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Planning to Prevent Pollution

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Team Canada

Introduction

A “Suck it and See” approach will no longer be tolerated.

Businesses, governments, conservation bodies and members of the public are becoming increasingly aware of the impacts associated with silty water.

Prior to commencement of work there is an increasing need to:

- Adequately pre-plan the work to minimise the volume of “dirty” water which will be generated.
- Calculate the volume of run-off which will need to be treated.
- Establish what treatment standards will be applied to the treated water.
- In advance provide an adequate sized system for the control and treatment of “dirty” water.
- Ensure that excess water is of the required quality (compliant with discharge conditions).

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Criminal Offence

Aberdeen Western Periphery Route Enforcement Undertaking

SEPA
Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

SEPA has secured one of the biggest financial outcomes for an environmental offence in Scotland

£40,000
Newtonhill Community Centre
Donation to support surfacing of car park

£150,000
Dee District Salmon Fishery Board
Diffuse pollution improvement projects & two year Agricultural Officer

£21,000
Stonehaven District Angling Association
Purchase of a Fishcounter

£1,850
Newtonhill Environmental Action Team
Provision of litter pickers and new shed

£280,850
Offer of Enforcement Undertaking

£20,000
Aberdeen District Angling Association
Purchase of benches & equipment to support path works

£2,000
Ythan Volunteer Group
Donation to support Tarty Burn invasive species treatment

£3,000
Newtonhill History Group
Heritage project

£20,000
Maryculter Woodland
Donation to allow path works

Detailed invertebrate study - **£20,000**
AWPR lessons learned paper for the Construction industry - **£3,000**

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Environmental Harm

UK Environment Agency

- **23%** of rivers are at risk from high levels of sediment.
- In 2004 **50%** of rivers with salmon action plans were at risk of missing their egg deposition targets.
- In 2008 **90%** of trout spawning beds studied contained enough fine sediment from soil to kill **50%** of the eggs and larvae.

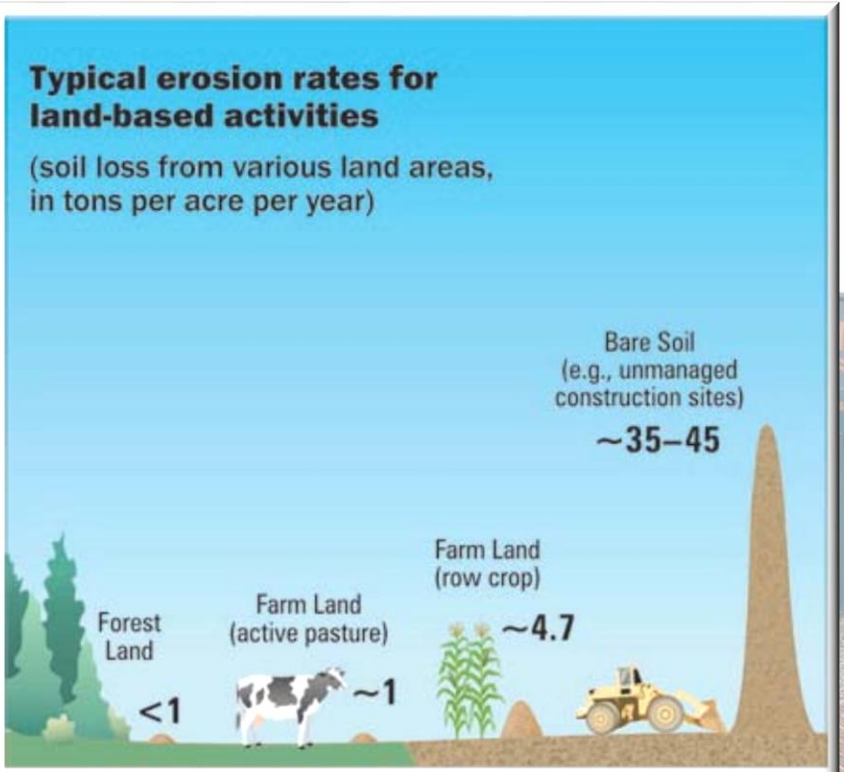

Figure 2. Typical erosion rates from land-based activities. (Dunne, T. and L. Leopold, 1978; NRCS, 2000; NRCS, 2006; ASCE and WEF, 1992)

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Man Made vs Natural (1)

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Man Made vs Natural (2)

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How Clean is Clean ?

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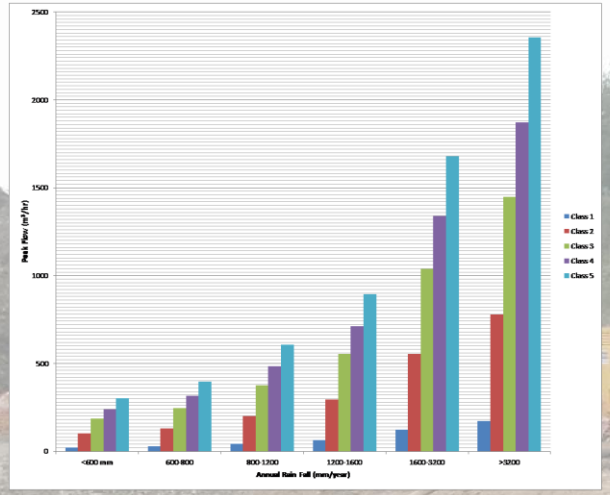
Dirty Water Volumes

Peak Flow Estimation (m^3/hr)

Return Period	2	5	10	25	50
Return Period Factor	1	1.22	1.48	1.88	2.22

Return Period Factor	1	
Catchment Area	20	Ha



	Soil Class				
	1	2	3	4	5
Run-Off Potential	Very Low	Low	Moderate	High	Very High
Description	Well drained, sandy, loamy or earthy peat soil	Very permeable soils (eg gravels, sands with shallow groundwater or rock)	Very fine sands, silts and clays. Permeable soils with shallow groundwater in low lying areas.	Clayey or loamy soils	Wet uplands, shallow rocky soils on steep slopes, peat with impermeable layers at shallow depth
Annual Rainfall (mm/year)					
<600	22	101	187	238	302
600 to 800	29	130	245	317	396
800 to 1200	43	202	374	482	605
1200 to 1600	65	295	554	713	893
1600 to 3200	122	554	1037	1339	1678
Peak Flow Rate (m^3/hr)					

4 Key Factors

- **Slope**

  The steeper the slope the faster the water will run-off, giving it less time to soak into the ground.

- **Soil Type**

  The more permeable the ground the greater the percentage of the storm that will soak into the ground, reducing volumes available to run-off.

  Fine grained soils (fine silts and clays) have poor settling characteristics, more difficult to recover.

- **Annual Rainfall**

  The greater the rainfall the greater the amount of run-off which will be generated.

- **Drainage Area**

  The greater the area drained, the greater the volume of water which will be generated.

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Preventing Pollution

Source

Pathway

Receptor

Three Key Aims

Minimise the Source

Eliminate/Reduce the Pathway

Protect the Receptor

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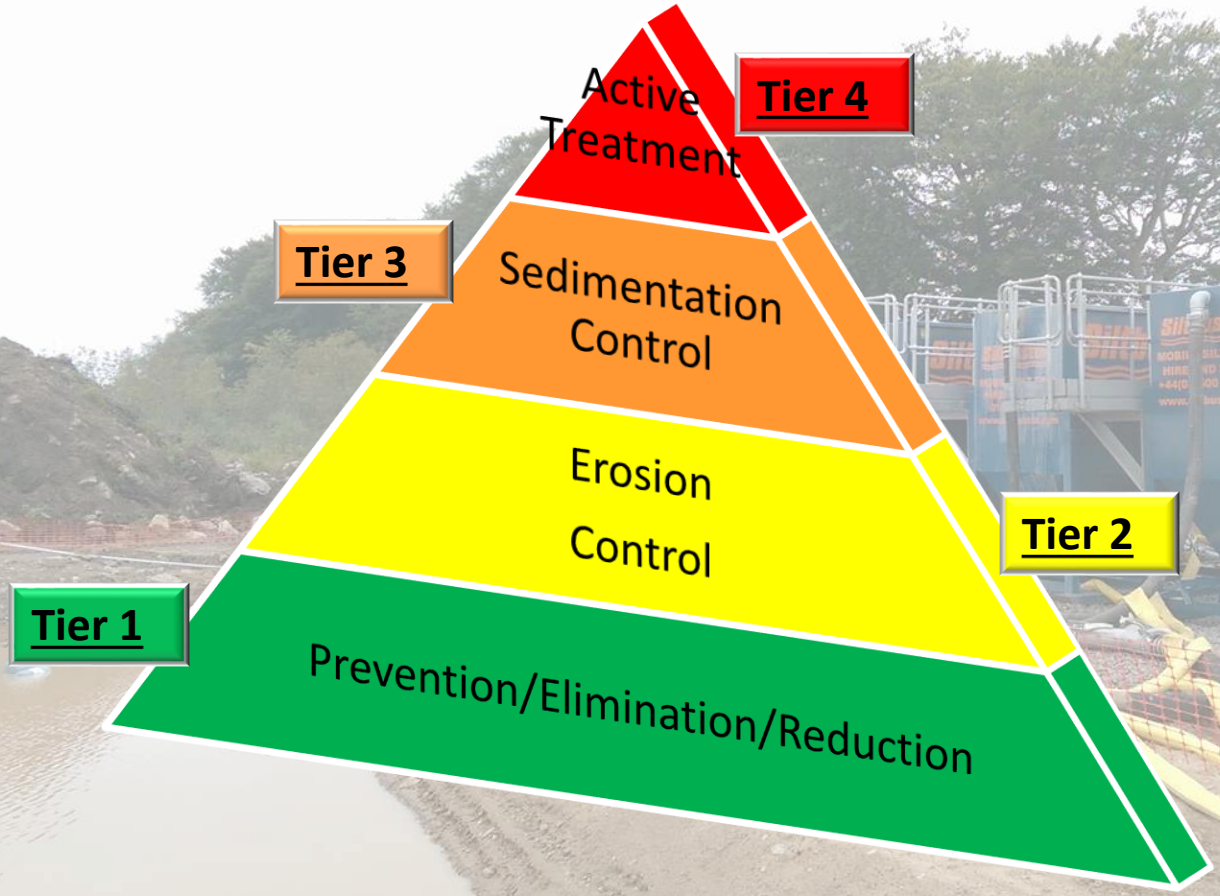
Treatment Hierarchy



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Tier 1 Prevention

Prevention and Elimination

Keep clean water clean, minimise volumes of dirty water

For example:

- Phased stripping of the site.
- Diversion ditches and banks to isolate the site from upland areas.
- Phased and early reinstatement of the site.
- Reduced site program.

The First Line of Defence

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Tier 2 Erosion Control

Erosion Control

Characterised by treatment solutions which minimise the velocity at which water travels across an exposed surface.

For example:

- Silt fences
- Check dams
- Temporary reinstatement of exposed surfaces by either compaction, use of grass seeds, mulches or specialist erosion geotextiles.

Commonly used to treat intermittent, small volumes of water locally to their point of production.

Protection of high risk areas.

The Second Line of Defence

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Tier 3 Sedimentation Control

Sedimentation Control

Treatment systems which are designed to recover suspended particles from water, prior to release into the environment.

For example:

- Gravity operated settlement tanks.
- Gravity operated settlement lagoons.

Can be operated on a continuous basis, may be used on small, medium and large flows.

Particularly applicable for use on sites with soil particles of medium silt or greater.

May not be effective in the recovery of colloidal, clays or fine silts.

The Third Line of Defence

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Tier 4 Active Treatment

Characteristically used to treat concentrated flow rates at locations with limited space for treatment.

Typically:

- Addition of a coagulant and/or flocculant to enable the recovery of fine particles.
- Recovery of suspended solids in a settlement lagoon or lamella clarifier.

Can be used to recover fine particles, such as colloids, clays and fine silts.

Use of low toxicity bio-coagulants and bio-polymers beneficial to the environment.

Low doses required, necessitate precise (digital) dosing of water treatment chemicals.

Can be configured to treat a variety of other pollutants, eg metals, oils, solvents.

Final Line of Defence

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Active Treatment

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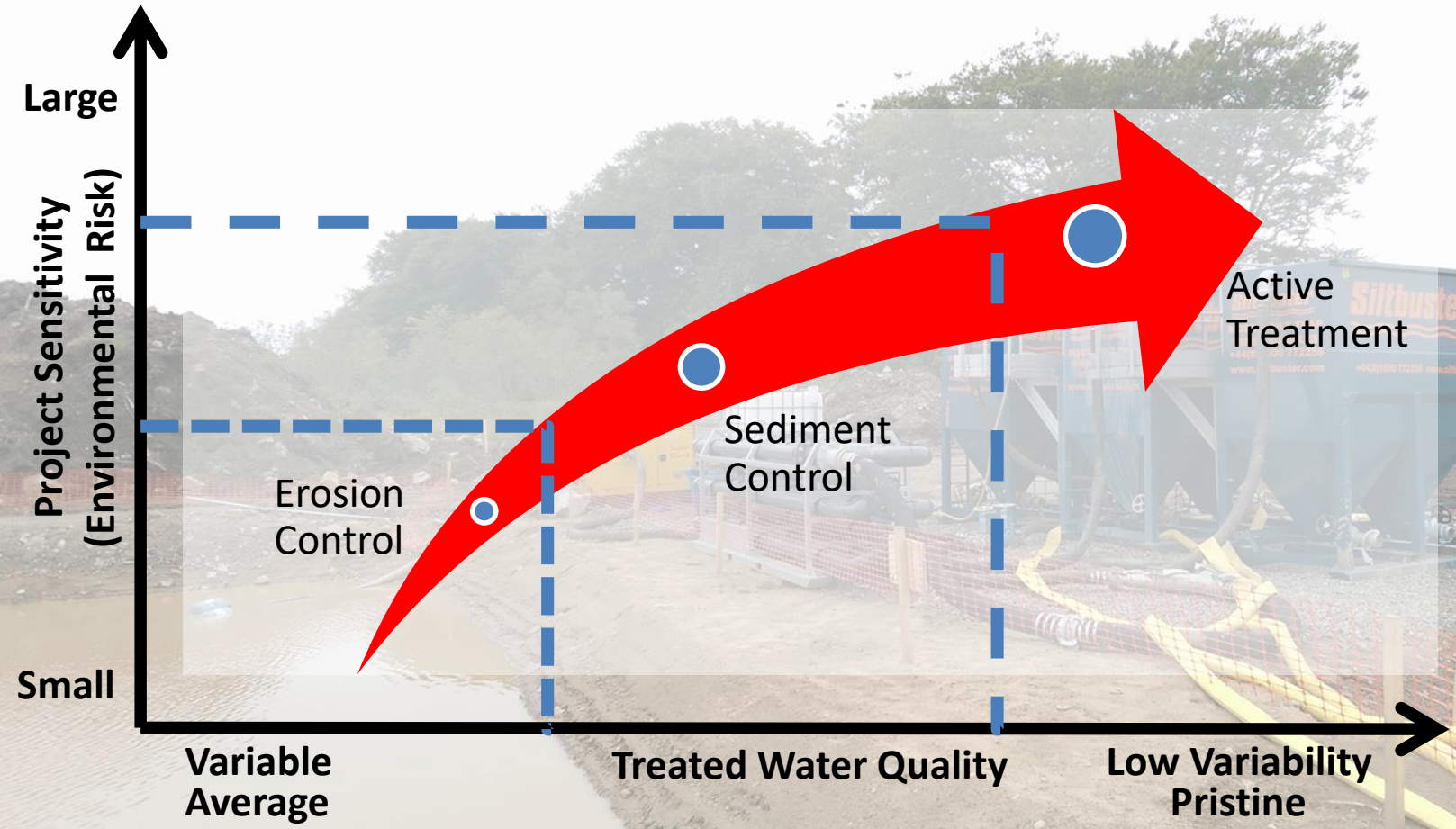
Expenditure verses Risk



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Conclusions

Summary

Pre-planning construction activities is essential to ensure adequate protection of inland waters.

Conclusions

- No two projects are the same. Site specific plans need to be developed.
- Works must be pre-planned to minimise environmental impact.
- If an adequate water quality is not being achieved, the plan must be amended.
- Every treatment solution has an operating range, fit the problem to the solution. Don't force the solution onto the problem.

Select a level of control appropriate to the environmental setting of the site.

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