 2012
- No crashes on bridge since commissioning
- Prior 6 winters averaged 3.5 crashes per winter
- Return on Investment?
  - System cost approx. $250K
  - # of personal injury accidents prevented

Template for other RWIS / VMS

- Fully instrumented Road Wx Station
  - Includes Precip Gauge (standpipe), Snow Depth Sensor, and Precip Occurrence Detector
  - Optical Pavement Sensors
- Larger Signs with AC Power supply
- Program for up to 10 separate messages (currently only using 6)
  - Numbered in order of ascending severity / priority
    - Default Safety Message (eg. 'Watch for Wildlife'), 'Water Pooling on Road / Use Caution', 'Slippery Sections / Use Caution', etc.
  - Program uses 'IF' statement starting with most severe case, executes until criteria met for a certain message, then sends that message # to sign controller

Hush Lake Road Weather Station

Larger and more versatile VMS

Design Considerations

- Driver psychology
  - Short highway segment between signs (10 km or less) to keep message relevant and in drivers' consciousness
    - Site selection criteria: look at collision data for spatial clusters of winter weather / road condition related crashes within a highway segment of suitable length
  - Static vs. Flashing / Alternating messages
- Need to accommodate 'manual override' of system in order to post specific high priority messages

Design Considerations (2)

- PTZ Web Cam is invaluable for tuning the algorithm to local micro-climatic conditions
- Optical Pavement Sensors are necessary
  - Faster and more reliable response to changing road surface conditions
  - Larger measurement footprint is more representative of road surface conditions (eg. Detection of slush is not reliable with traditional embedded pavement sensors)

Future

- Incorporate 'Present Weather Sensor' for select stations
  - Precipitation Type classification
  - Visibility measurements
  - Will enable more specific messaging / more accurate information for motorists
- Expand repertoire of messages to communicate varying levels of severity of "slipperiness"
  - Reduce perceived need to override the system with 'custom' messages

Present Weather Sensor

Acknowledgements

Project Contributors

- **Instigation**: John Schnablegger and Ashok Bhatti, acting on recommendations from a Corridor Safety Review by Opus Engineering
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- **Equipment purchasing / logistics coordination**: Nic Seaton, Weather Network Program Manager
- **Sign installations**: MoTI Electrical Maintenance Contractors Raylec and Westcana crews
- **System and Equipment Maintenance** : Sean Anderson, Brant Benum, Andy Cooke, Paul Heikkila, Mike Smith, Environmental Electronics Technicians

Questions?

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