Hydropower Good Practice Guide

Dr John Aldrick
HO Water Resources Regulation manager

nvironment Agency
olicy on Hydropower

The Agency strongly supports the Government's targets for the use of renewable energy. (10% - 201
20% - 2020)

UT

The Agency recognises both **potential benefits** & **environmental impacts** of small-scale hydropower

The Agency's duty is to balance the benefits/impacts of hydropower

/e're only borrowing
e water, so what's the big deal"

Agency regulatory regime

Range of matters to take into account

- **e.g. water resources, fisheries, flood risk, water quality, navigation, Na**

Water Resources permit

- Quantity that can be abstracted
- Residual flows in deprived reach
- Operating/control agreement
- Time limited licence **(normally 12 years to CAMS Common En Date)**
- Fish Screening requirements
- Fish Pass requirements

Hydropower issues

Location

- environmental sensitivity

Volume/timing

- local impact

Residual flows

- deprived reaches
- flow measurement

Fisheries

- turbines
- screens

Environmental site list audit

- Checklist indicates factors that need to be considered

Water Resources
Conservation
Chemical/physical water quality
Biological Water quality
Fisheries
Flood Defence

Red boxes need further work

Notes provide

tick box		A Water Resources Checklist
YES	NO	
		Is the scheme non-consumptive i.e. will 100% of any water abstracted be returned to the water course from which it was taken?
		Is the scheme being built on existing infrastructure?
		Will the turbine be placed directly within the weir / water course rather than in a separate channel?
		Is there a flow-depleted channel?
		Is there a flow-depleted weir?
		Is it intended to increase the height of the impoundment?
		Do surveys reveal any existing abstractions, including unlicensed ones, which will be derogated by the proposal? (1)
		Is there an EA gauging station in the depleted reach or nearby that is likely to be affected by the scheme?

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a) control device at offtake
(b) no control at offtake)

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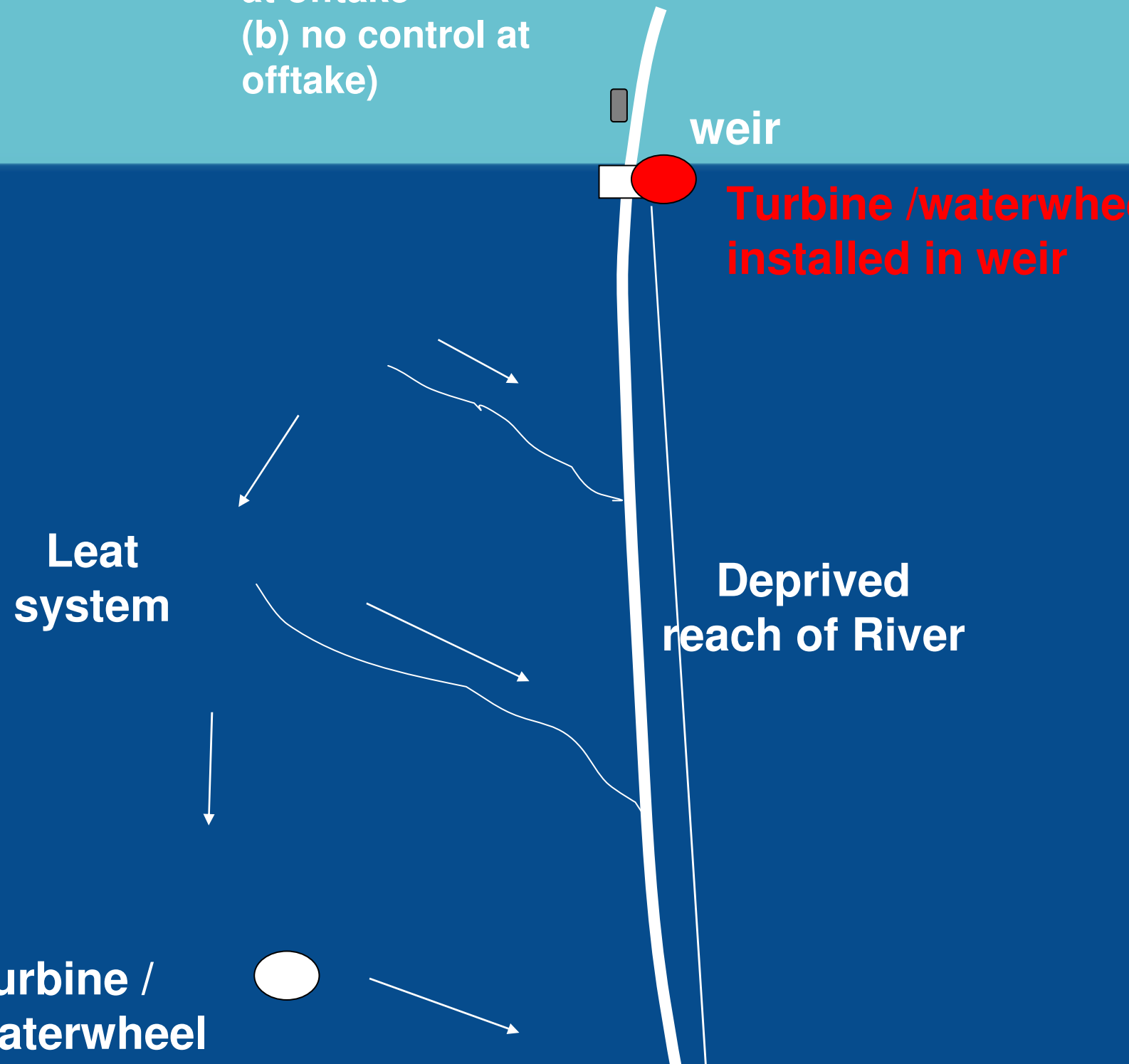


Deprived reach Flow

- Flow to be left in deprived reach between intake and discharge - (how much?)
  - To meet fisheries, ecological, amenity, riparian, navigation needs
  - Dependant on environmental sensitivity
  - May depend on the length of the deprived reach
  - May vary with flow or season (eg migratory fish)
  - Flow measurement or control
  - Decisions impact on economics/viability of scheme

Hydrological analysis

- Flow for hydropower
- Flow in the depleted reach

More flow for energy = less flow for environment

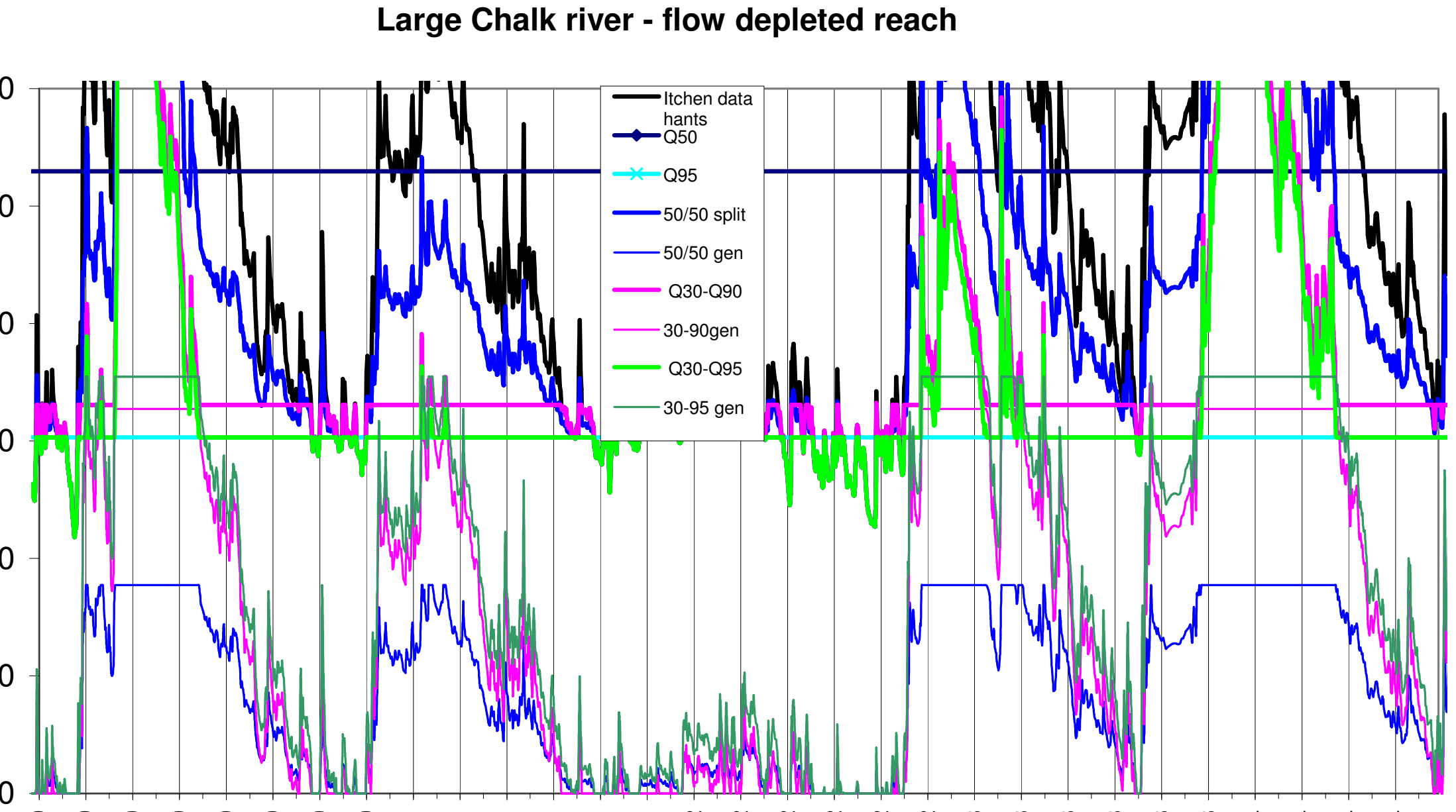
(in depleted reach)

Can examine hydrology using

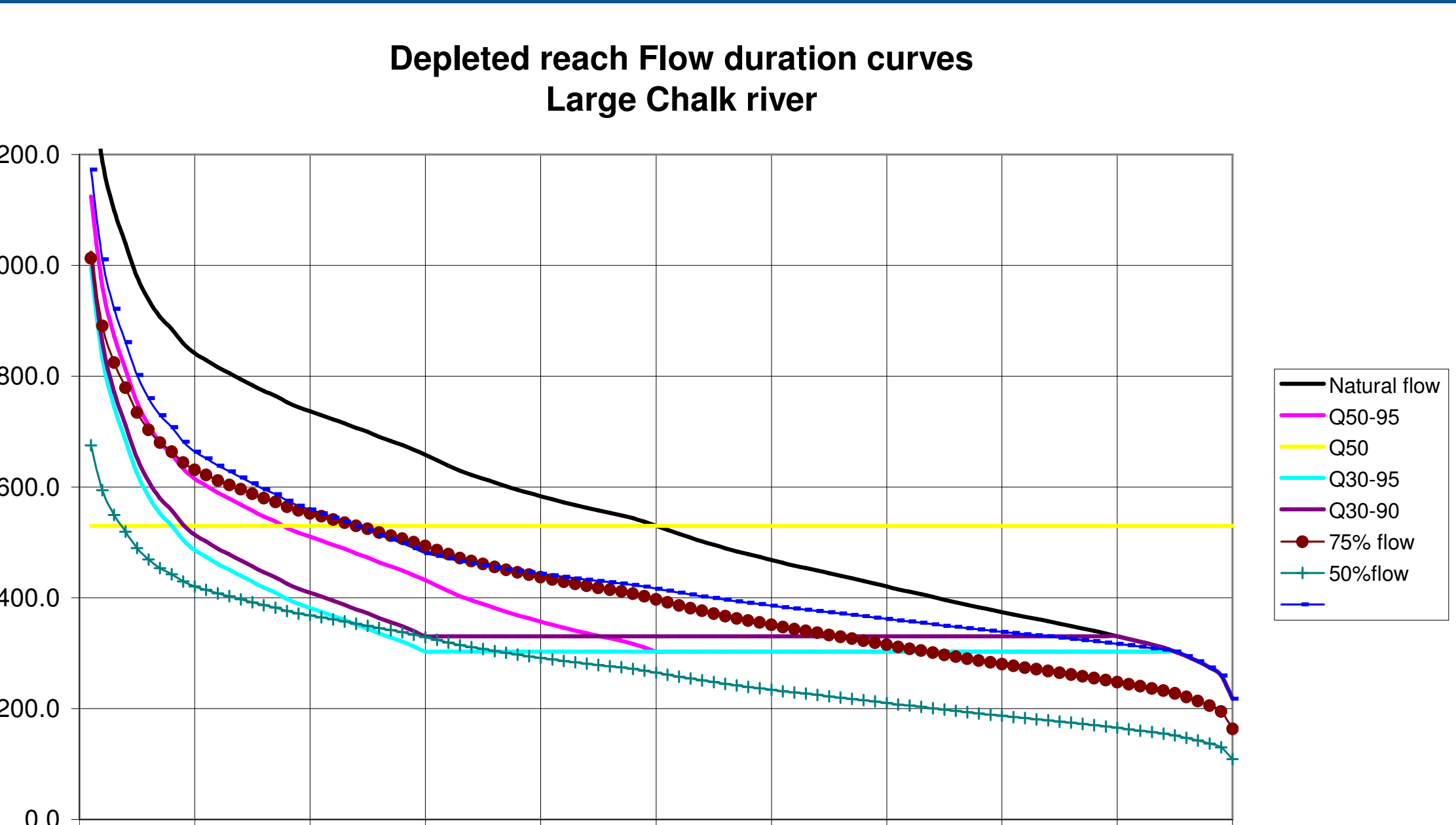
- daily hydrographs
- Flow duration curves

Large Chalk river Q30 & flow split

Q50/Q95 1.75



FDC – Large chalk river



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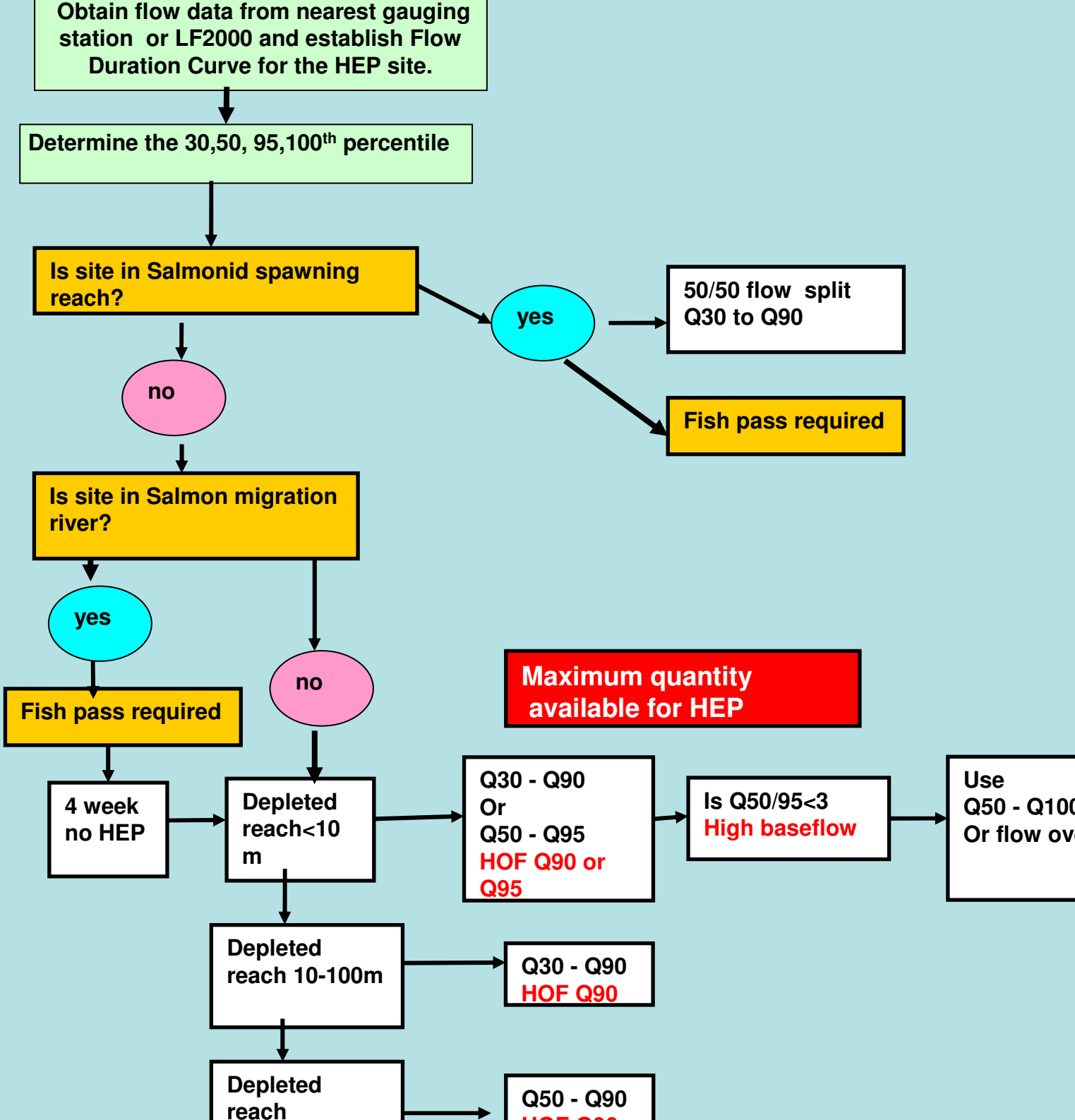

Hydrological conclusions

Q30 - HOF for hydro has major impact on flow in deplete
each.

Acceptable for very short reach <100m

Longer reach/salmon spawning needs more flow variabili

Turbine in weir – most advantageous esp High baseflow
ivers if very short depleted reach

(1.2 to 1.8 times more power) may allow more hydro

Salmonid spawning rivers – flow split

Salmon migratory rivers – month no hydro

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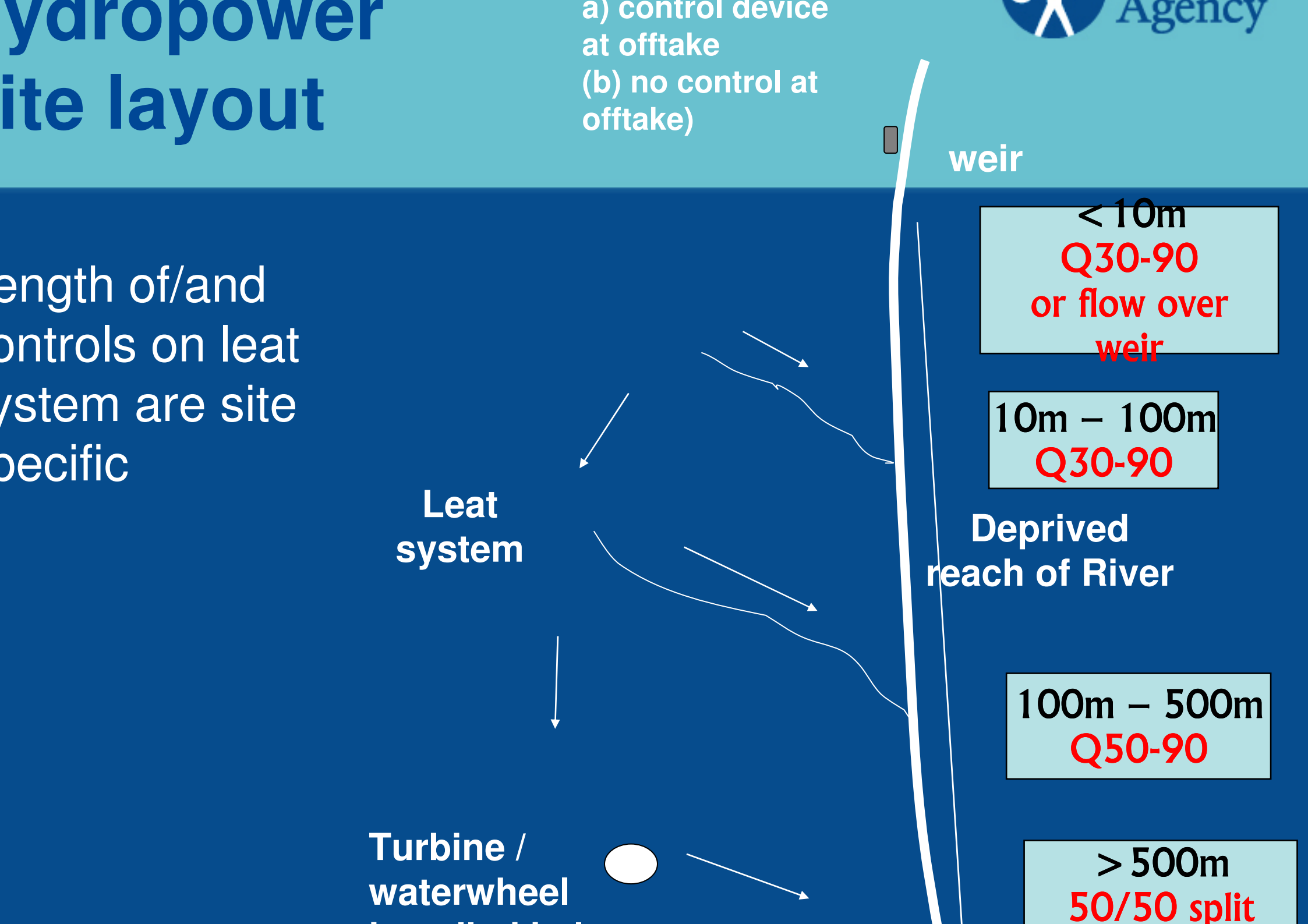

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Turbine type/Fish screen requirements

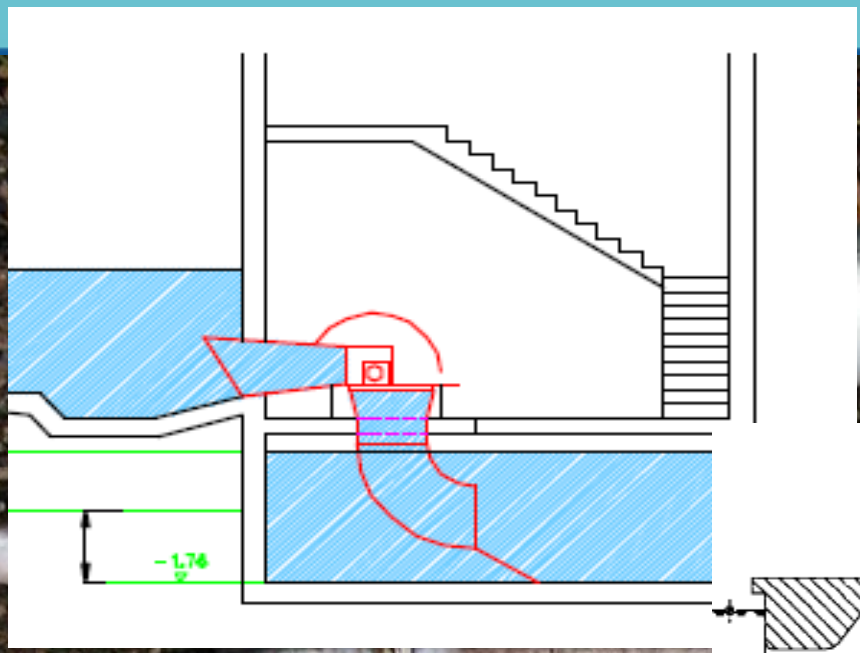
- Fish friendliness of turbine will determine screen requirements

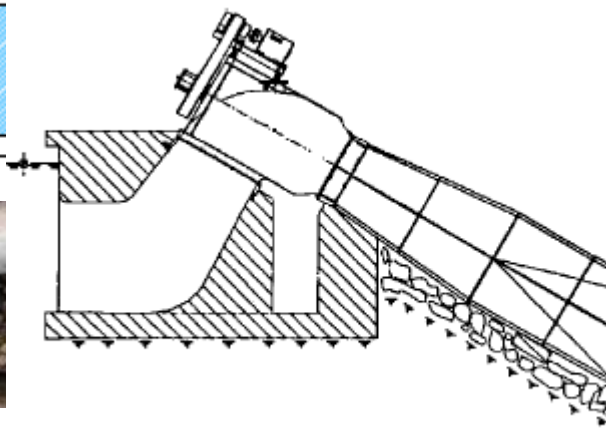
Must also consider

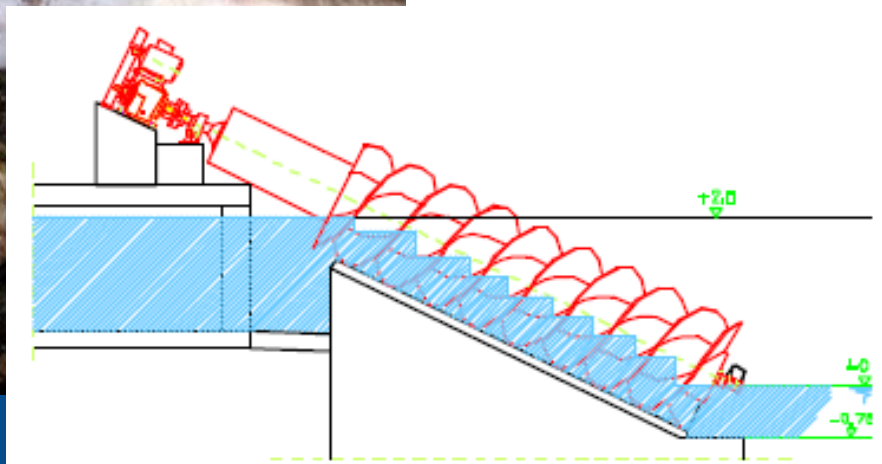
- Water approach velocity
- Escape & by-wash

ish friendly turbines?

- Crossflow
- Francis
- Kaplan
- Archimedean screw
- Waterwheel







Fish Screens

TURBINE TYPE	SCREEN REQUIREMENTS
Water wheel Archimedes screw	Trash screen As appropriate (100mm)
Kaplan Farncis turbines	10mm screen - North-East, North-West, Wales, Southwest (devon/Cornwall) 12.5mm screen – Midlands, Anglian, Southern, Thames, Southwest (Wessex)
Crossflow turbine	6mm screen All regions Drop through Coanda screens 1

Fish screens

Mostly physical

- wedge wire, mesh,bar

Fish screens are expensive

Recent R&D

- Mesh size
- flow velocities

Fish Screen - principles

- Inlet velocity – ideally 0.25-0.3m/sec (at an angle to the flow) – leading to a
- By-wash – to enable fish to escape

- Tail race screens on salmonid rivers?

Fish migration

Fish passes

- may involve retro-fit
- also likely to be costly
- New weirs
- Salmonid rivers first

pplicants should
xpect the Agency to:

- Provide clear guidance on the licensing process
- Highlight key issues for environmental assessment
- Have an understanding of hydropower
- Provide information it has available
- Be consistent
- Provide timely responses, with explanations

pplicants should not expect the Agency to:

- collect and analyse supporting data
- carry out the environmental assessment
- accept inadequate data or assessments
- give a binding view based on incomplete information
- design the scheme
- contravene its statutory duties

he Agency expects
he applicants to:

- to know their site, its environment and their objectives for the scheme (background)
- consider and design their proposals carefully
- consider options/alternatives
- make early contact with the Agency and continue such throughout the process
- appreciate the legislative and other constraints
- provide quality, focused environmental assessments
- provide appropriately detailed plans and drawings to support any applications