Modelling Group
WATER NEW ZEALAND

Modelling Symposium

Wellington Water Live Modelling

Managing Time Series Data in ICM: Journey!

Presented by
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water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

Introduction

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Senior Modelling Engineer

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Senior Water Engineer

Background

Data Journey - more monitoring in the future as the data needed for wastewater management will grow.

Put systems in place now to manage the growing amount of data and reap the benefits.

Real time modelling provides potential to improve network management and control, more informed decisions, better understanding of the network.

This project focus is on the wastewater network.

Will cover the journey regarding data warehouse, InfoWorks TSDB functionality, and results.

Wellington Water Values

Tāngata Tiaki

Together we protect our most precious taonga.

Whānau

United we support, connect and respect each other.

Mana

We recognise, respect, and value the mana of others and seek to build mana-enhancing relationships.

Objectives

- Trialling live operational models
- Establish systems and processes
- Monitoring engineered outfalls
- Identifying surcharge throughout the network
- Enabling operational / energy management of treatment plant flows, network storage, and pumping facilities
- Pro-active network management prior to storm events
- Blockage detection
- Informing resource consents

Benefits

Short Term

- Integrate data sources
- Automatically acquire and validate data

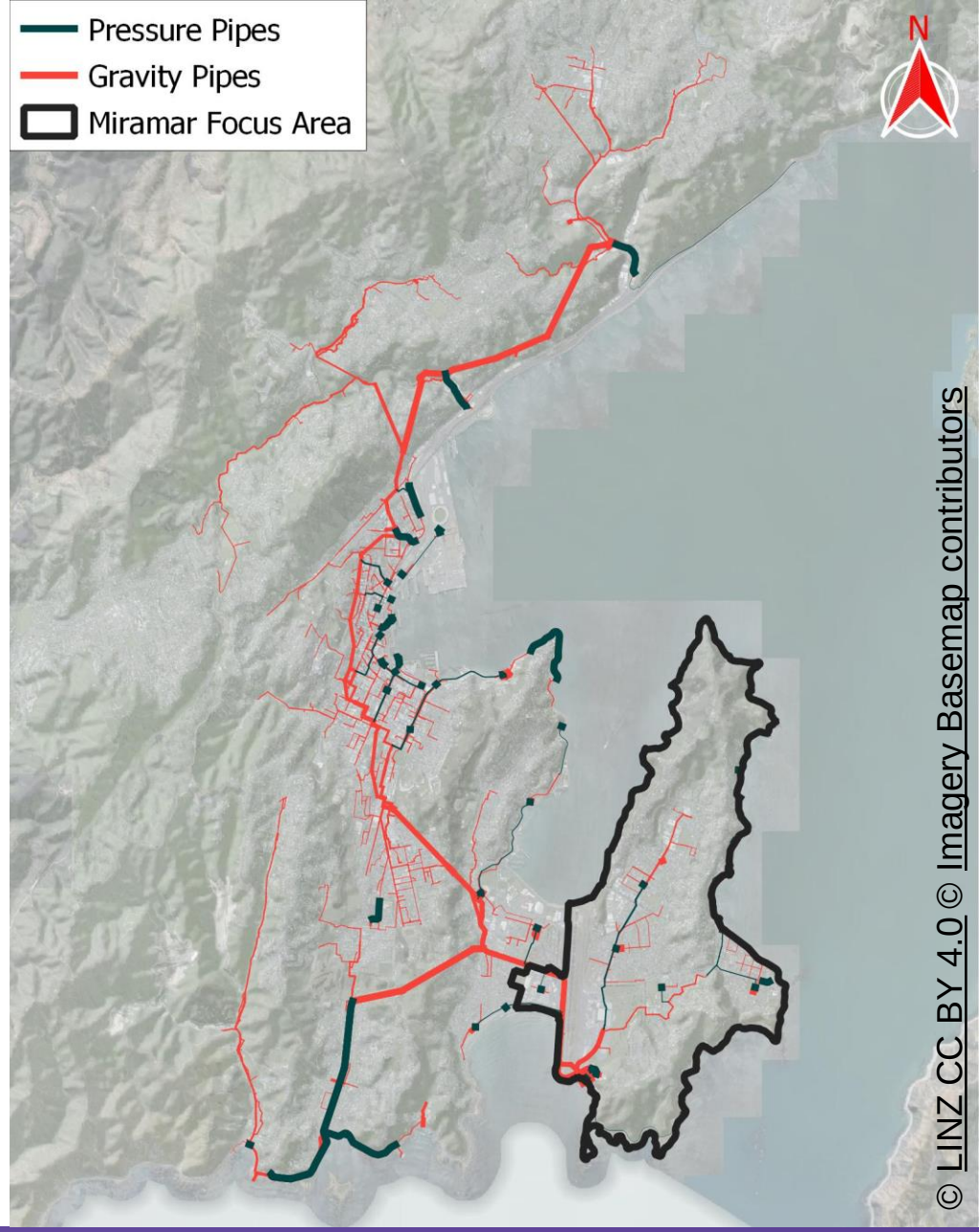
Long Term

- Alerts for pro-active maintenance
- What if analysis
- Improve operational knowledge and processes

Miramar Trial Catchment

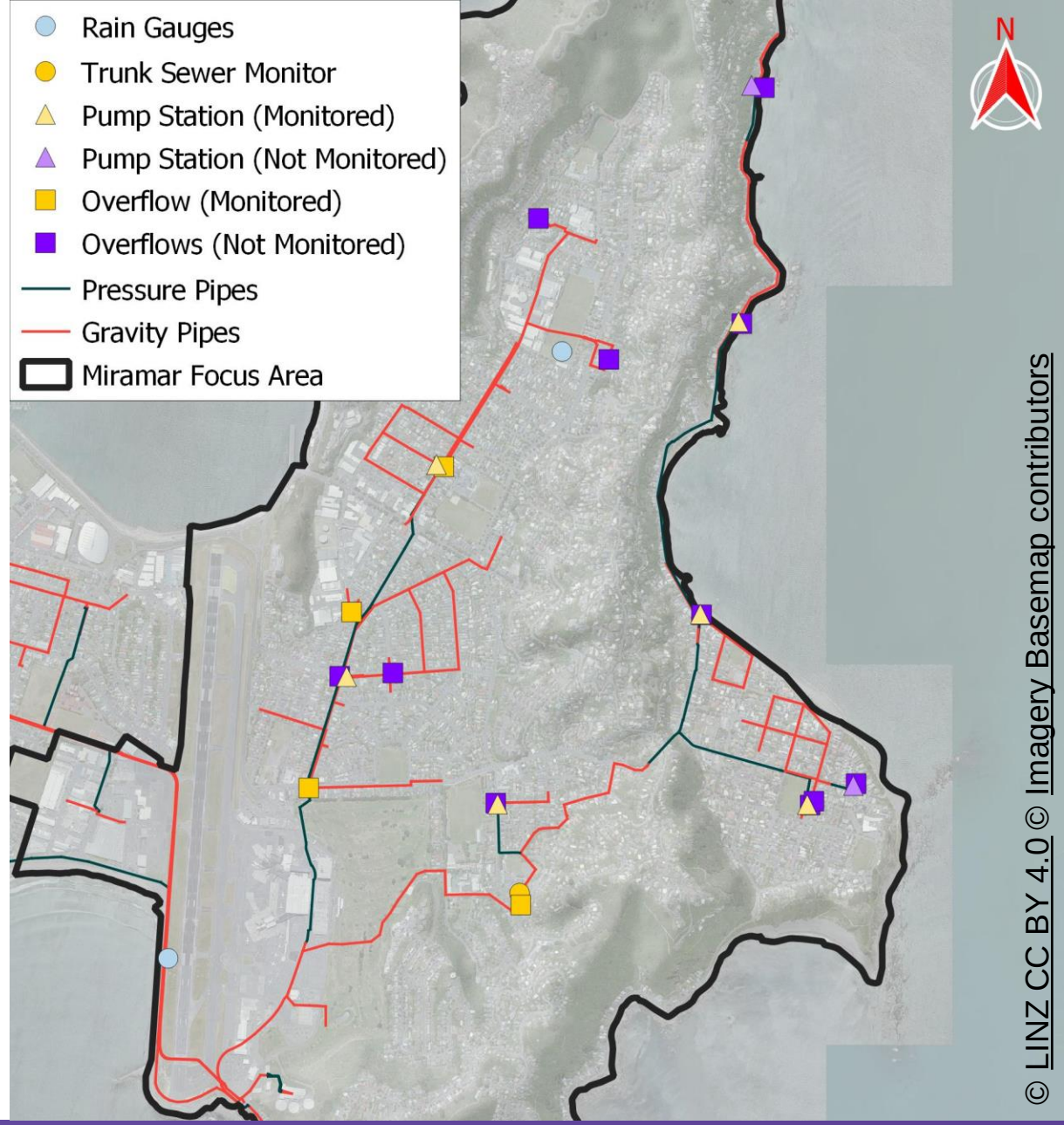
Reasons for Selection:

- Engineered overflows that discharge to the harbour and affects water quality
- Availability and quality of the hydraulic model
- Availability of SCADA and other live data
- Keeping models up-to-date and live where necessary

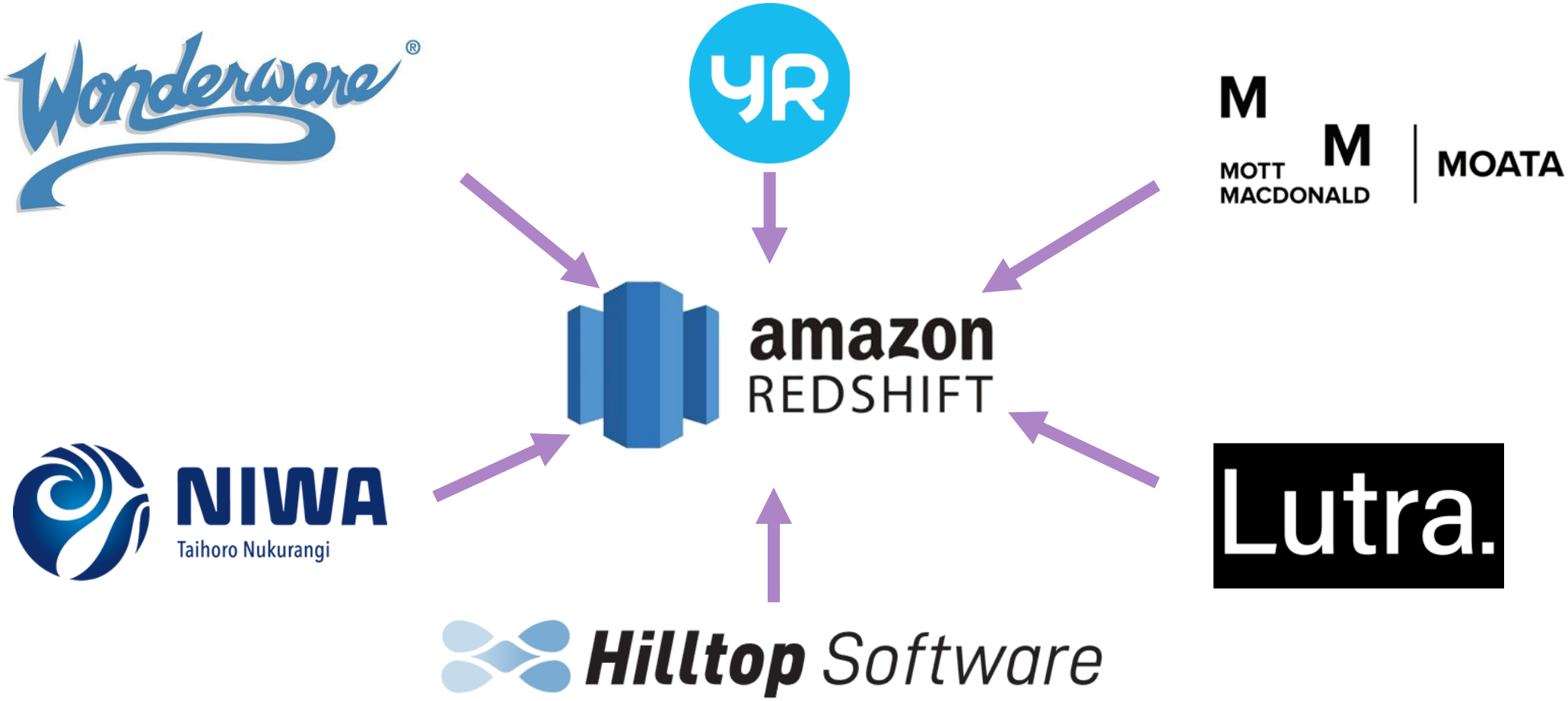


Miramar Model

- Eight pump stations
  - Discharge ranges from 8 to 130 L/s
  - Six have inlet flow monitors
  - Simplified with screw pumps (outflow = inflow up to the max)
- Fifteen engineered overflows
  - Four are monitored
- One permanent trunk sewer flow monitor
- Two rain gauges



Data Warehouse and TSDB Streams



Data Download and TSDB Import

Process:

1. Windows Scheduler calls a batch file every hour
2. Batch file calls FME to download the data (may be some processing via Python, R depending on API) to the Data Warehouse and local CSV files
3. ICM TSDB then updates an SQLite database (next to ICM) with the latest data

Future Process:

1. Windows Scheduler calls a batch file every X hours
2. Batch file calls ICM Exchange to access Info360 Insight
3. ICM Exchange runs the forecast sims and returns the results

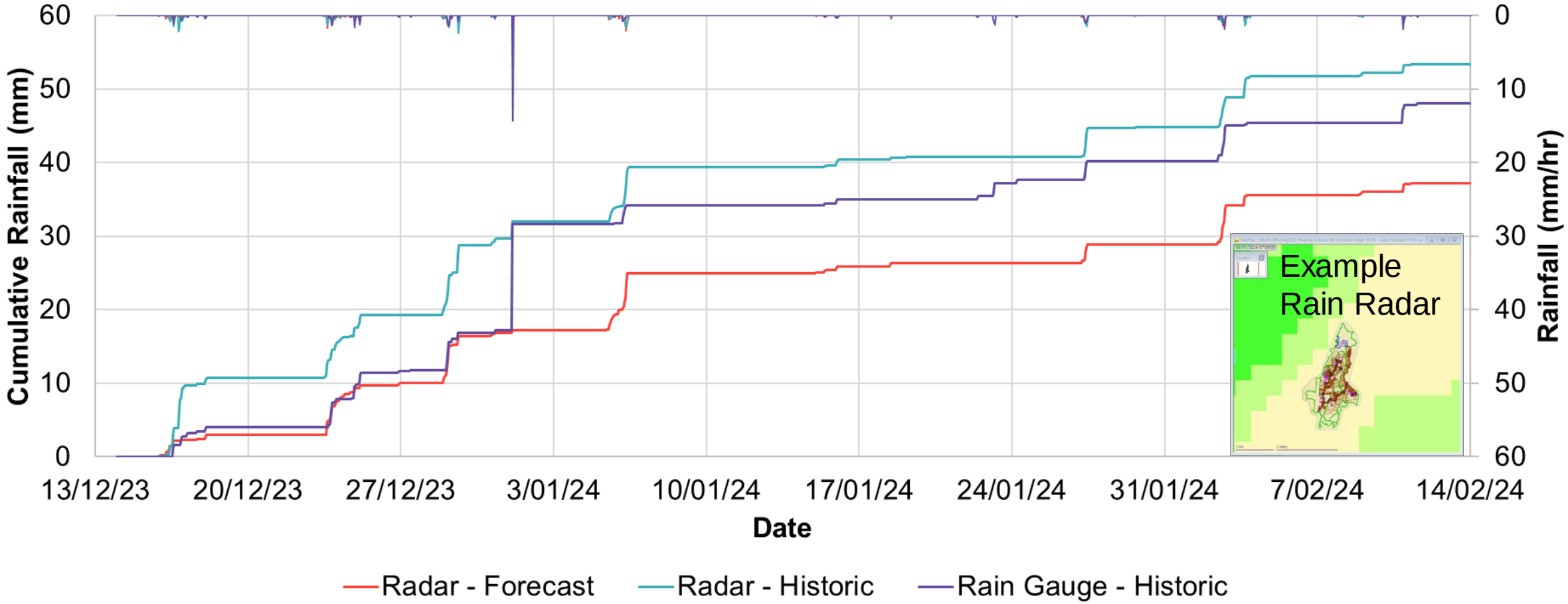
FME by Safe Software

amazon REDSHIFT

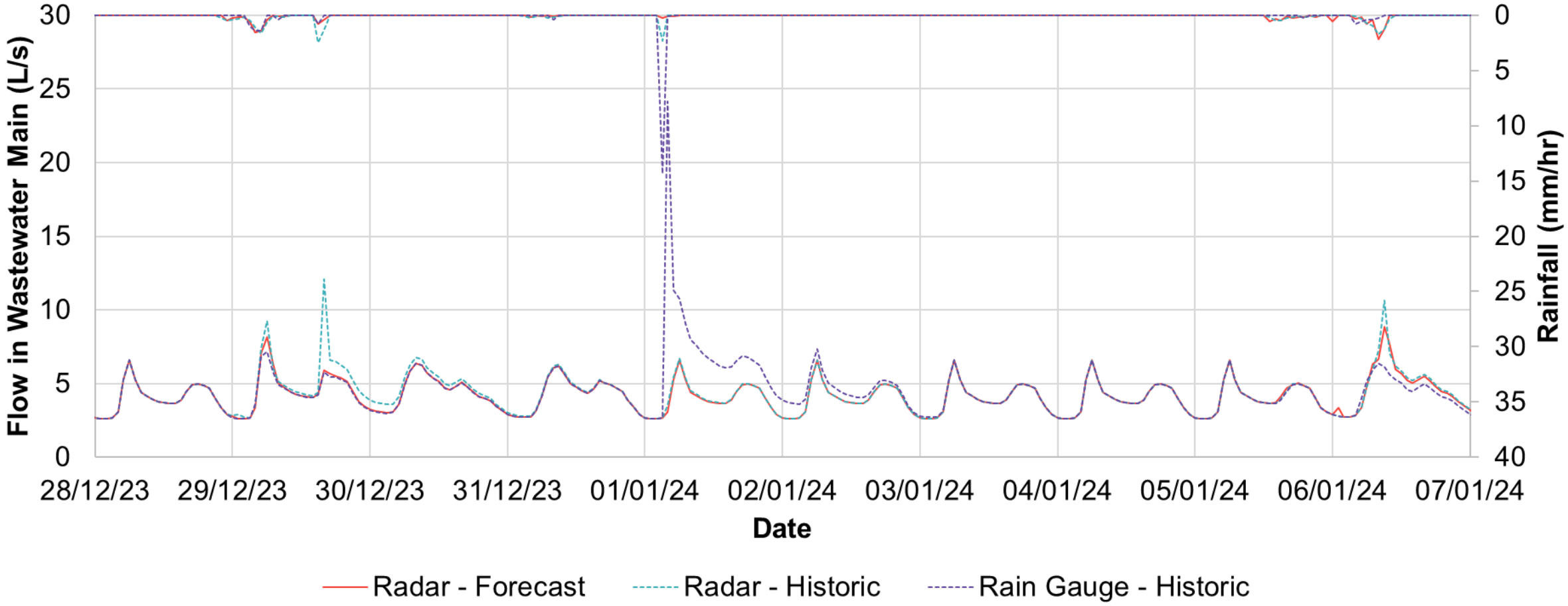
ICM INS

ICMLive

Comparison - Rain Radar to Rain Gauges



Comparison - Forecast to Historic



Historic Results

InfoWorks ICM [2024.5.0]

Hywel Lewis

File Edit Network Selection Model Results Actions Tools Window Help

Database [2024.5]

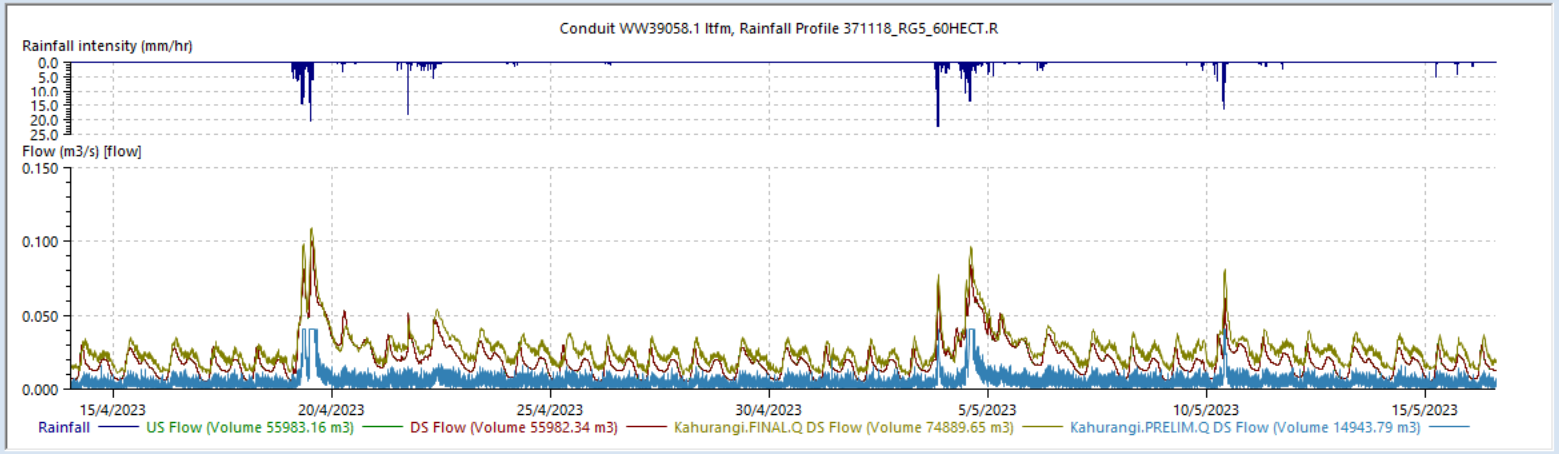
- Database [2024.5]
  - network
    - MoaPt SPA_Aug2023
      - MoaPt SPA_Aug2023_Mir...
  - tsd
    - miramar.api
    - evans_bay.stfm
    - miramar.dwh
    - lutra.dwh
    - moata.dwh
    - scada.dwh
    - niwa.dwh
    - hynds.dwh
  - Inputs
  - DEM
  - sims
    - radar
    - gaging
      - ltfm
        - rainfall Live data_1_RO
        - rainfall Live data_2
  - layers
    - Layer list
    - none
  - workspaces
  - SQLs
  - themes
  - selections
  - radar
  - charts
  - Recycle Bin (*)

Grid [TVD connector] - MoaPt SPA_Aug2023_Miramar (version 42) (S...

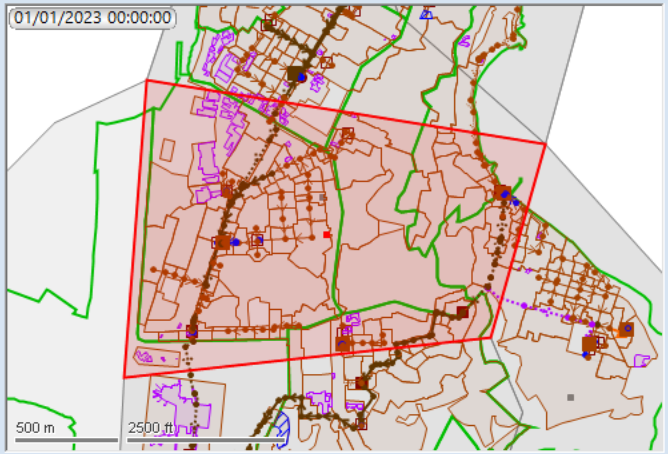
	ID	Input A
▶	371118_RG10_4ARGIN.R	#hilltop_Miramar at Miramar Bowling Club.R
	371118_RG11_39NEVAY.R	#hilltop_Miramar at Miramar Bowling Club.R
	371118_RG15_53TAUH.R	#hilltop_Miramar at Miramar Bowling Club.R
	371118_RG5_60HECT.R	#hilltop_Miramar at Miramar Bowling Club.R
	371118_RG9_22ELPHIN.R	#hilltop_Miramar at Miramar Bowling Club.R
	388 Broadway.Q	#moata_trace_388 Broadway_Sewer Overflow Discharge.
	5 Elphinstone.Q	#moata_trace_5 Elphinstone_Sewer Overflow Discharge.
	Byron_inflow.FINAL.Q	#moata_trace_Byron_Final Sewer Flow.Q
	Byron_inflow.PRELIM.Q	#moata_trace_Byron_Preliminary Sewer Flow.Q
	Byron_overflow.Q	#moata_trace_Byron_Sewer Overflow Discharge.Q
	Kahurangi.FINAL.Q	#moata_trace_Kahurangi_Final Sewer Flow.Q
	Kahurangi.PRELIM.Q	#moata_trace_Kahurangi_Preliminary Sewer Flow.Q
	PS26OV2_tide.Y	#niwa_POINT (174.8302 -41.3186).Z
	Southhampton.Q	#moata_trace_Southhampton_Sewer Overflow Discharg
	Wellington Aero.EV	#cliflo_Wellington Greta Point Cws.E

surface (2D) | Turbulence model (2D) | Polygon | TVD connector

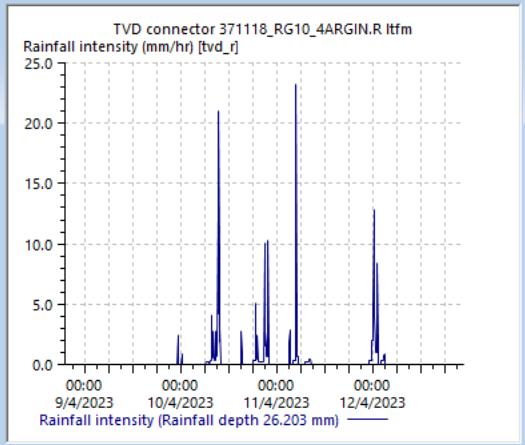
Conduit WW39058.1 ltfm



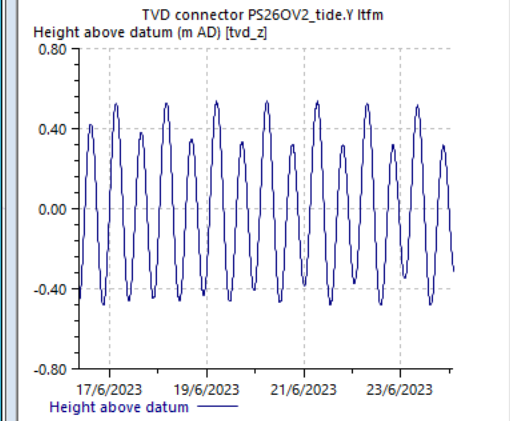
GeoPlan - MoaPt SPA_Aug2023_Miramar (version 42) (Scenario rainf...



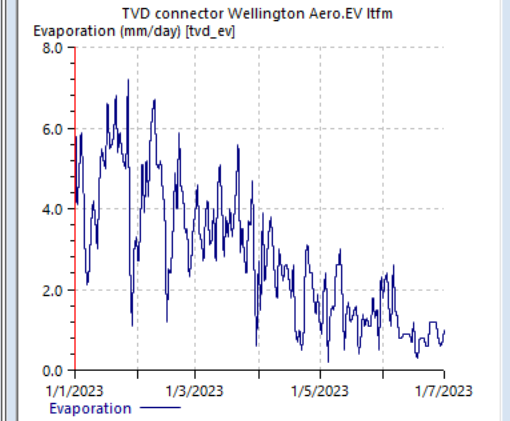
TVD connector 371118_RG10_4ARGIN.R ltfm



TVD connector PS26OV2_tide.Y ltfm



TVD connector Wellington Aero.EV ltfm



Database [2024.5] | Properties | Message Log | Output | Job Control

Ready - Press F1 for Help

[12/04/2023] [12:36:10] [22.7876] | Zoom (m): 2114.07 [1:23994] | READ | R/W | NUM | SCRL

Type here to search

ENG 11:56 am 6/03/2024

Challenges Encountered

Very dry recently! Miramar gets very wet in winter/spring - will be able to do more testing once it gets wetter

Permissions for data connections! Internally WWL has a PostgreSQL data warehouse. Setup for most time series has been set up in FME and picks up APIs where available, so that the backend can be used externally

Software needed! 64-bit ODBC drivers set up to access internal databases such as SCADA (Wonderware) and Lutra

Lot of languages to use! R (CliFlo), Ruby (ICM), Python & FME (processing), DOS/Windows Shell Script (Task Scheduler)

Data latency! Moata rain radar forecast only 1 to 2 hours, YR 62 hours which is more useful

Conclusions

- Successful proof of concept
  - Download different data sources to Data Warehouse
  - Read from Data Warehouse into InfoWorks
  - ICM Exchange to run and export results
    - Now need ICM Live / Info360 Insight to access TSDB
- Can also use TSDB for calibration
  - Reduces human error and one source of truth
  - Can smooth errors and interpolate without modifying source data
  - Can copy time series database and provide to consultants within a transportable
  - Create a time series database of local climate variables
    - Evaporation, rainfall, tide, soil moisture
    - One source for all models
- **Wellington Water better positioned for handling increased data**

Next Steps

Now

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Thank you!
Questions? Patai?

water
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The New Zealand Water & Wastes Association Waiora Aotearoa