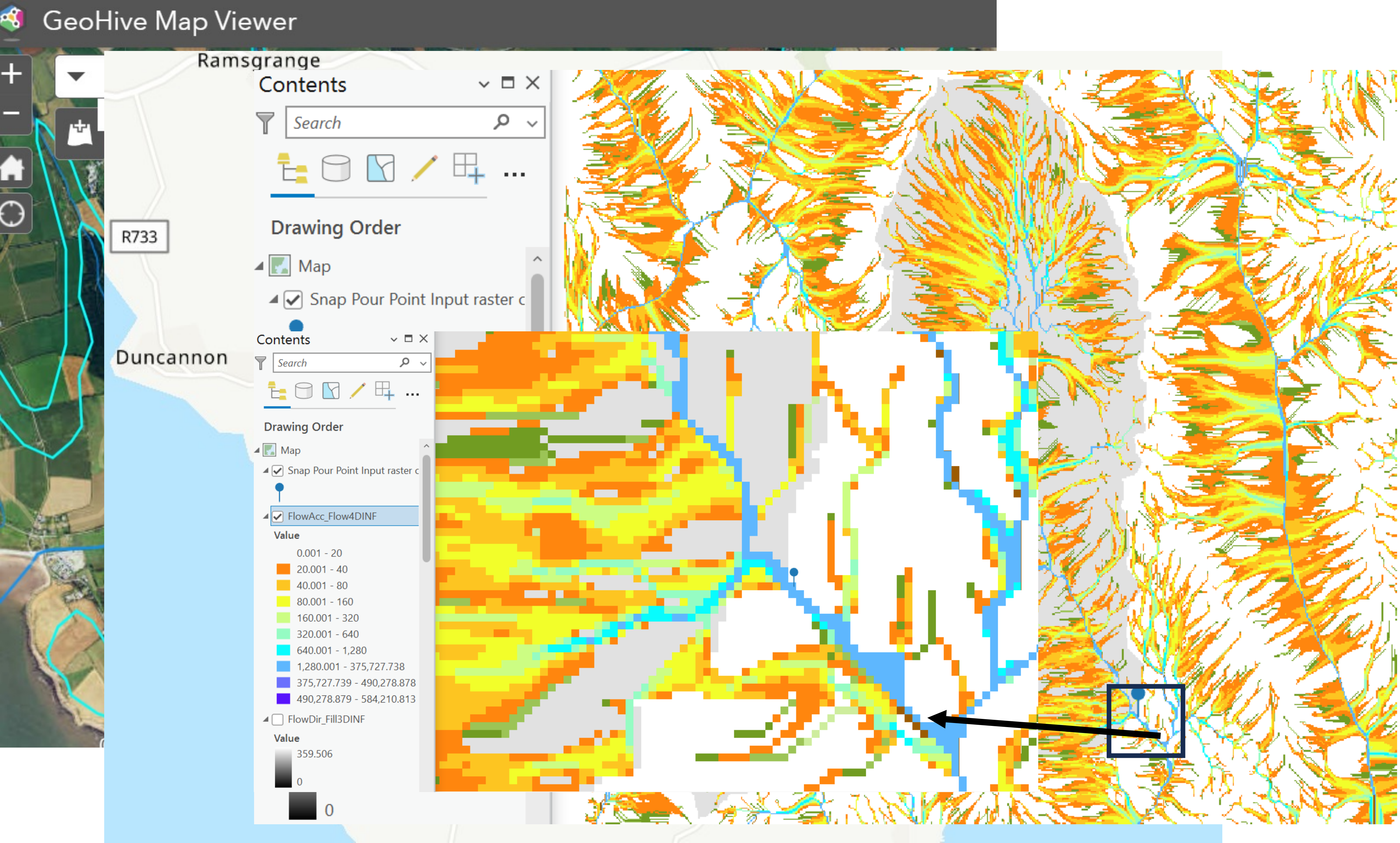
Wexford Demonstration Features

Quantification and Scaling of Flood Impacts

Or

Data, Maps, Models and Metrics!


GeoHive Map Viewer
Ramsgrange
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Contents
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Contents
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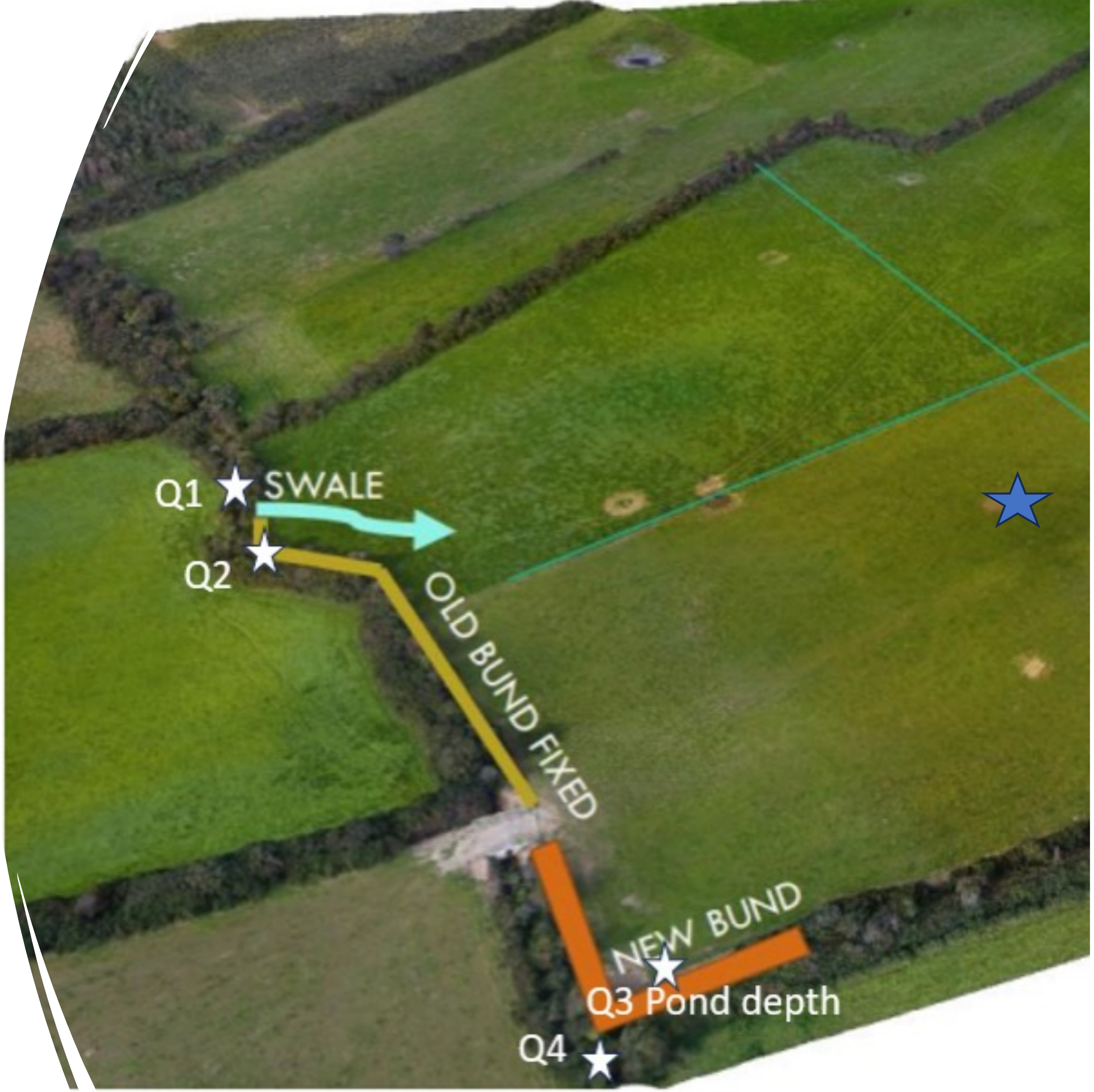
FlowAcc_Flow4DINF
Value
0.001 - 20
20.001 - 40
40.001 - 80
80.001 - 160
160.001 - 320
320.001 - 640
640.001 - 1,280
1,280.001 - 375,727.738
375,727.739 - 490,278.878
490,278.879 - 584,210.813
FlowDir_Fill3DINF
Value
359.506
0
0

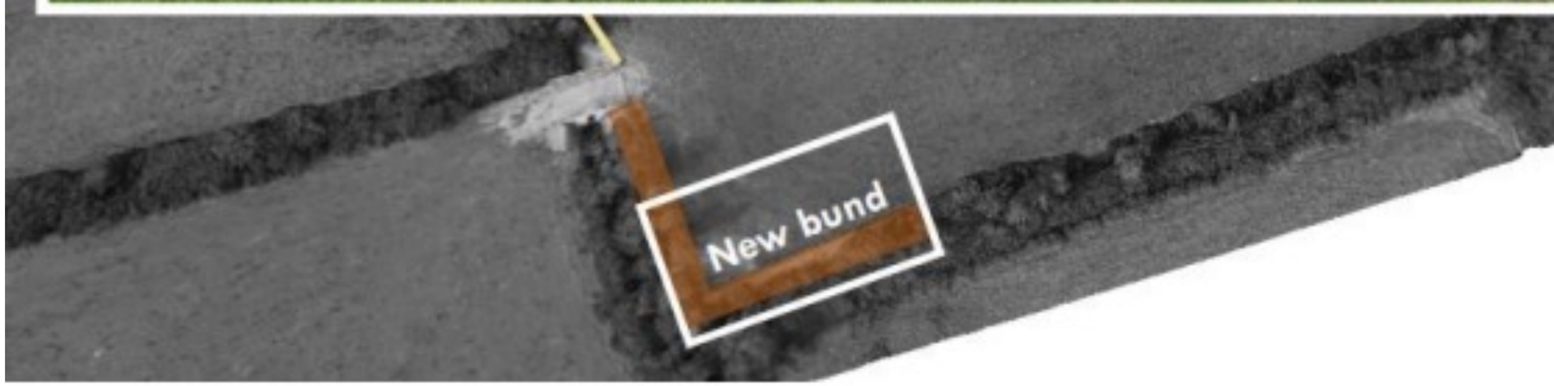
Ballygow demo site (3km^2) co Wexford

Beef & sheep on heavy soils with some river gravels

- 4 Water level recorders ☆
- 1 rain gauge ★
- New bund
- New pond
- New draw off structure
- New Bridge

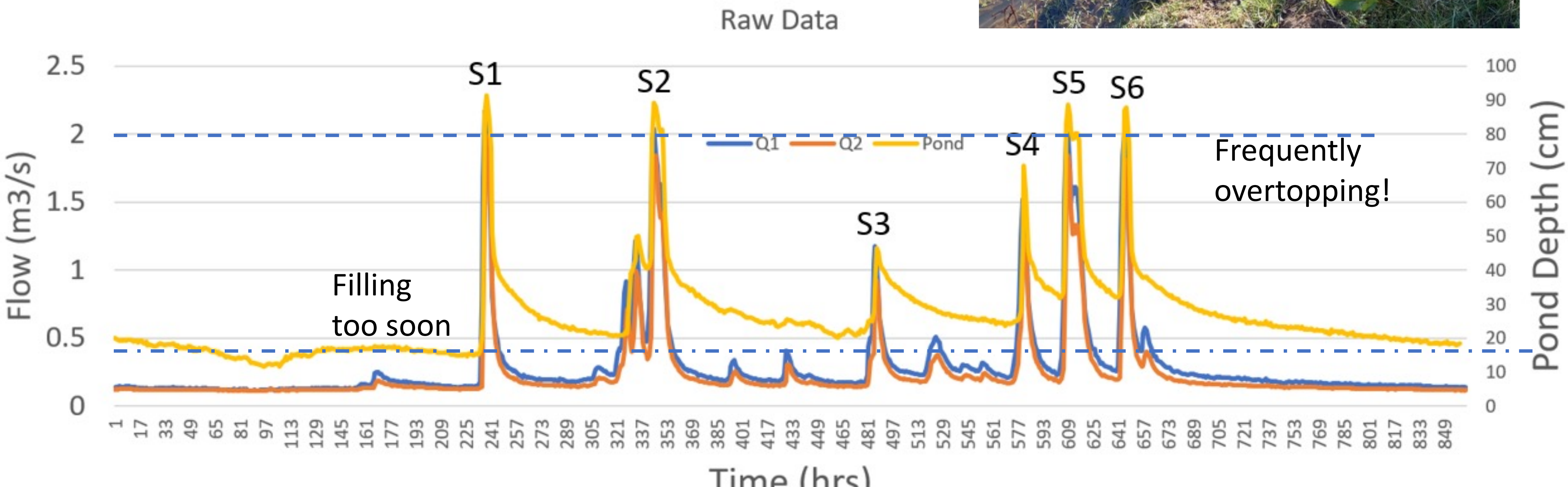


Original Bund 2021

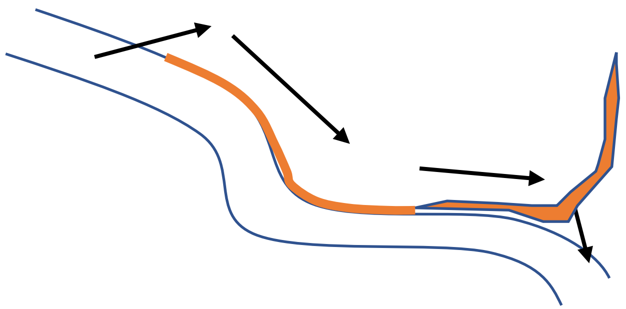


- Approx. 1 m at highest point, outlet pipe at 30 cm – release back into stream
- Sediment trap

Pond Function - Observations

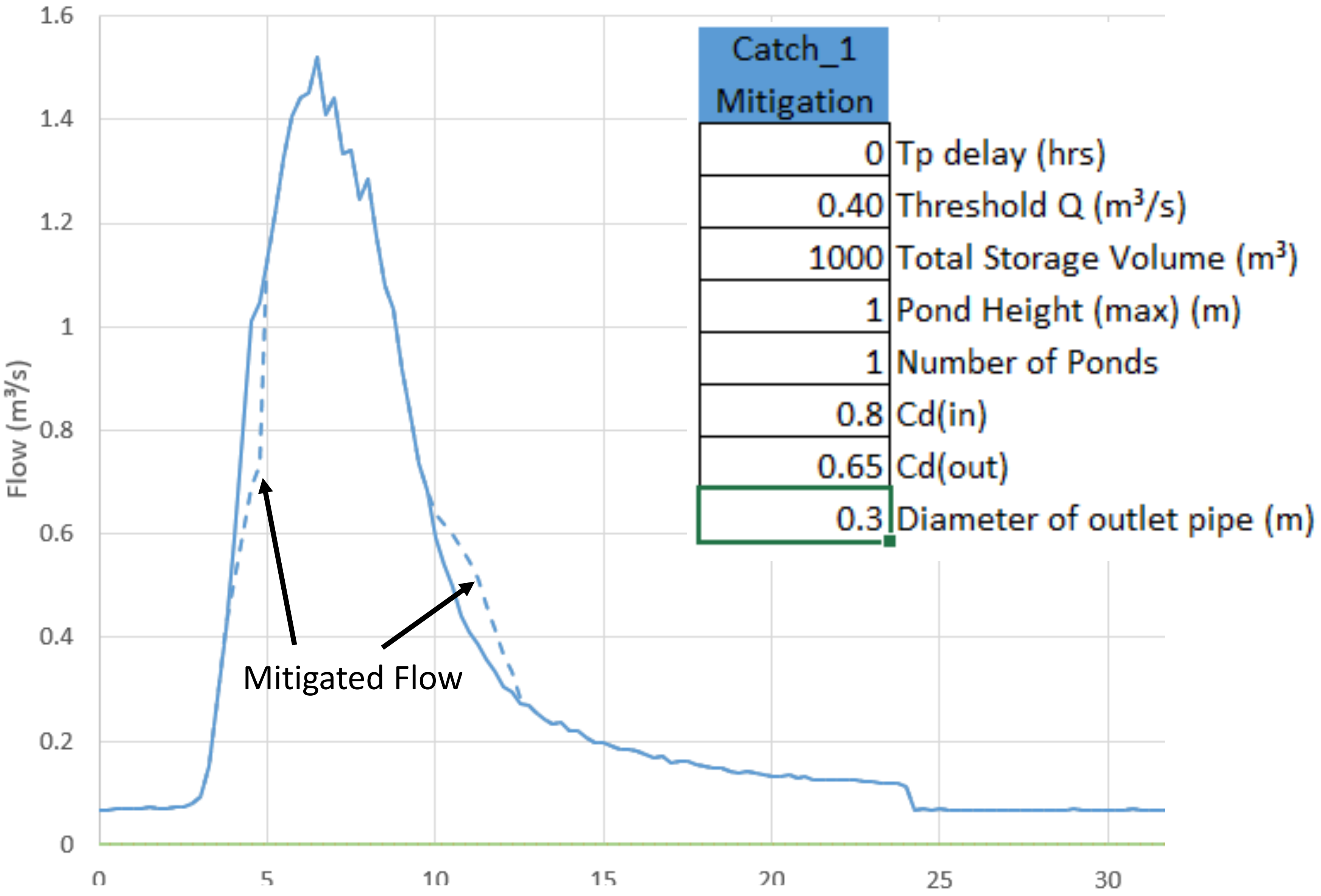


Pond Forensic Model ~200m long



Original designed function

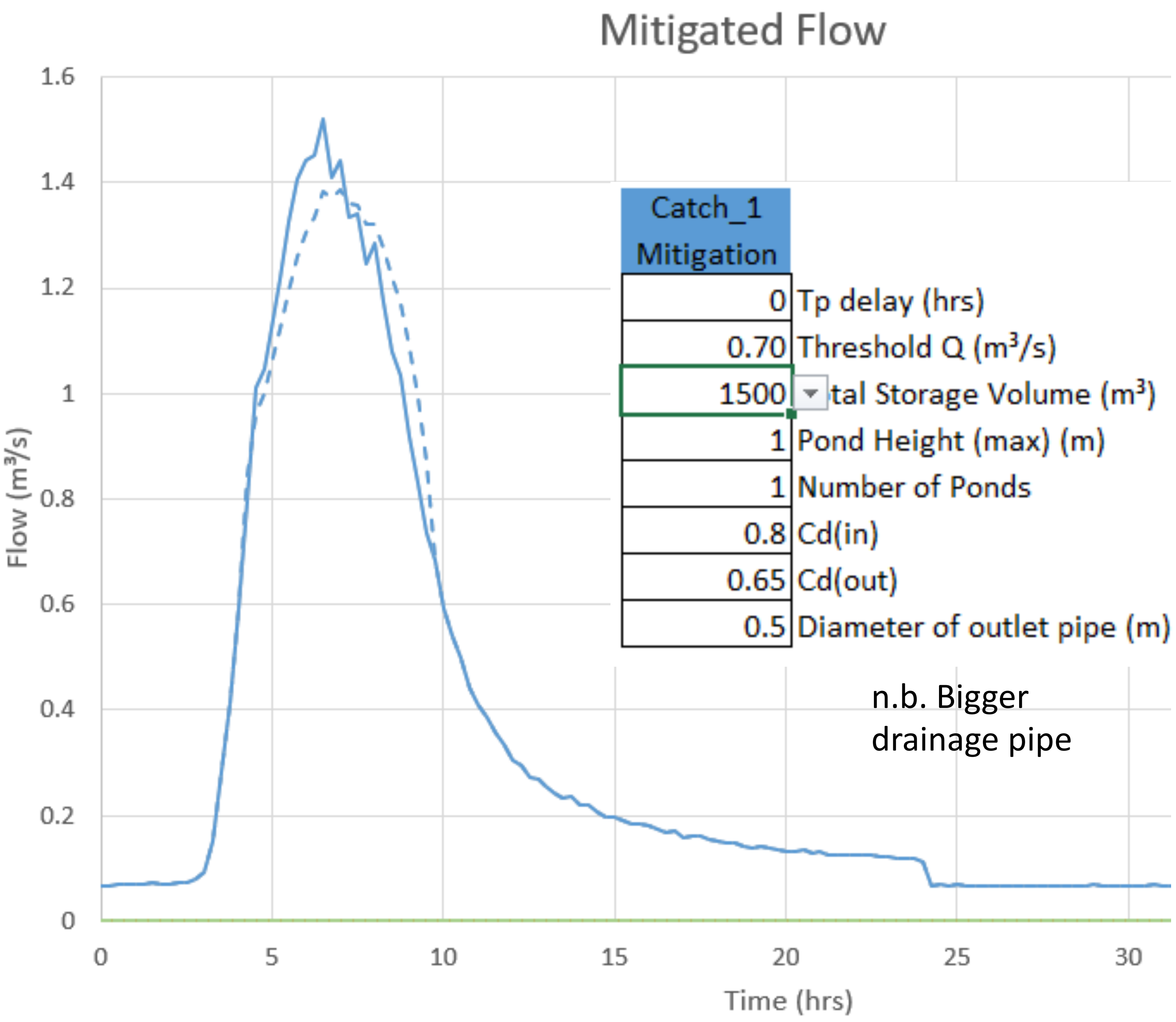
Ballygow original bund design capacity



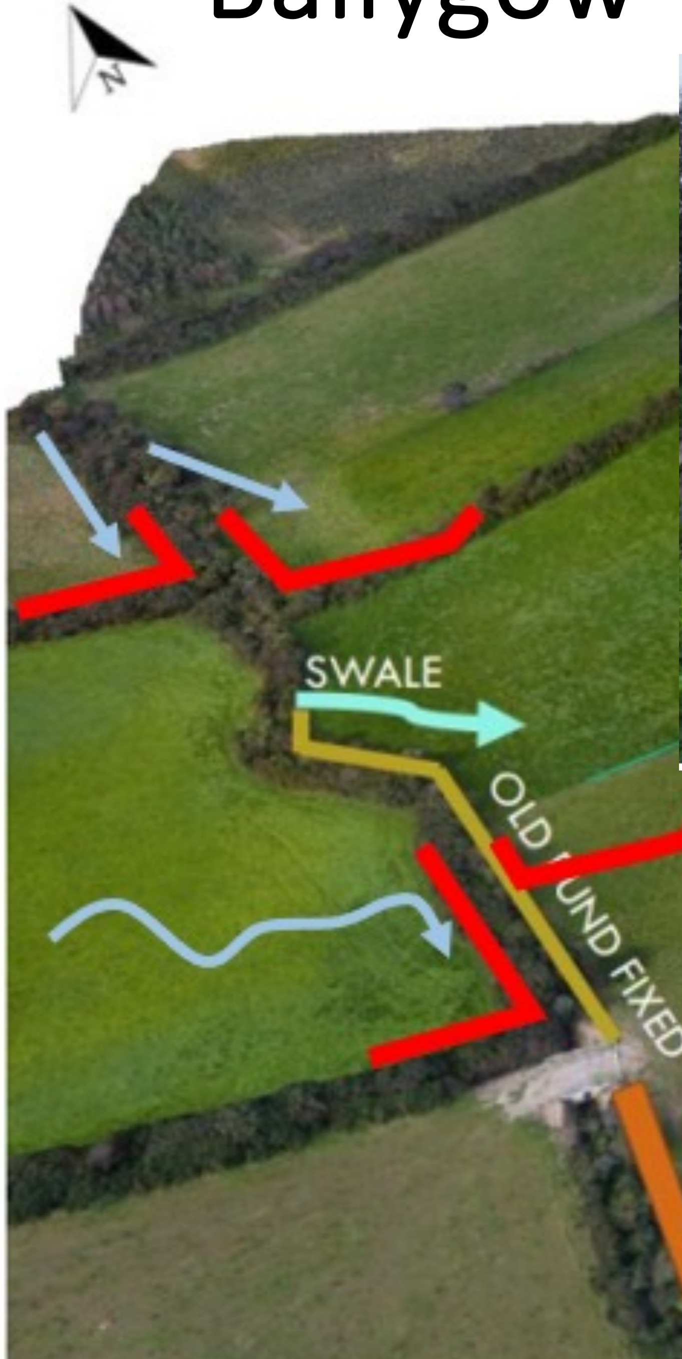
Pond is too small, inlet flow too high

Can we optimise this pond?

More storage volume **(1500m³)**, raise draw off rate **(0.7m³/s)**, bigger pipe on outfall **(50cm)**

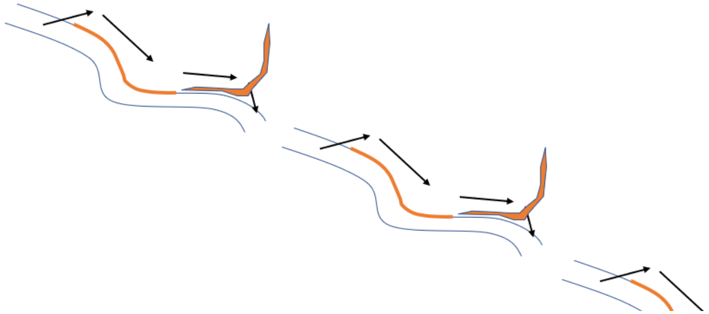


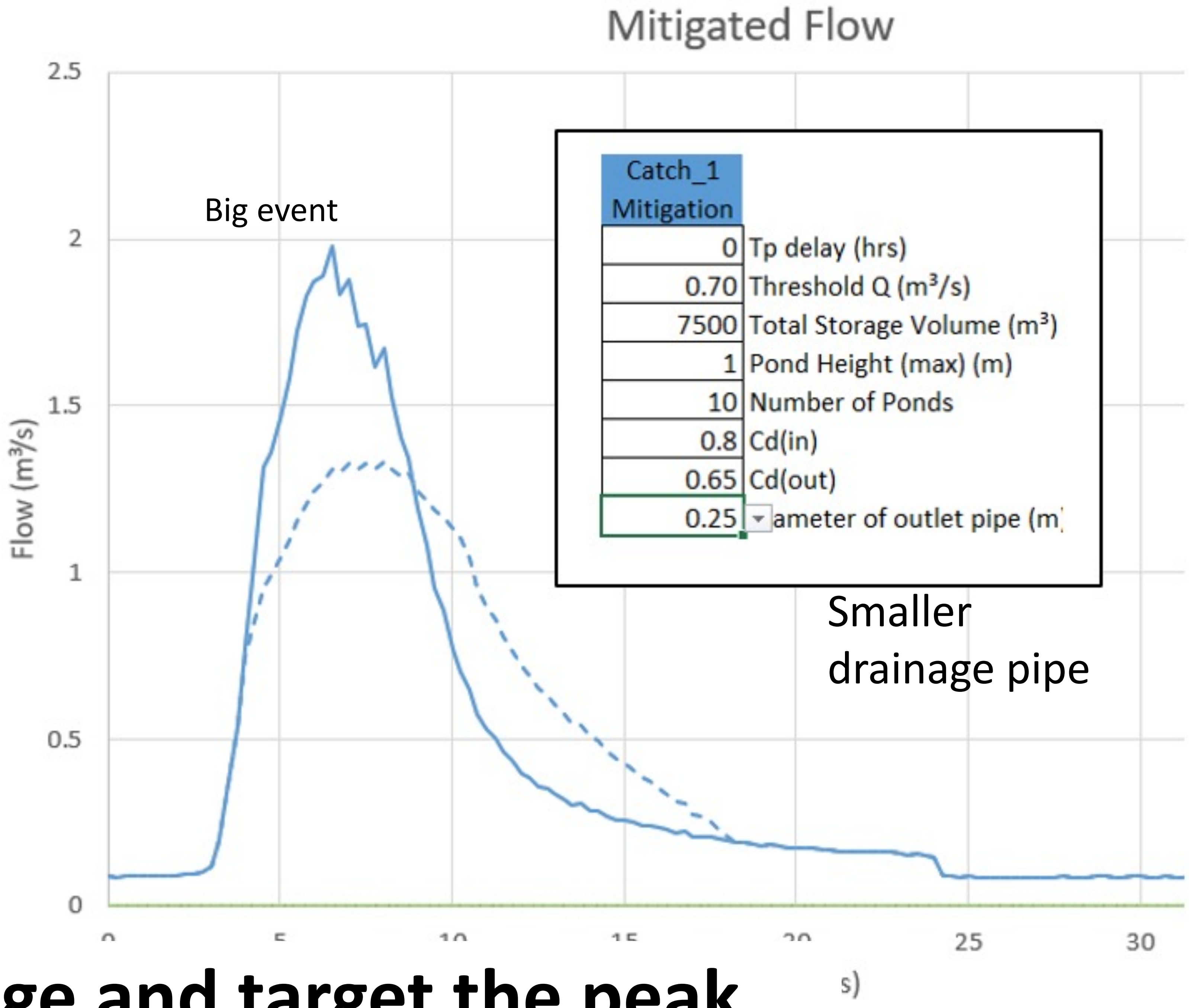
Ballygow Wexford Storage Pond Version 2



Aggregated Pond Model

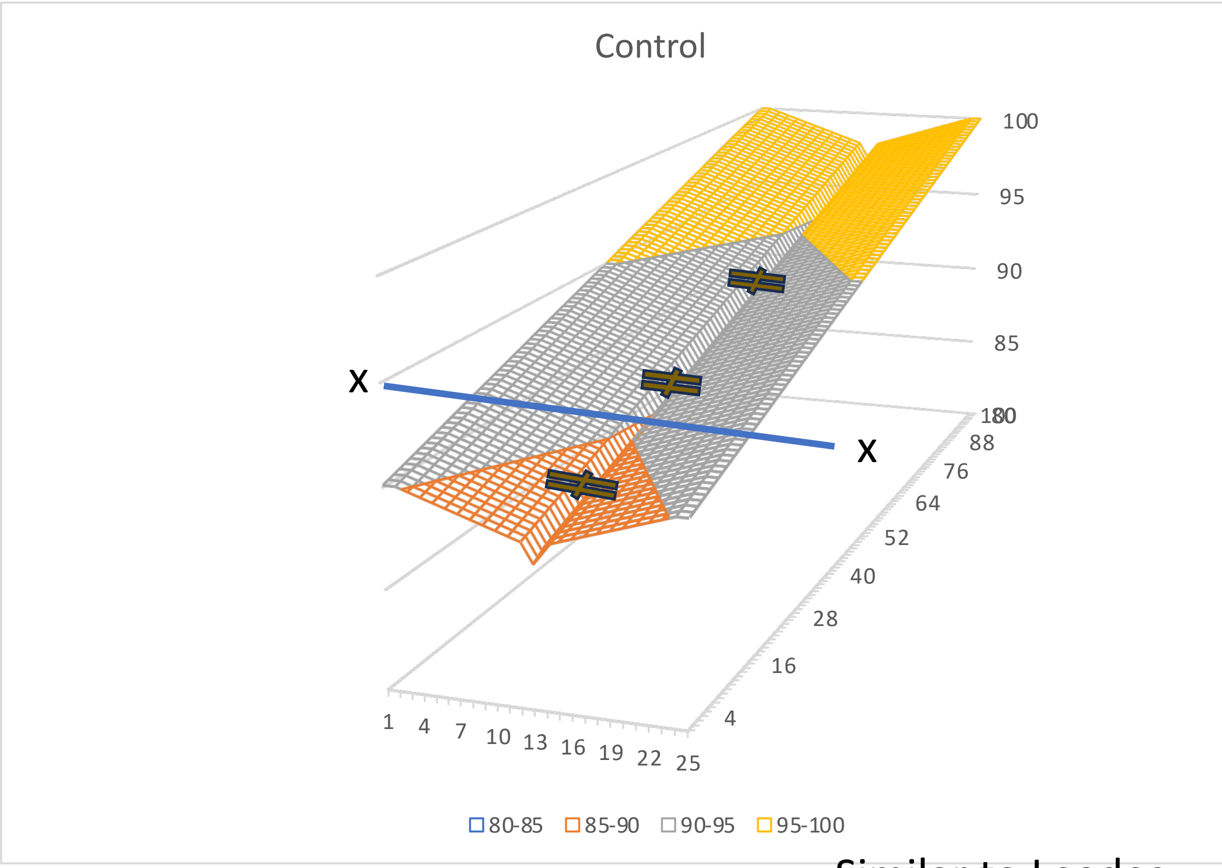
What if we had more ponds?
E.g. 10 ponds $7500m^3$ at $3km^2$

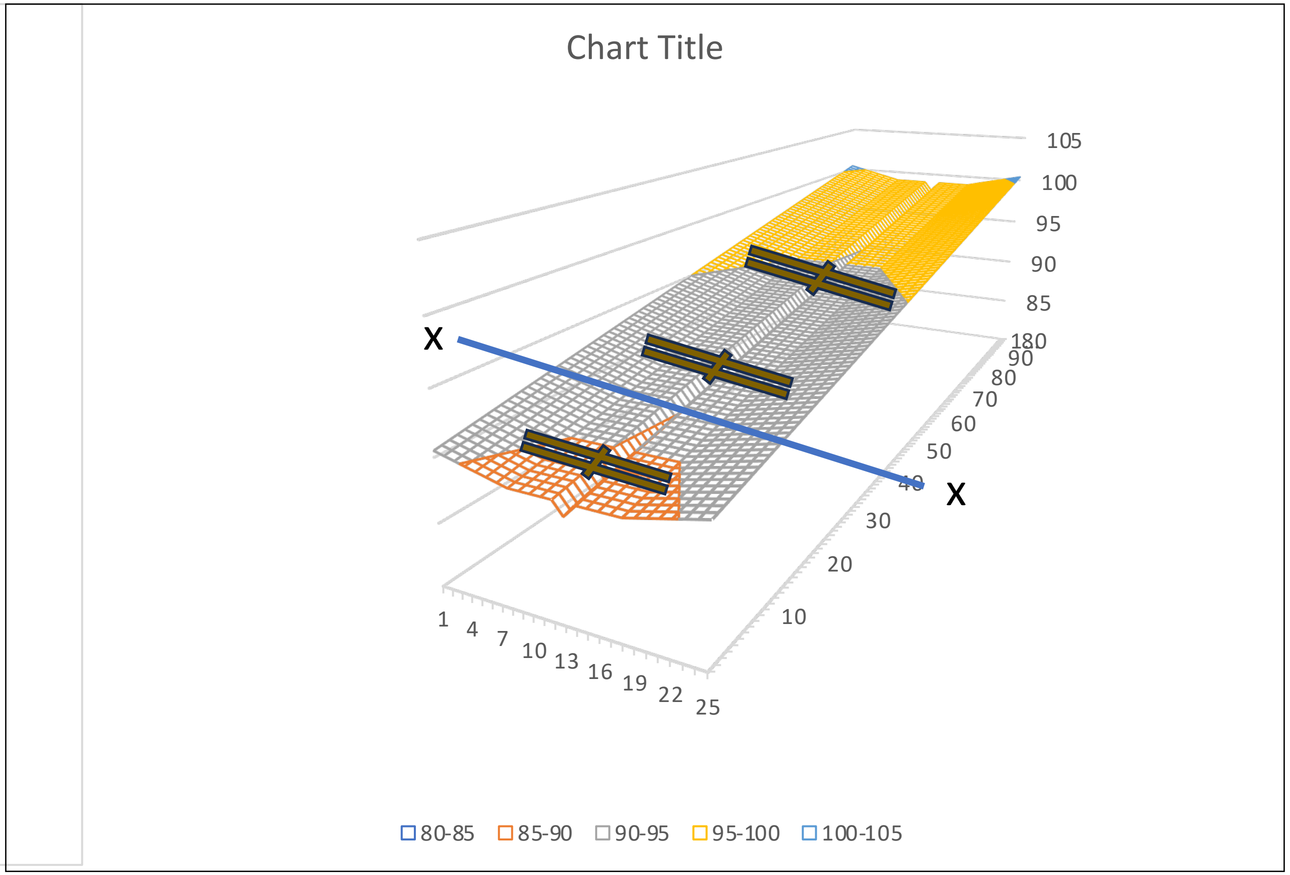




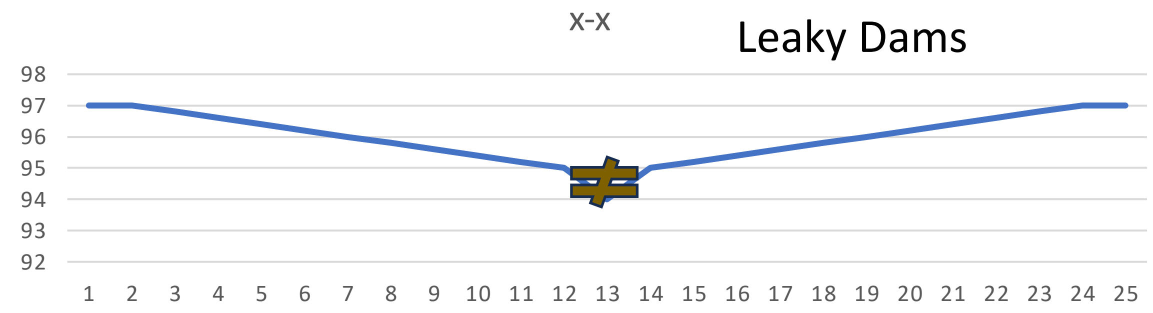
Big storage and target the peak

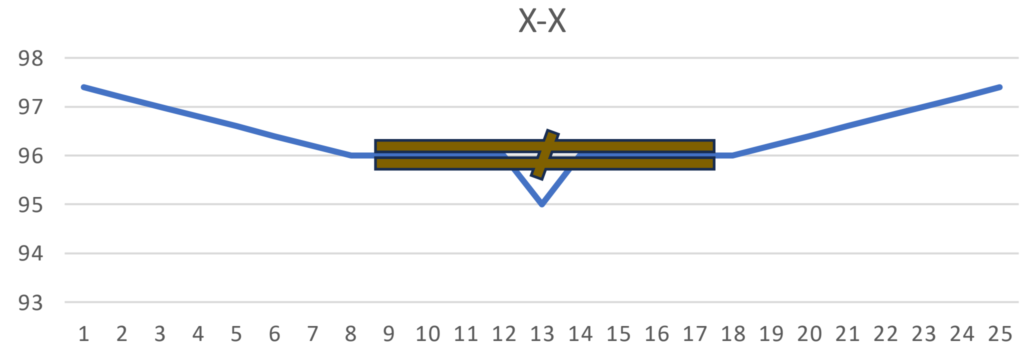
HEC-RAS – 2D Hydraulic Routing Model (1m DEM)





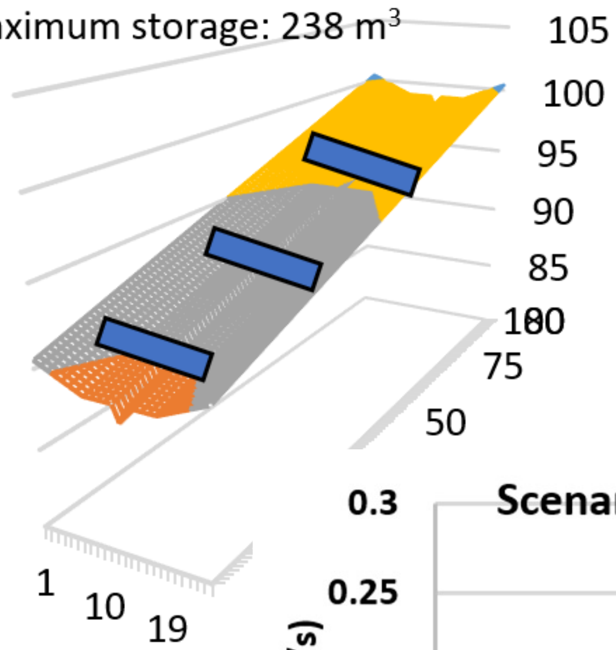
Similar to Leades Leaky Dams



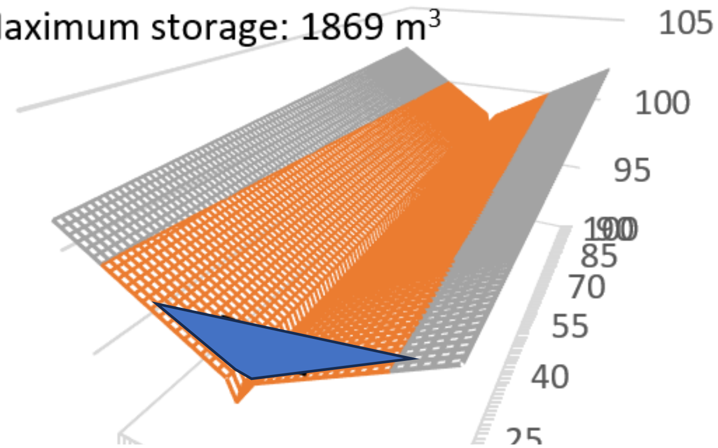


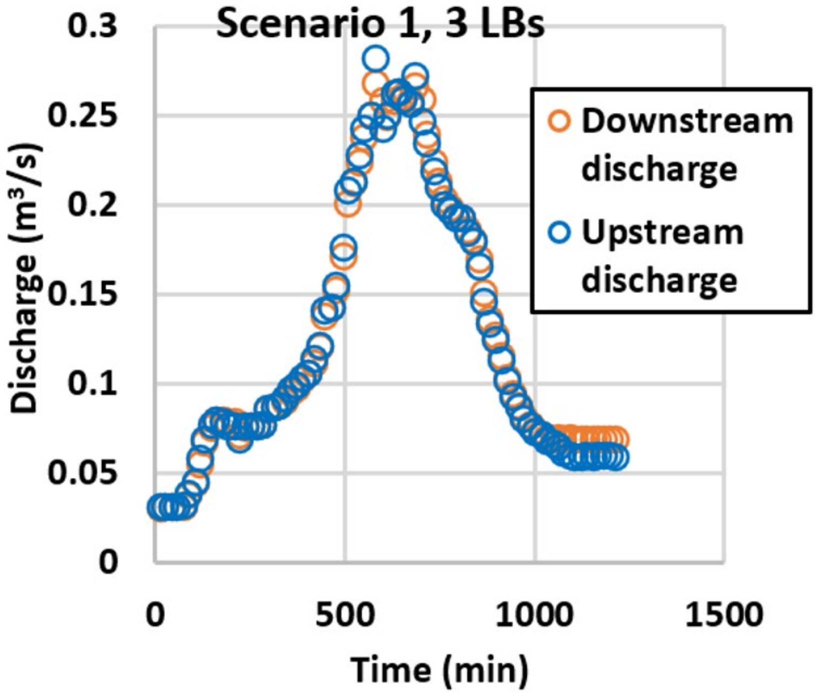
HEC RAS Scenarios Impacts for 1:2 year event $1km^2$

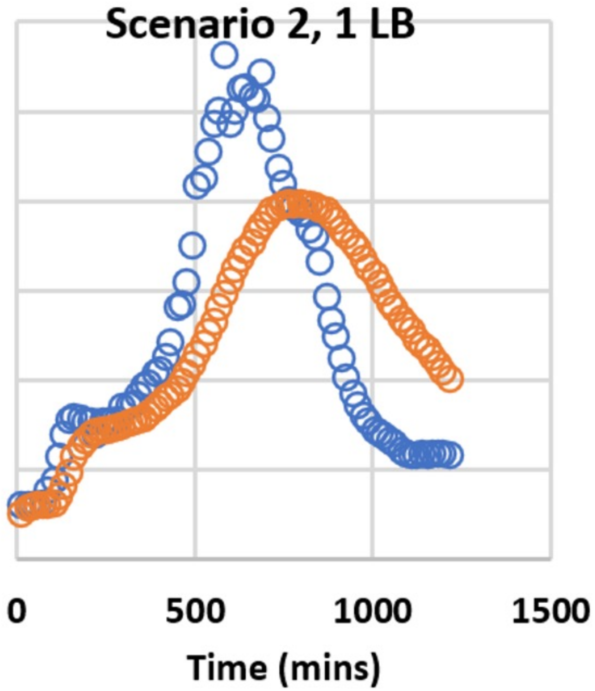
Scenario 1
3 leaky barriers
Maximum storage: 238 m^3



Scenario 2
1 leaky barrier
Maximum storage: 1869 m^3

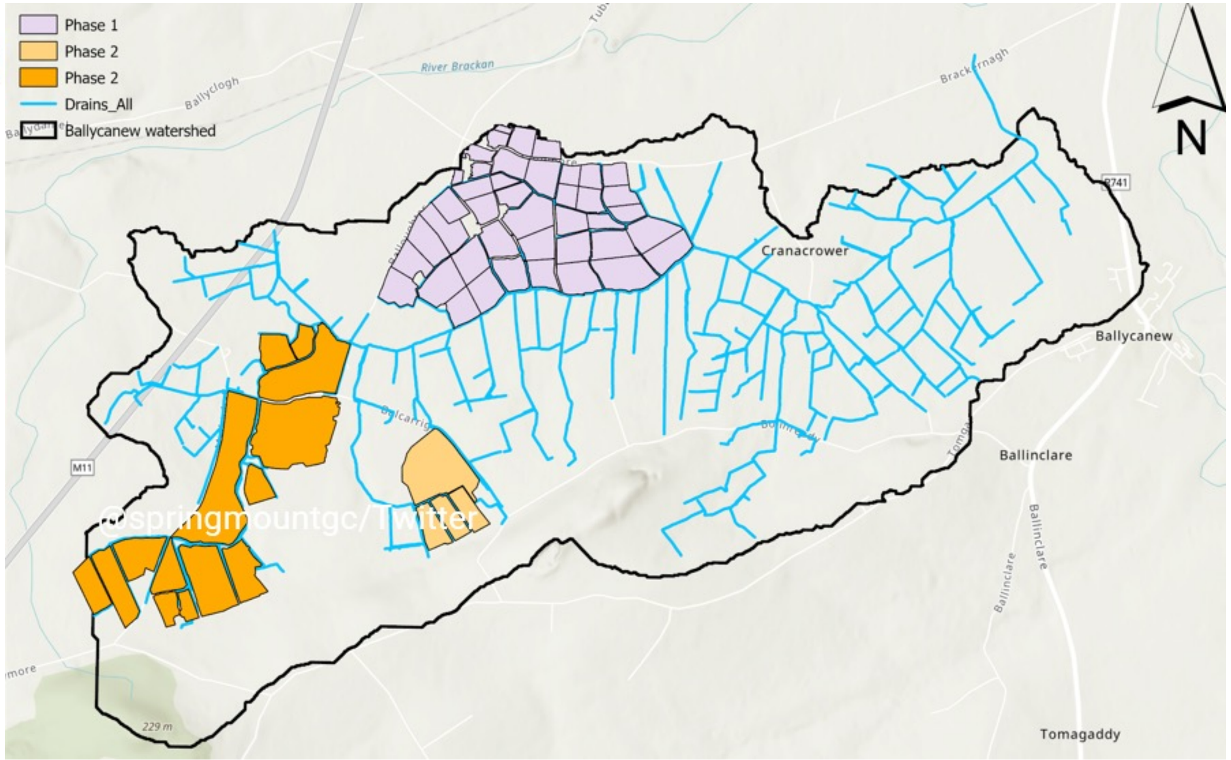






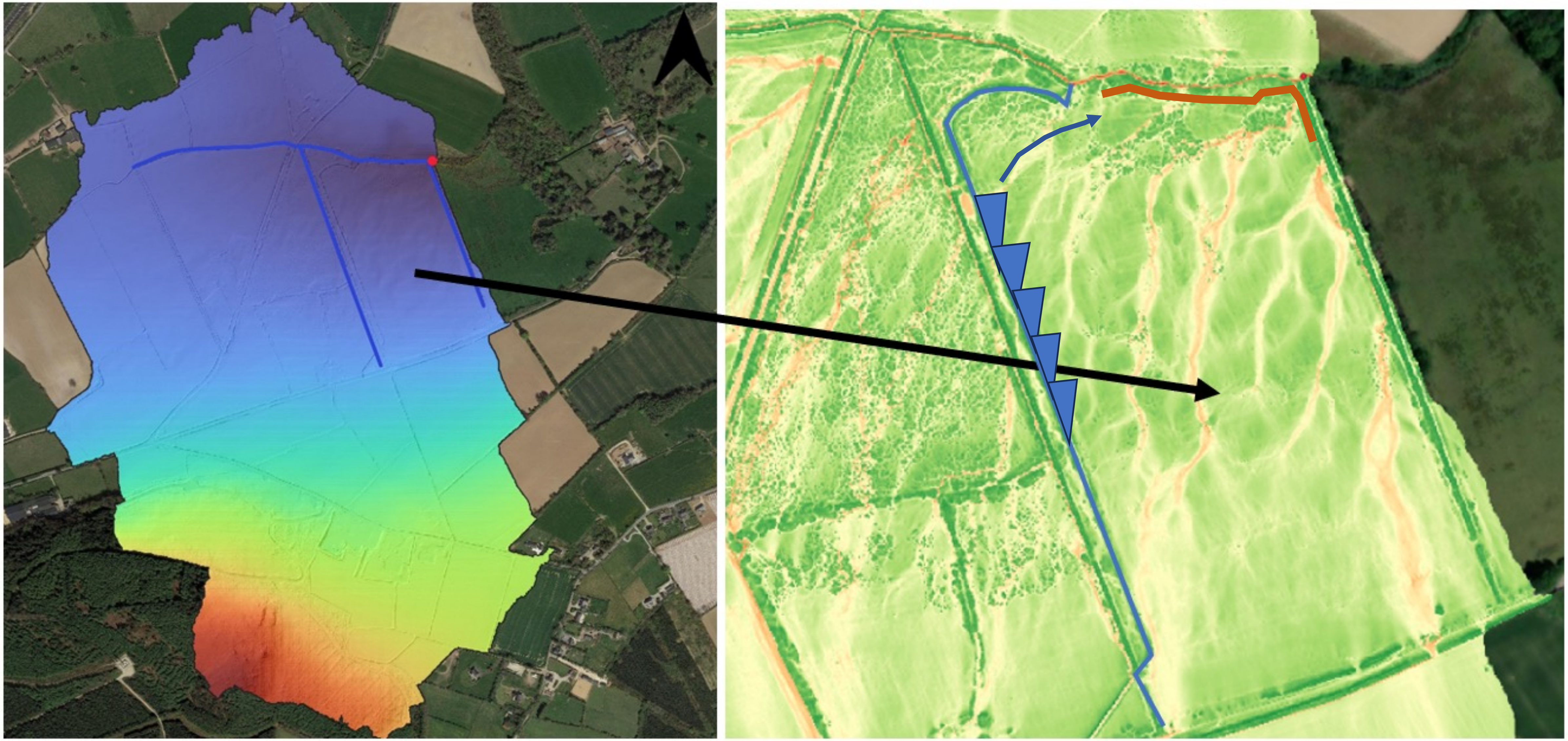
Opportunity Mapping in Ballycanew IACP
2 examples

- 11.92km2
- 78% grassland-based farming
- Soils derived from marine deposits of heavy muds, poor drainage
- P at risk through overland flow



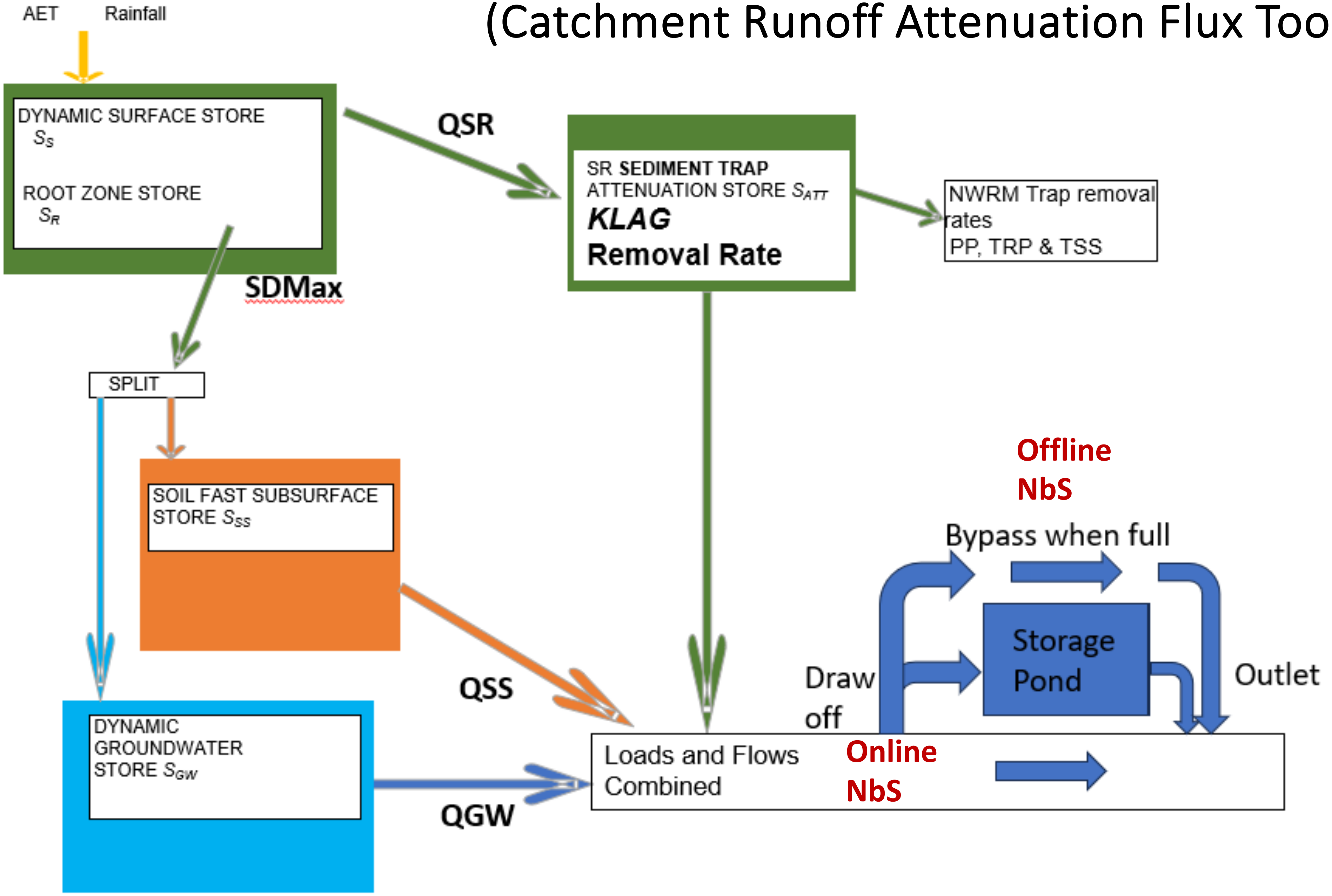
~2500m³/km² or 2.5mm unit area

Detailed mapping:- Eureka a floodplain!



Upscaling Impacts – CRAFT

(Catchment Runoff Attenuation Flux Tool)



CRAFT with Offline Pond

CRAFT

P. F. Quinn and R. Adams

((AB6-AD5)+(AD5*AA13)))

Qin	Qleft	pondS	Qout	ModQmit	Mod Q
0	0.221	0.0001	0.000041	0.221041	0.341

Ballycanew **11.92 km**2**

Mitigation Options

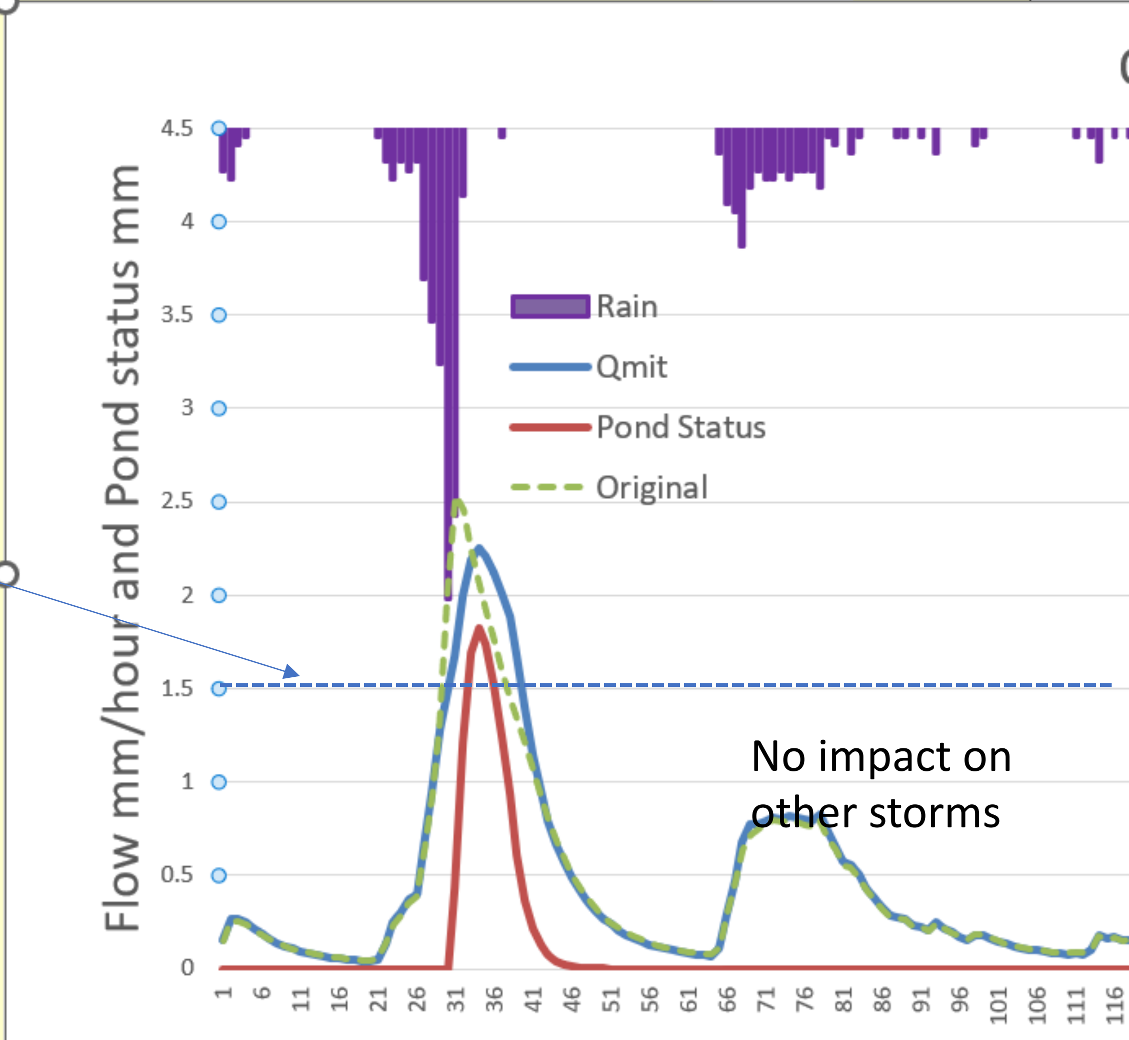
For Online ponds modify KSSF

Offline ponds	**Xmax storage mm/unit area**	20	2
	XRate of drainage when full	76	0.76
	Rate of pond drainage when not full	41	0.41
	Threshold when filling starts mm/hr	15	1.5

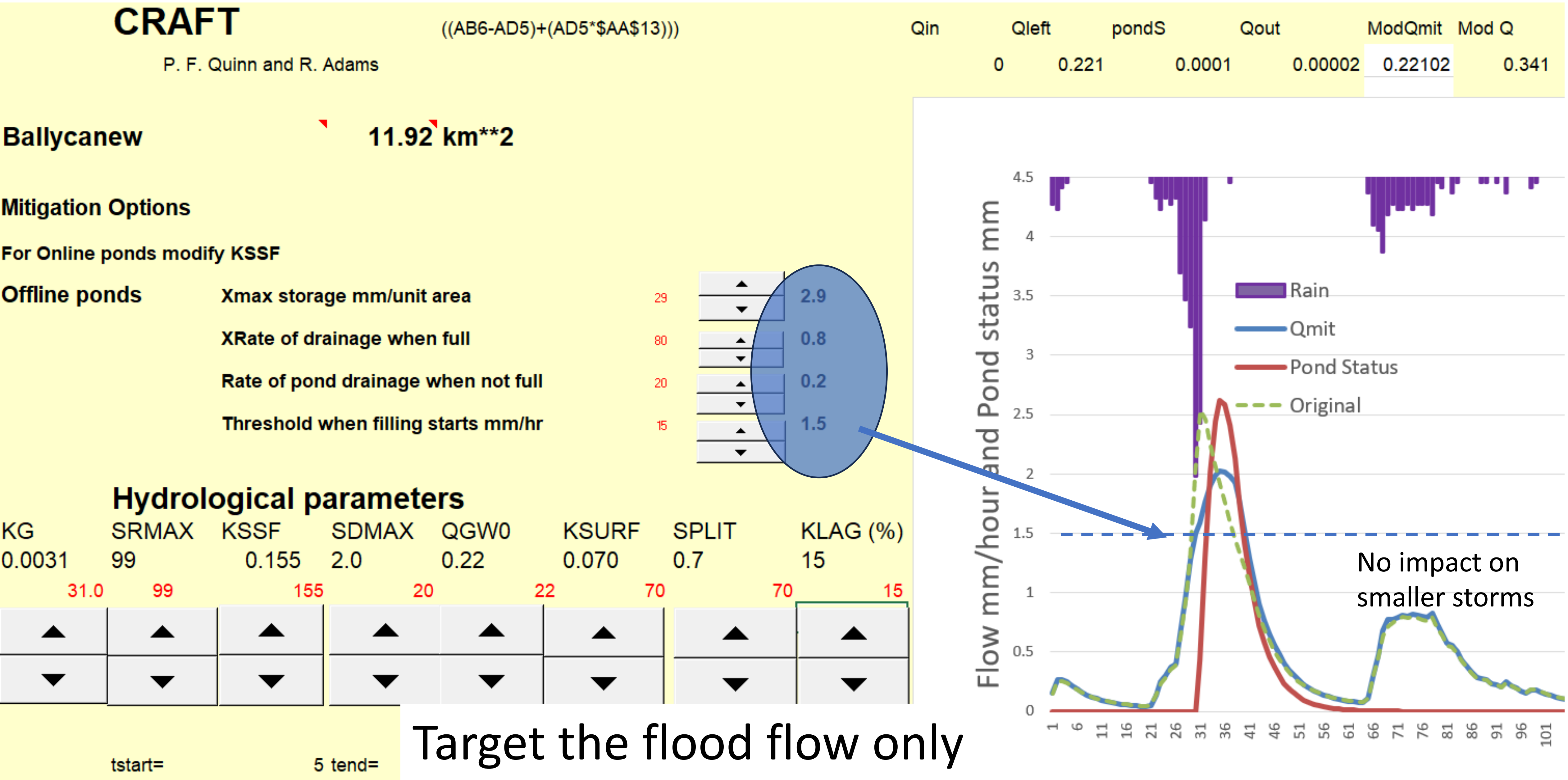
Hydrological parameters

KG	SRMAX	KSSF	SDMAX	QGW0	KSURF	SPLIT	KLAG (%)
0.0031	99	0.155	2.0	0.22	0.070	0.7	15
31.0	99	155	20	22	70	70	15

tstart= 5 tend= 4392 summitQ 697.90082

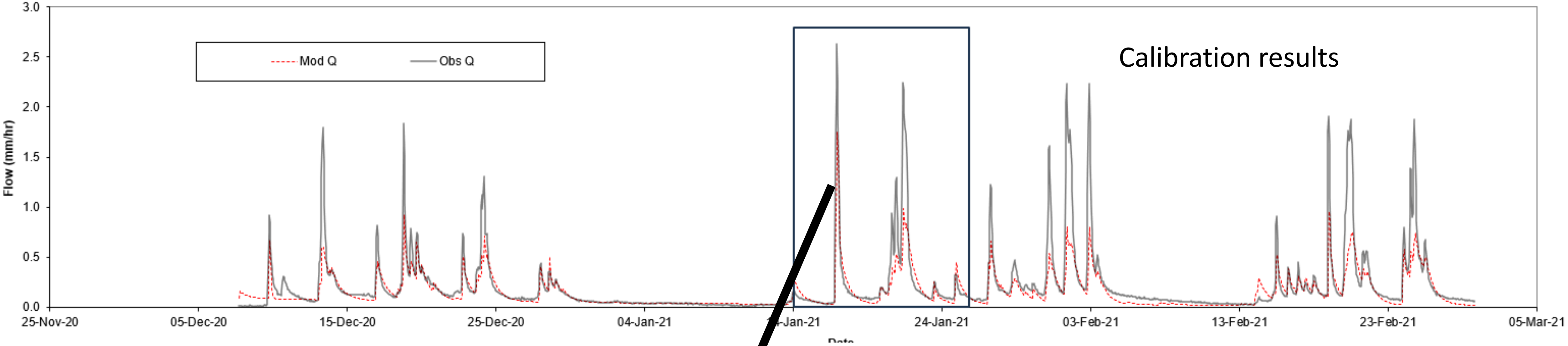


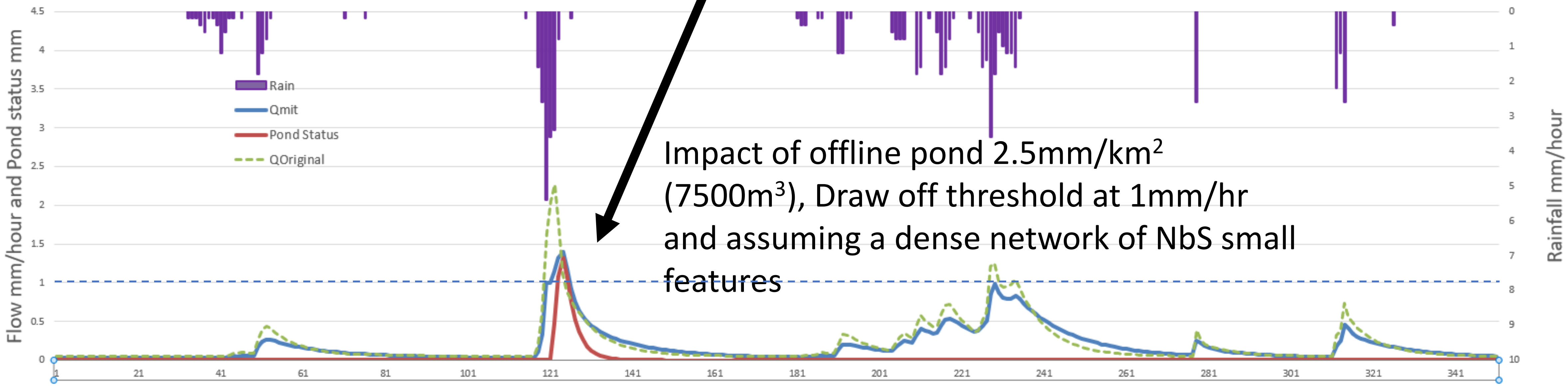
Targeting high flows only (Increasing storage volume)



Target the flood flow only

Optimistic Simulation for Ballygow Data 3km^2





SloWaters Findings and Recommendations

- **There is ample room in the landscape to store flood flow on farms.**
- **Ponds with bunds (1m high) fit well into the farmed landscape** and the land take is minimal with minimum impact of the farm economics.
- Ponds should be large enough to hold **flood flow capacity of ~ 1000 m^3** or more
- The designer should decide *a priori* **what magnitude storm** they want to manage (e.g. 2mm-3mm/hr peak runoff or 1:100 Return Interval).
- The target storage for flood management should be at least **2-3 mm/km^2 (if feasible), or 2000-3000 m^3/km^2.**
- A network of **offline ponds** in opportune locations is needed.
- For flood flow **the draw off structure should target only the peak flow** ***this should be 50-70% of the peak flow.***
- The pond drainage pipe or weir structure needs to be matched to the inflow rate and total volume. We recommend a **peak pond drainage value of at least 0.5 Qp inflow rate.**

SloWaters Recommendations

1. **We** propose a **‘catchment runoff management treatment train’** approach to catchment management on farmland. Smaller **Online NbS for water quality and bigger Offline ponds for flooding.**
2. **Build and test more real, full scale NbS features** … instrument them … analyse function … model the impact and incorporate the results into models to scale up.
3. **Further work** is required to address how a mixture of NbS feature should be added to the farmed landscape to address both water quantity and quality issues at the catchment scale (e.g. in ACP catchments).
4. **More training is needed – learn together!**