Canal & River Trust

Keeping people, nature & history connected

Modelling the country's canal network using Aquator

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Hydraulic/Hydrological Modeller
10 October 2013

Overview

- The previous models used
- An introduction to locks
- The Aquator lock component
- Overview of progress and challenges
- Next steps

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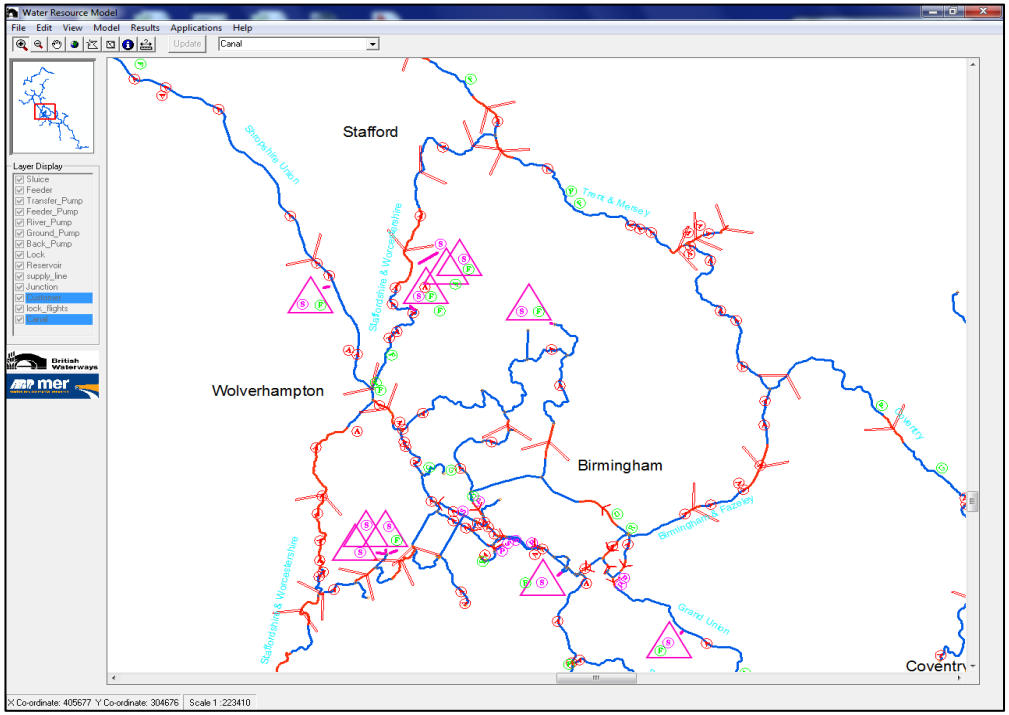
Previous model

Previous model



- High risk – completely bespoke code
- Little visibility
- Chasing errors very difficult
- Changes to the model configuration restrictive
- Slowly becoming obsolete, updating would be expensive
- Run times poor

Technical requirement

- Water resources model
- Ability to model water movement through locks
  - Various different components
  - Interaction with canal pounds
- Flexible
- Support
  - Developer
  - Industry use
- No need for hydraulic transfers
- Transparent

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An introduction to locks

An introduction to locks

Flow

Elevation change

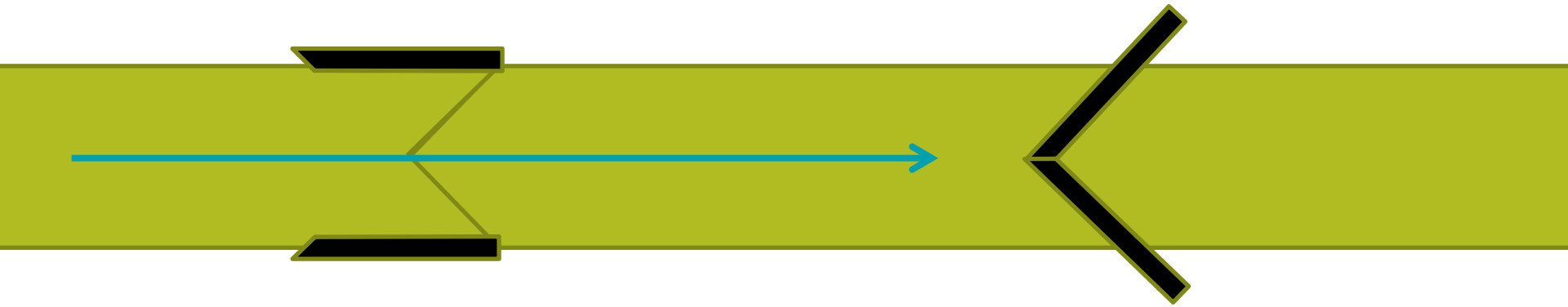
Plan view

An introduction to locks

An introduction to locks

Flow

Lockage



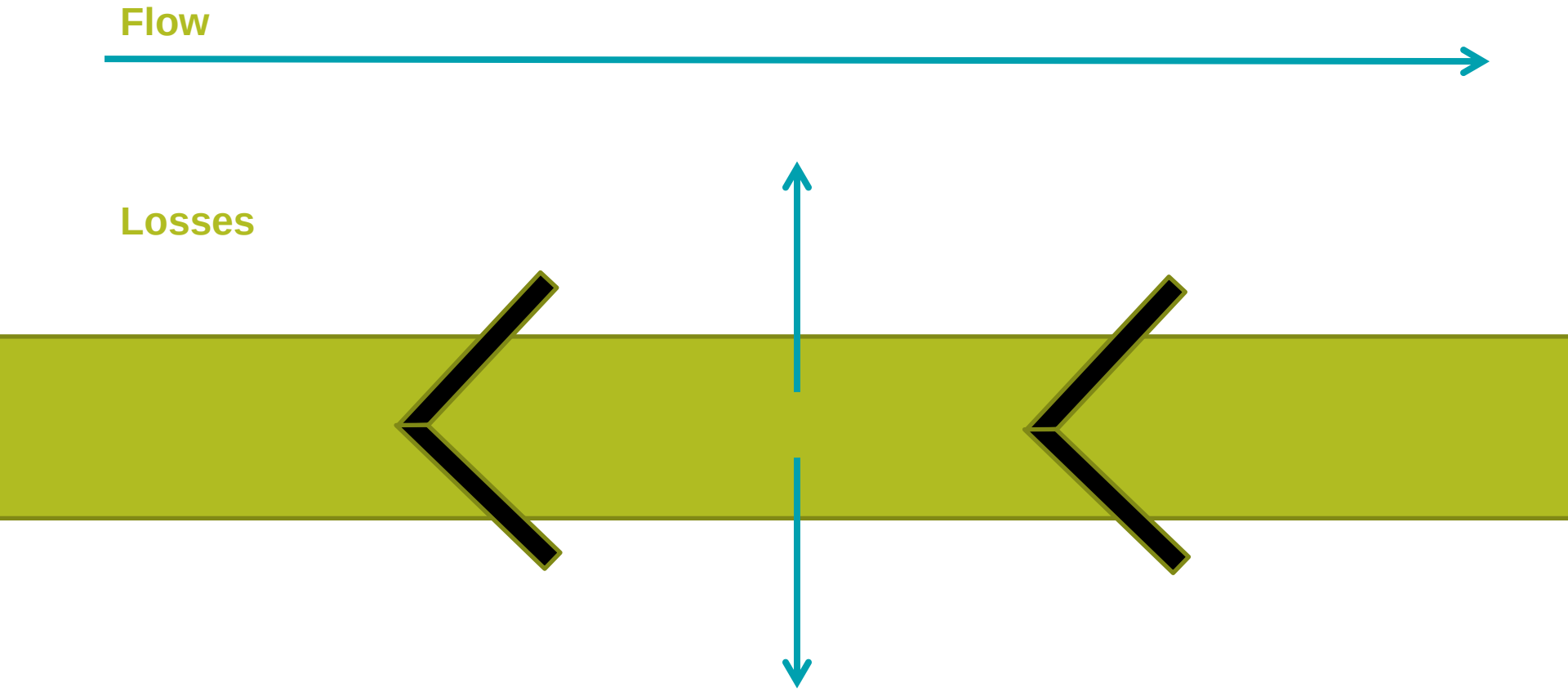
An introduction to locks

Flow

Leakage through gates

An introduction to locks

An introduction to locks



An introduction to locks

Flow

Bypass flow (or sluice)

An introduction to locks

Flow

Weiring over gates

An introduction to locks

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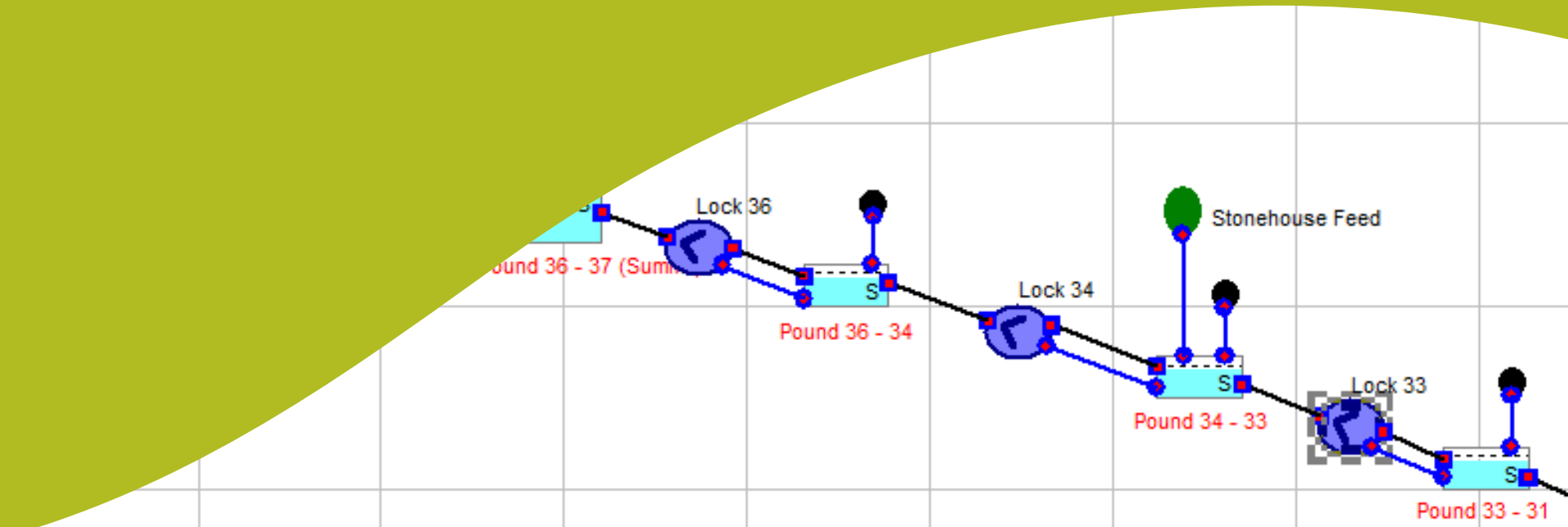
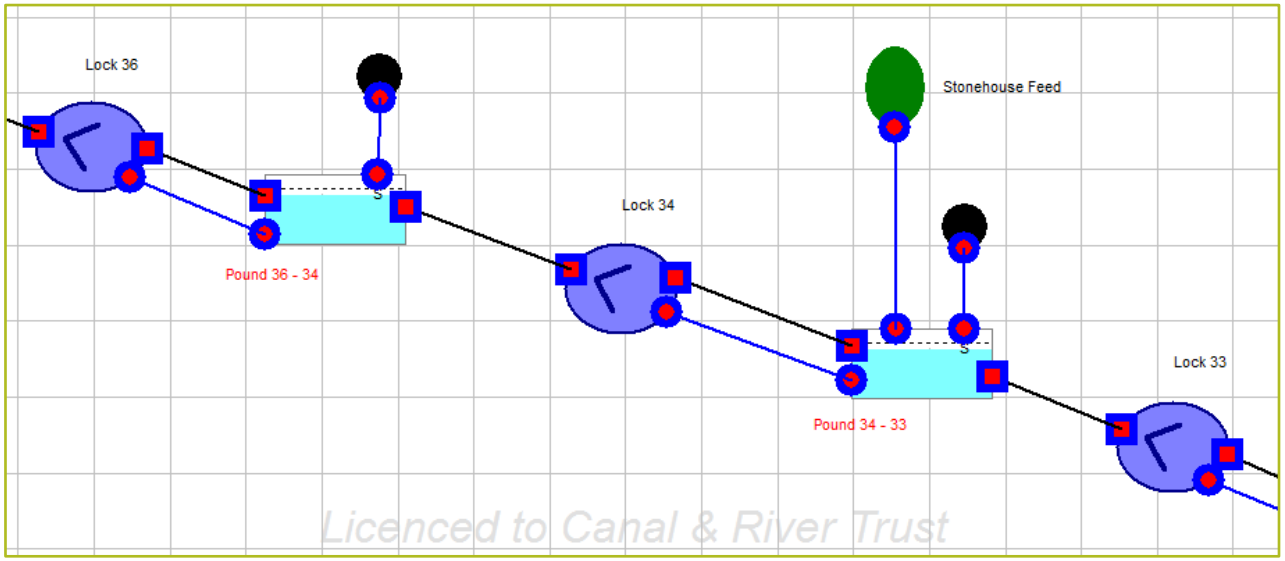
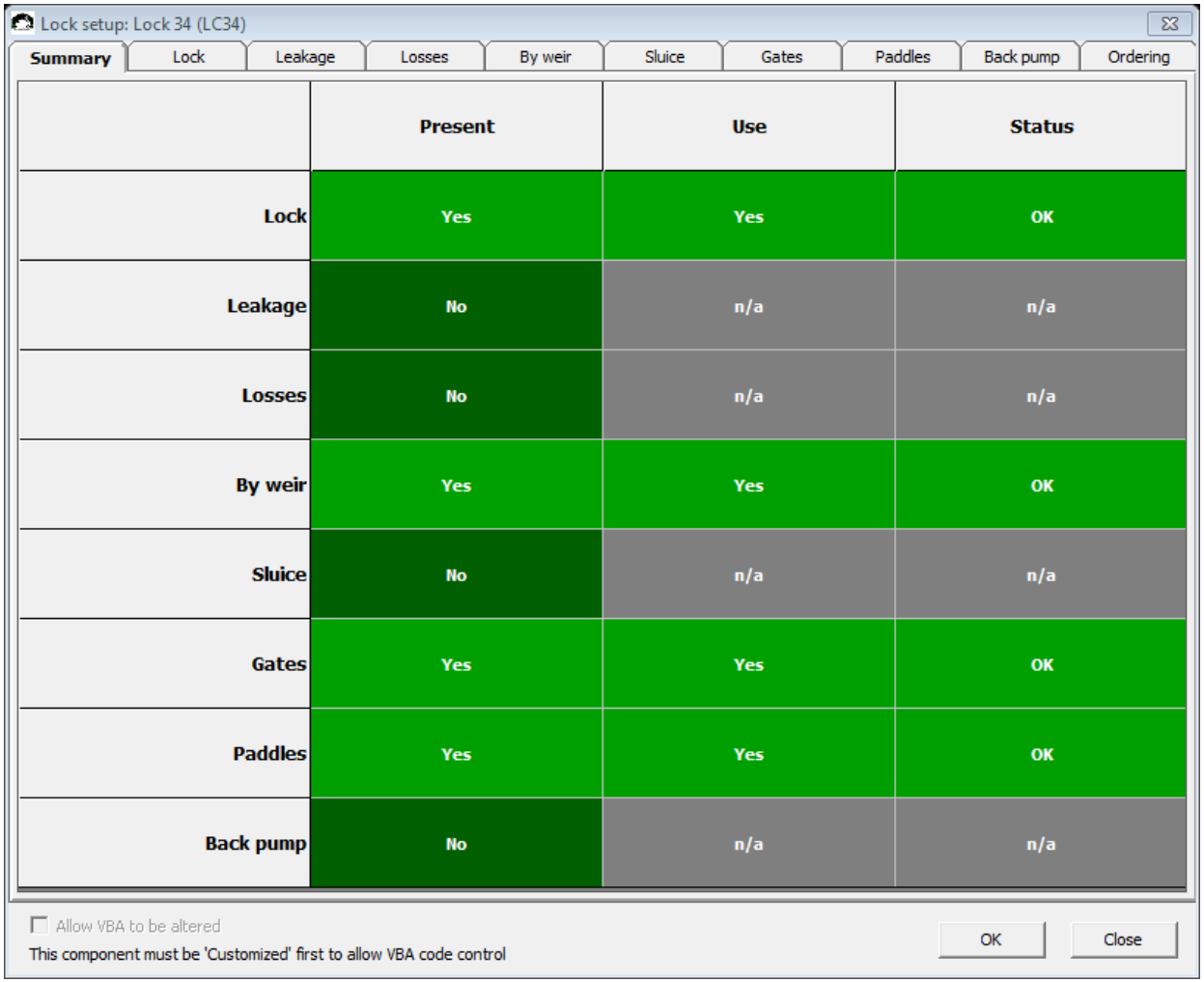
The Aquator lock component



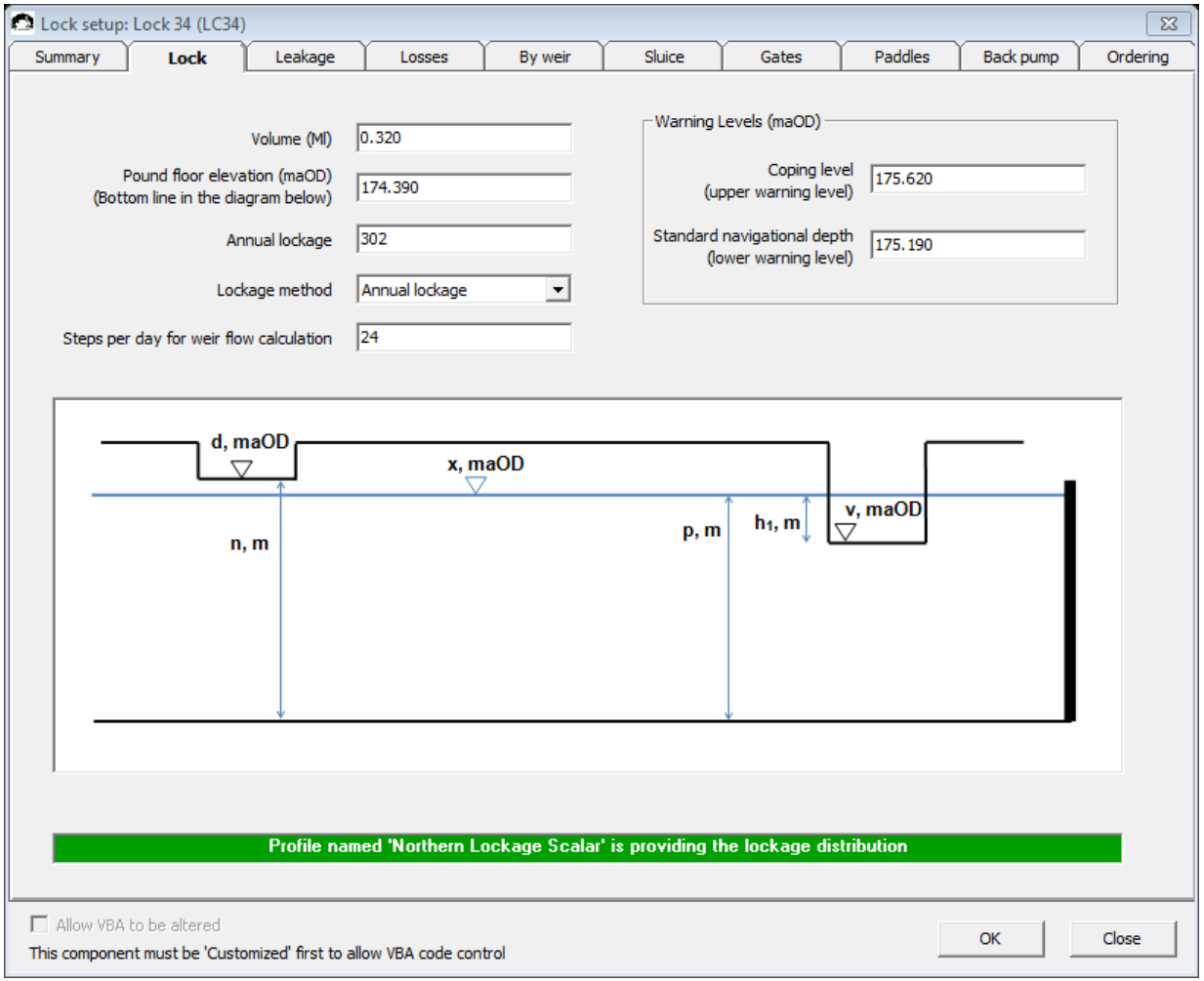
The Aquator lock component



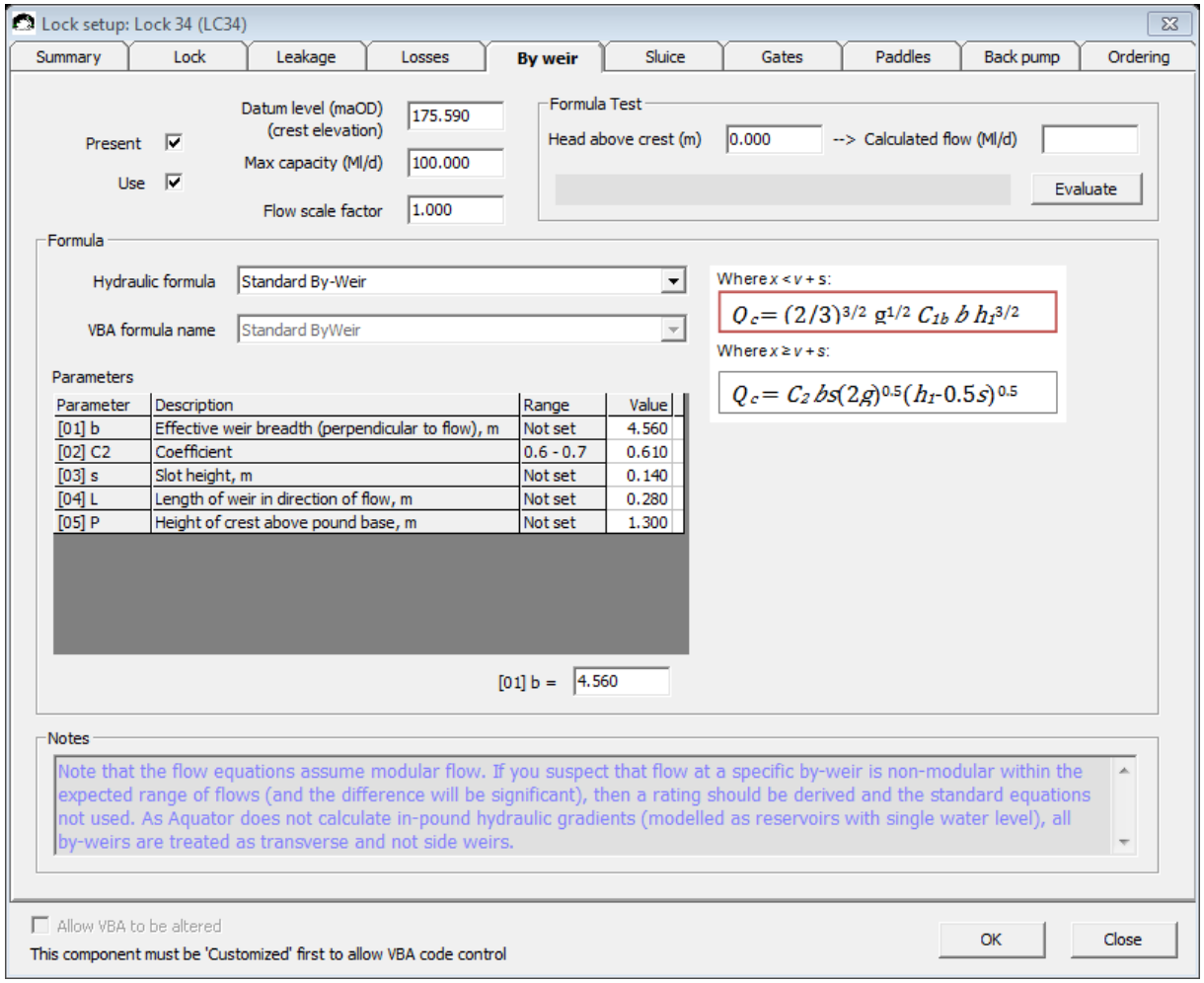
The Aquator lock component



The Aquator lock component



The Aquator lock component



The Aquator lock component

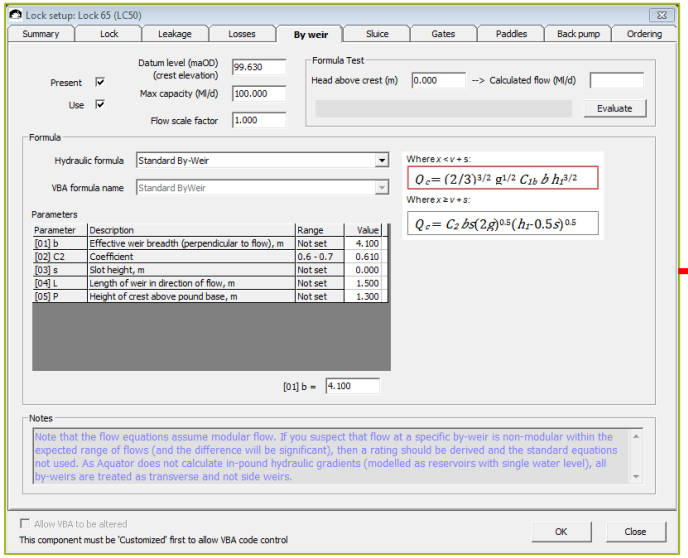
Key storages | **Level data table**

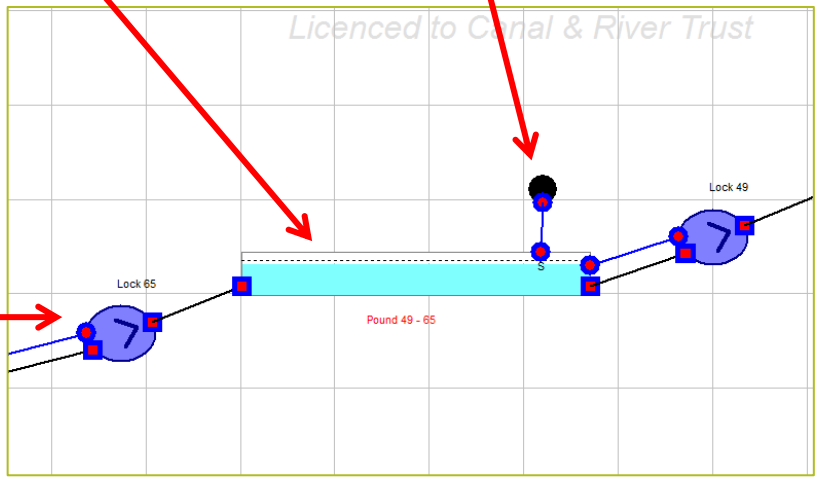
Row	Level (m)	Area (sq km)	Storage (Ml)	Seepage (Ml/d)	Spill (Ml/d)
1	100.000	0.196616	294.92	0.00	58.980
2 (TWL)	99.700	0.196616	235.94	0.00	0.000
3	98.500	0.196616	0.00	0.00	0.000

Edit Spill (VBA).Equation parameters (VBA)

	Datum (m)	Width (m)	Slot Height (m)
1	99.700	3.630	0.000
2	99.830	7.000	0.000
3	99.810	8.760	0.000
4	99.800	9.200	0.000

OK | Cancel | Help





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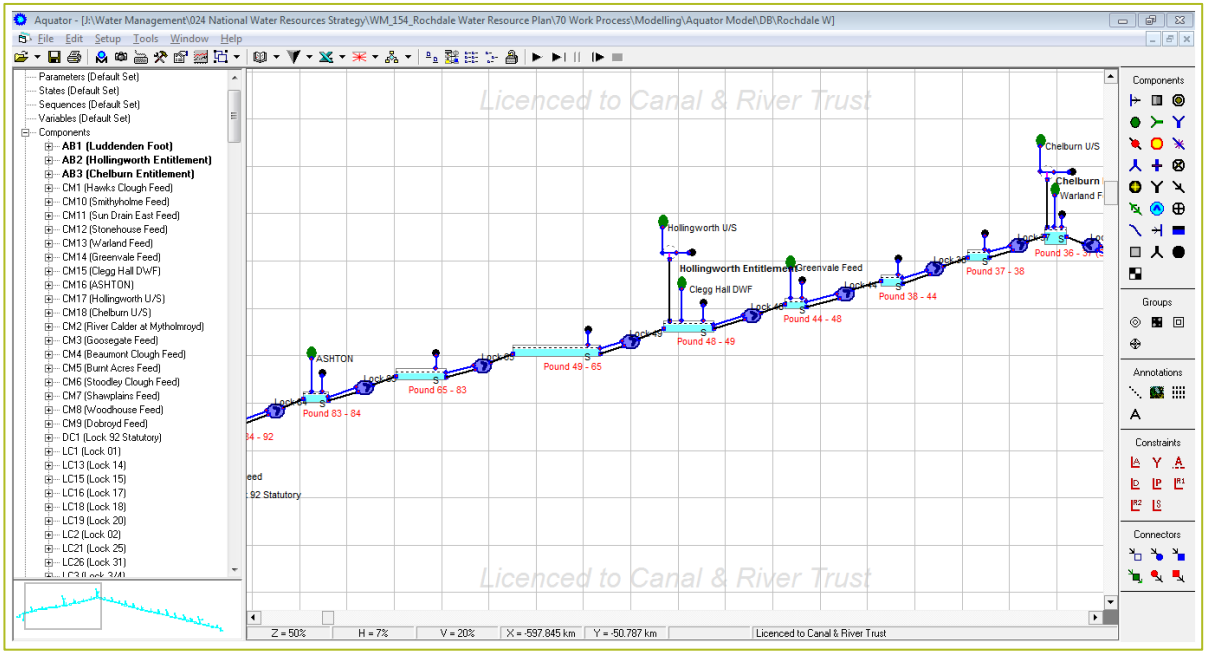
Progress & challenges

Progress & challenges



Progress

- Design and development
- Testing
- Model build – Rochdale
  - 25 locks (92), 24 pounds (91), 17 feeders, 3 entitlements
- Model runs, some issues to be resolved

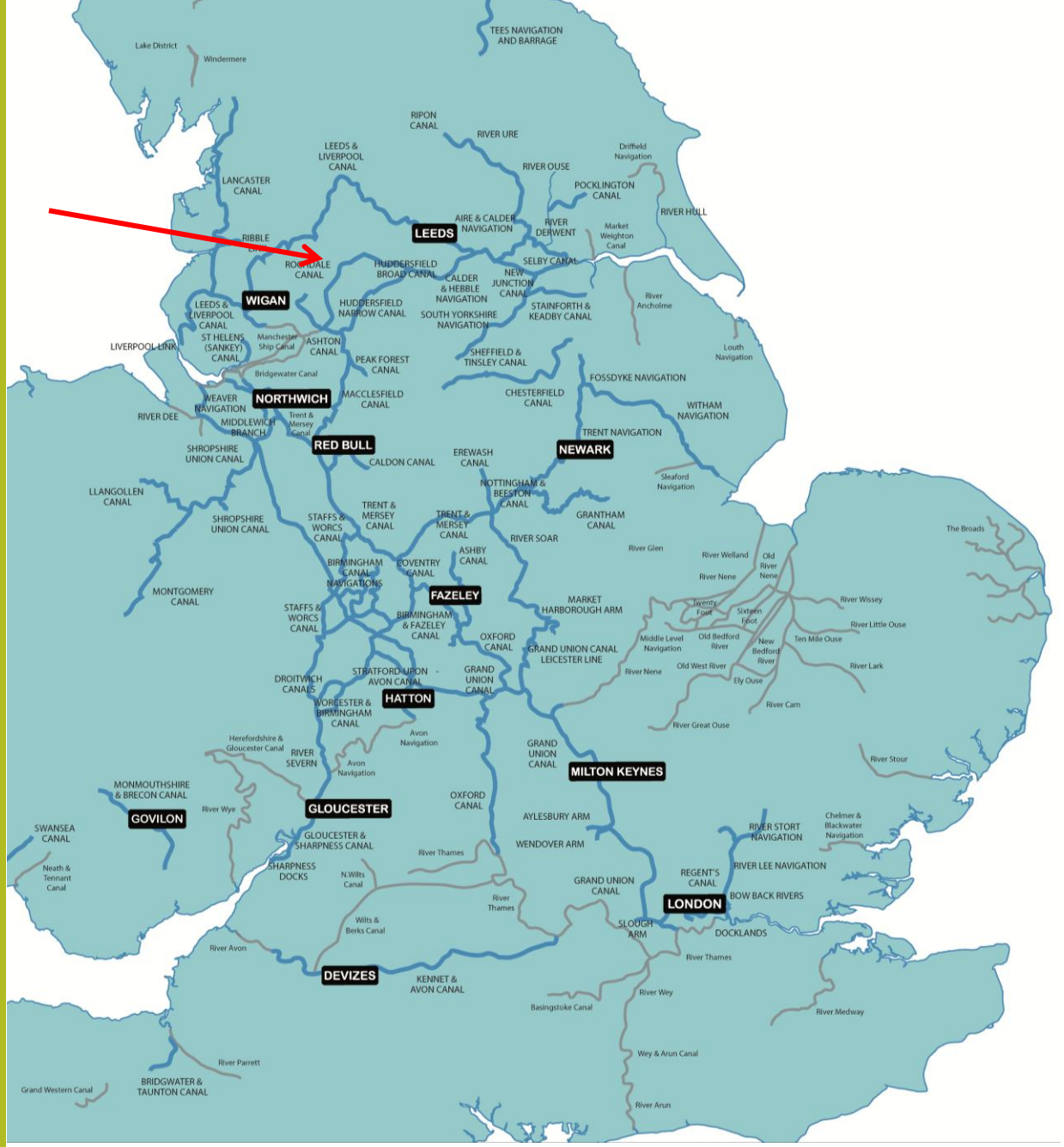
Challenges

- Data collation
- Only previously had a spreadsheet model
- Learning Aquator & lock component
- Configuration,
  - feeders as full available or entitlement?
  - Small storage in pounds

Next steps

- Refine the Rochdale model
  - Use early models to refine configuration of locks
  - And pounds
  - Accounting for waste (out of system)
  - Reporting
- Calibration
  - Using data from the SCADA network
- Develop Grand Union South
- Merging models into composite database
  - And then connecting up the network

Rochdale Canal



Map Key

- Canal & River Trust offices
- Canal & River Trust waterways
- AINA waterways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Aquator User Group – 2013

Modelling the country's canal network using Aquator

Part 2: How the Lock component works within Aquator

Chris Green (OSS Ltd)

The Canal & River Trust Aquator Lock Component

- The most complicated Aquator component ☹
- Has both river and supply functionality ☹
- Two types of water movement – always moved and optional ☹
- Requires passes both down the canal system and up the system ☹
- Sub daily calculation of weir flows ☹

The Canal & River Trust Aquator Lock Component

Two types of water movement – always moved and optional

Always moved (e.g. Lockage, by-weir flow)

Calculations proceed down the system from top to bottom early in the day

Canal now possibly in an imbalanced state

Optional (e.g. Sluice, back pumps and sometimes Paddles)

Calculations proceed up the canal system from bottom to top restoring the balance (using pound resource state)

The Canal & River Trust Aquator Lock Component

Two types of water movement – always moved and optional

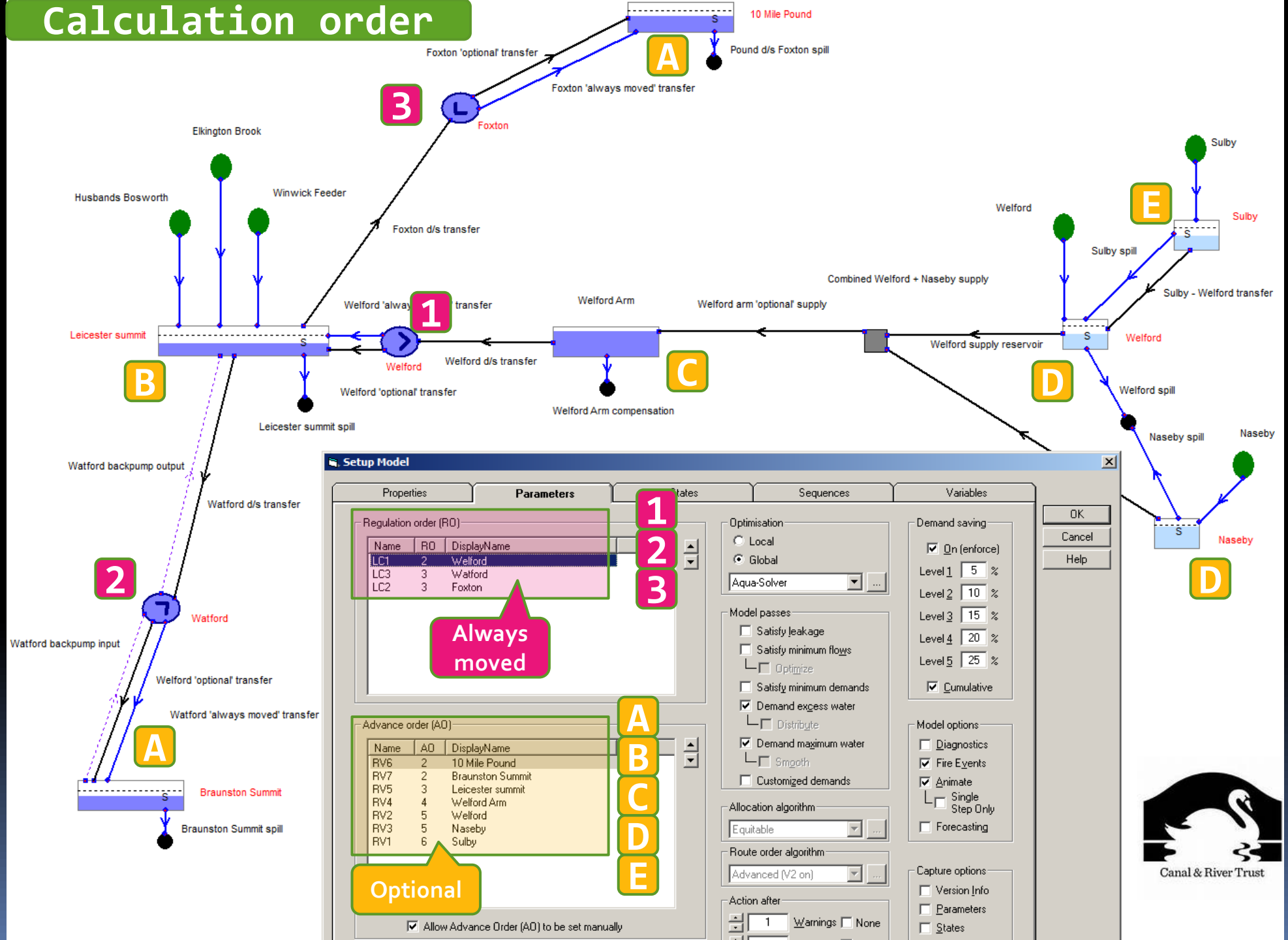
Always moved (e.g. Lockage, by-weir flow)

During Aquator's river regulation phase using Regulation Order (RO)

Optional (e.g. Sluice, back pumps and sometimes Paddles)

During Aquator's demand meeting phase using Advance Order (AO)

Calculation order



The Canal & River Trust Aquator Lock Component