Innovation in Stormwater sediment separation

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VICTORIA State Government

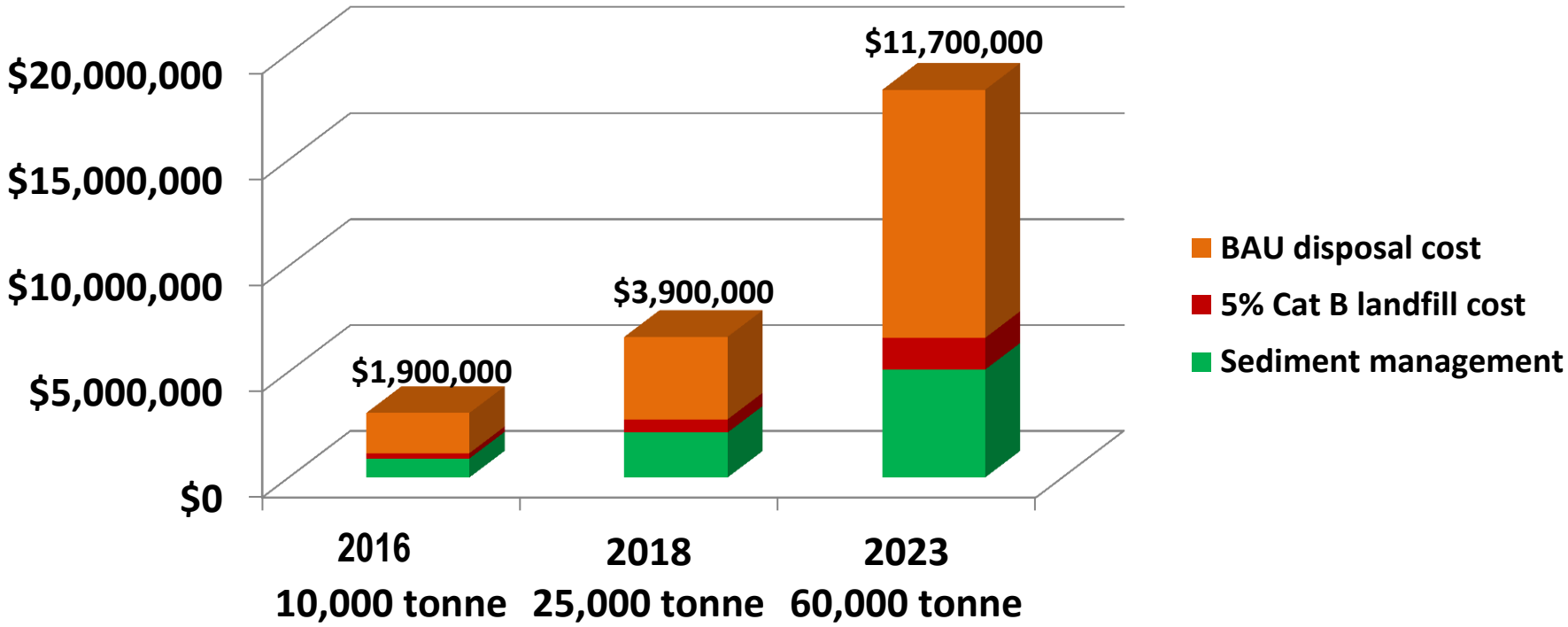
Melbourne Water

Urban stormwater sediment management Innovative solution required

- 500 ponds
- 400,000 m3 functional volume
- 50,000 tonne annual maintenance program
- 40-50% prescribed waste

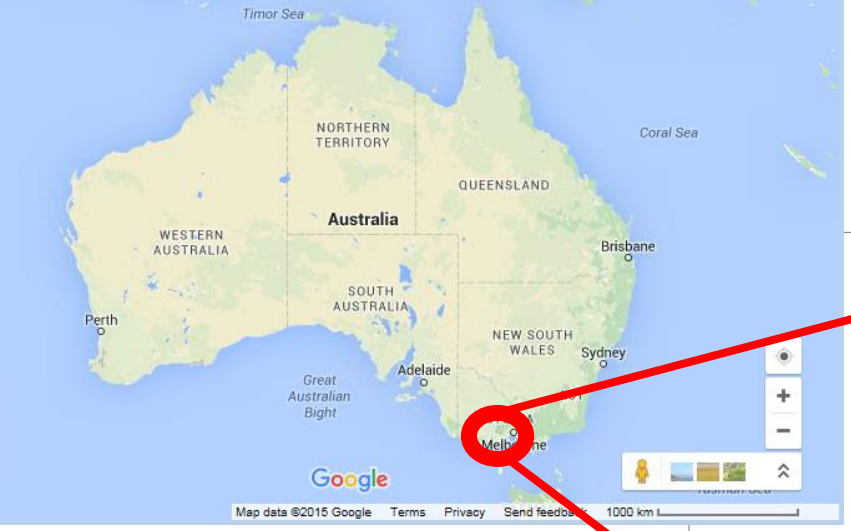
Sediment status	% of total volume	Current program	Future program
Solid inert (clean fill)	30%	Local area disposal	Local area disposal
Solid inert (clean fill)	30%	Landfill	Reuse via facility
Low level contamination	30%	Landfill	Reuse via facility
High risk contamination	10%	Landfill	Landfill

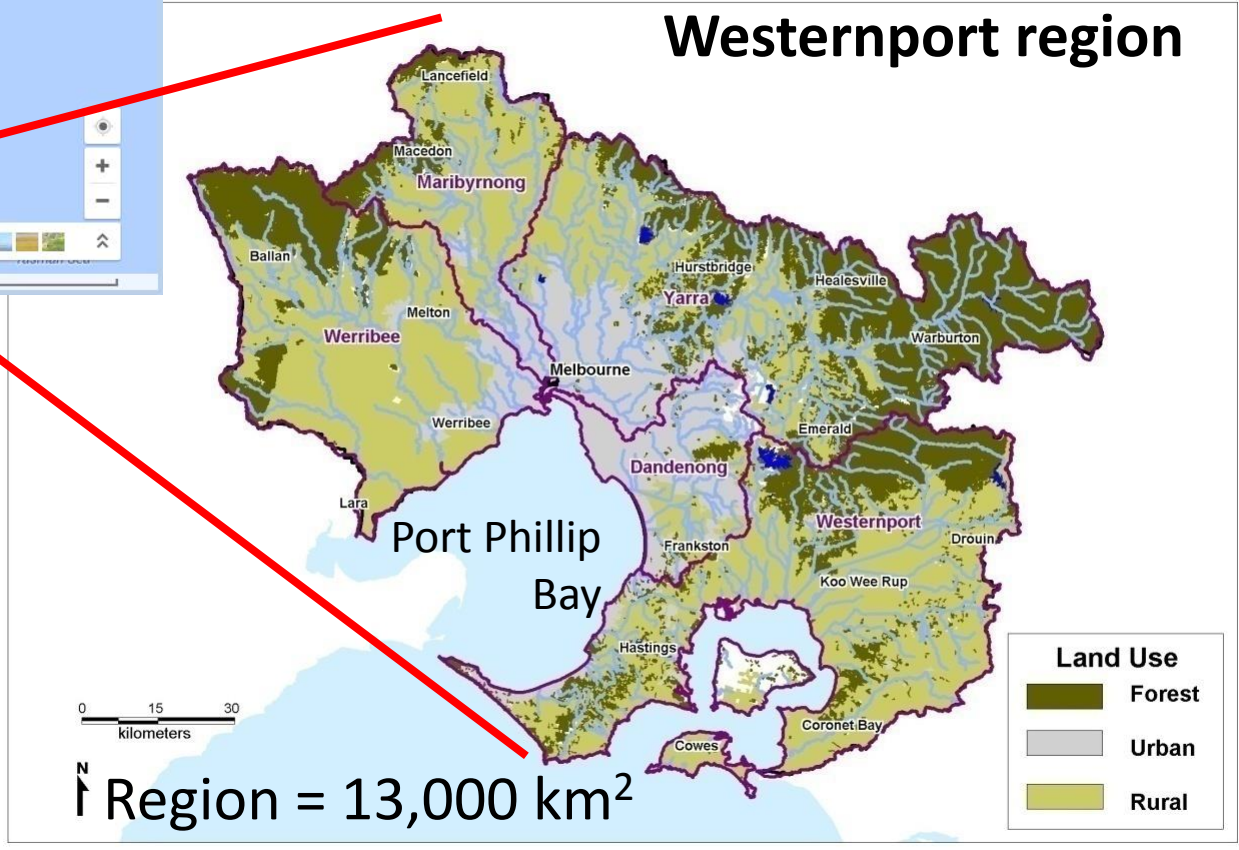
Sediment management costs



New solution to delivering activity required

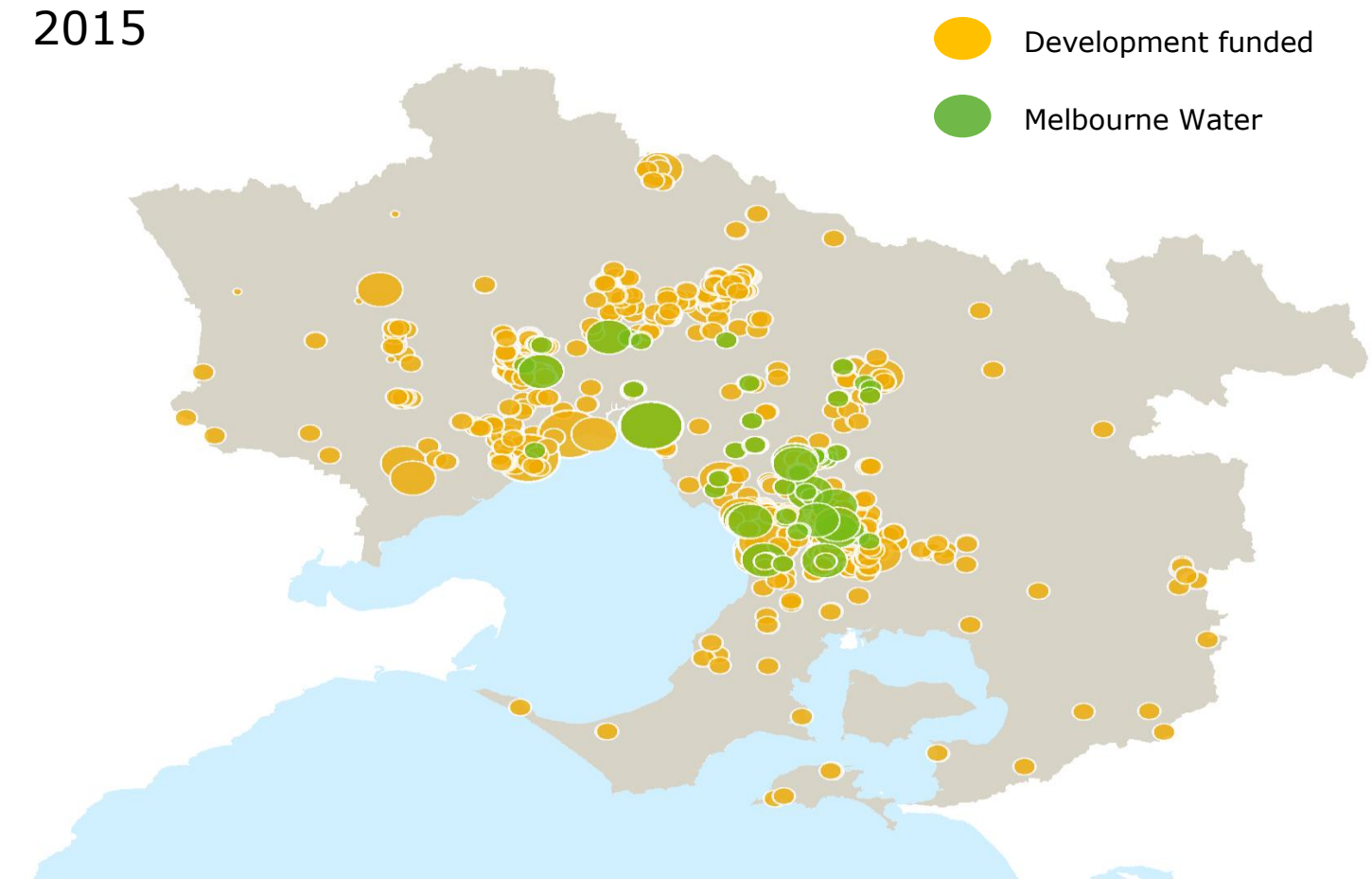
Greater Melbourne – Port Phillip & Westernport region





Region = 13,000 km^2

Rapid growth in constructed wetland systems – to 2015



Sediment pond function

Sediment ponds are designed to capture >125µm particles for a given flow.

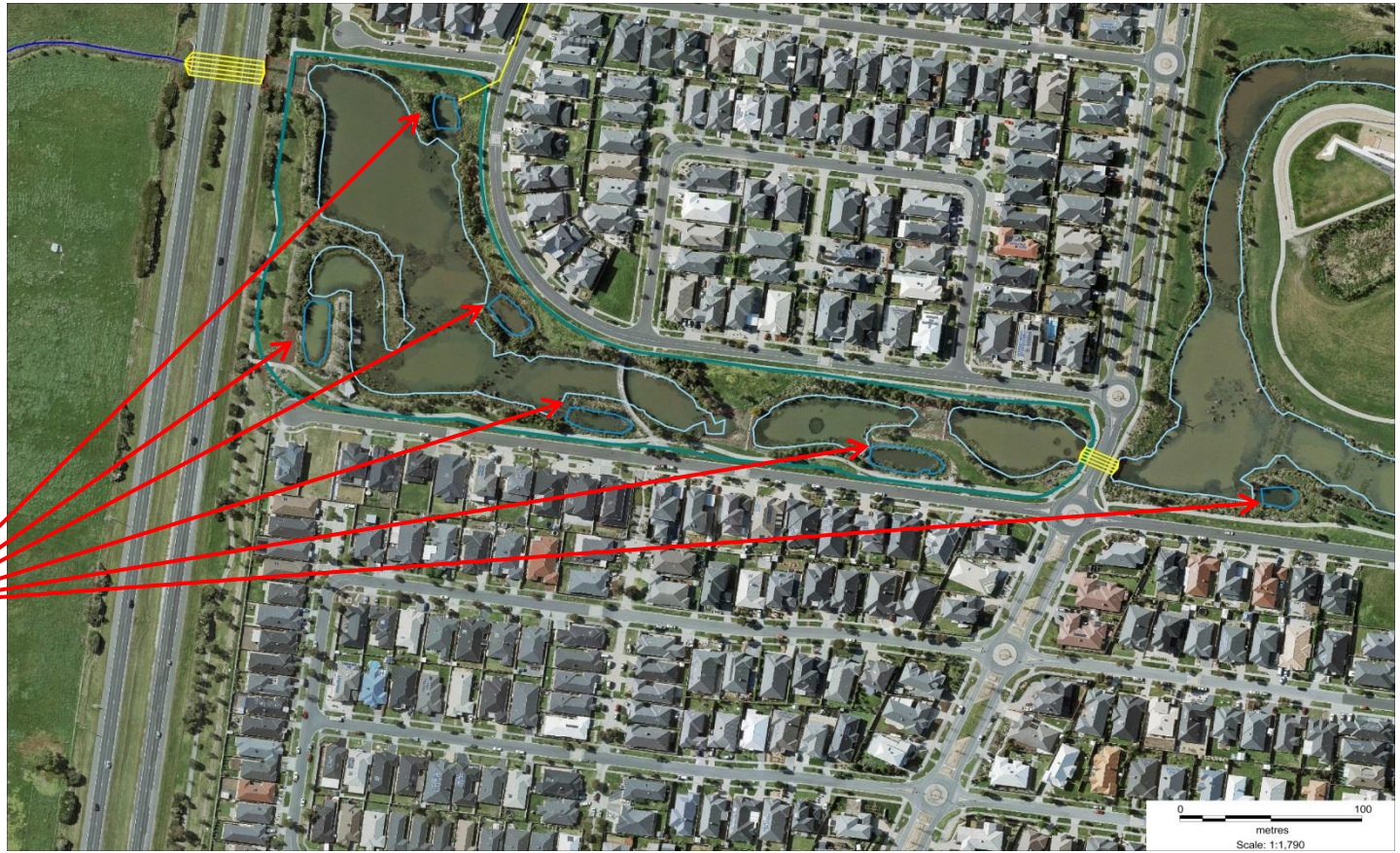
Protect other assets.

5 yr accumulation volume.

Constrained urban context

Stormwater treatment is required following development.

Sediment ponds to be managed



Current desilting process

Maintenance access

Assets not always set up to enable maintenance.

Dewatering

Debris removal

Onsite sediment processing to remove debris has traditionally been done on dry material.

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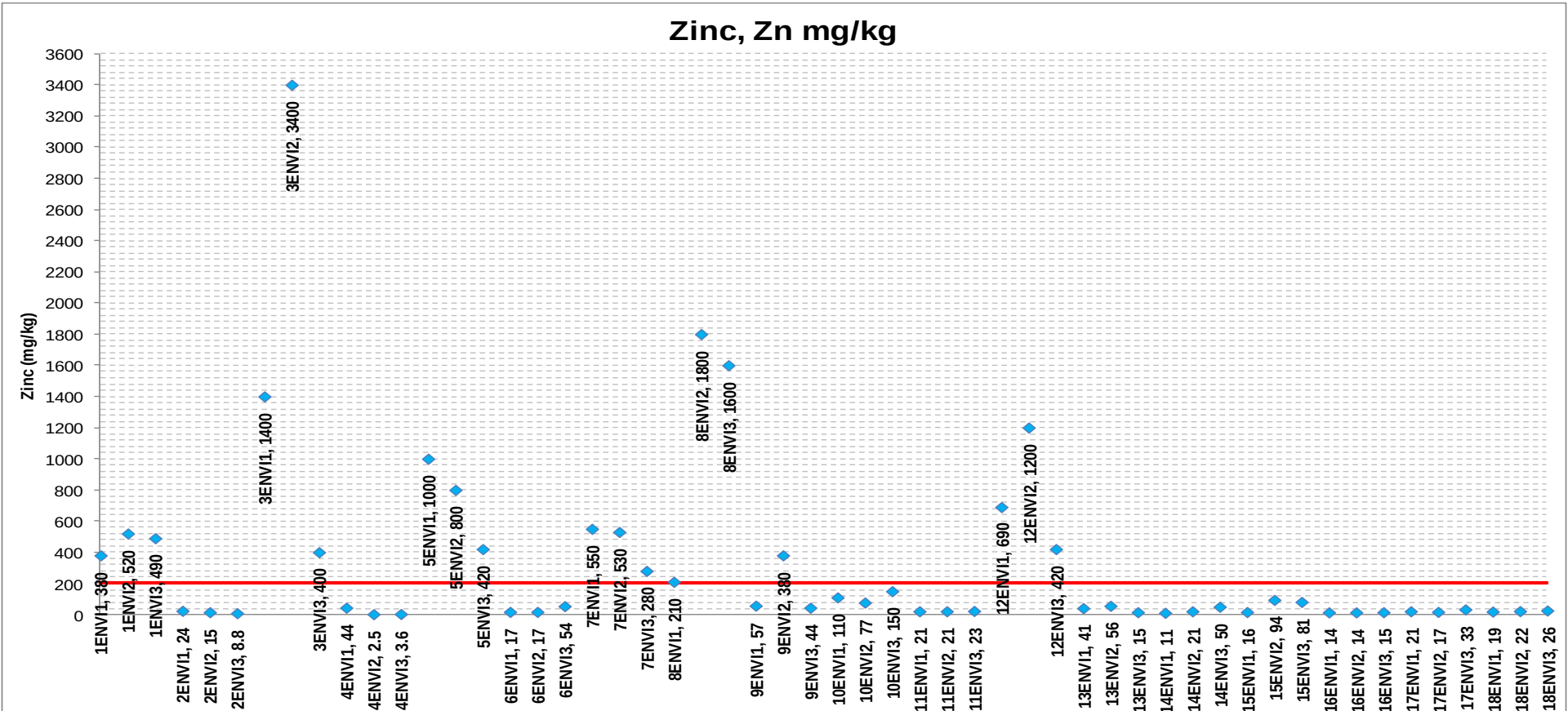
Problems:

- **“Blanking of screens”**
- **Dust generation**

Prescribed waste implications - Zinc analyses



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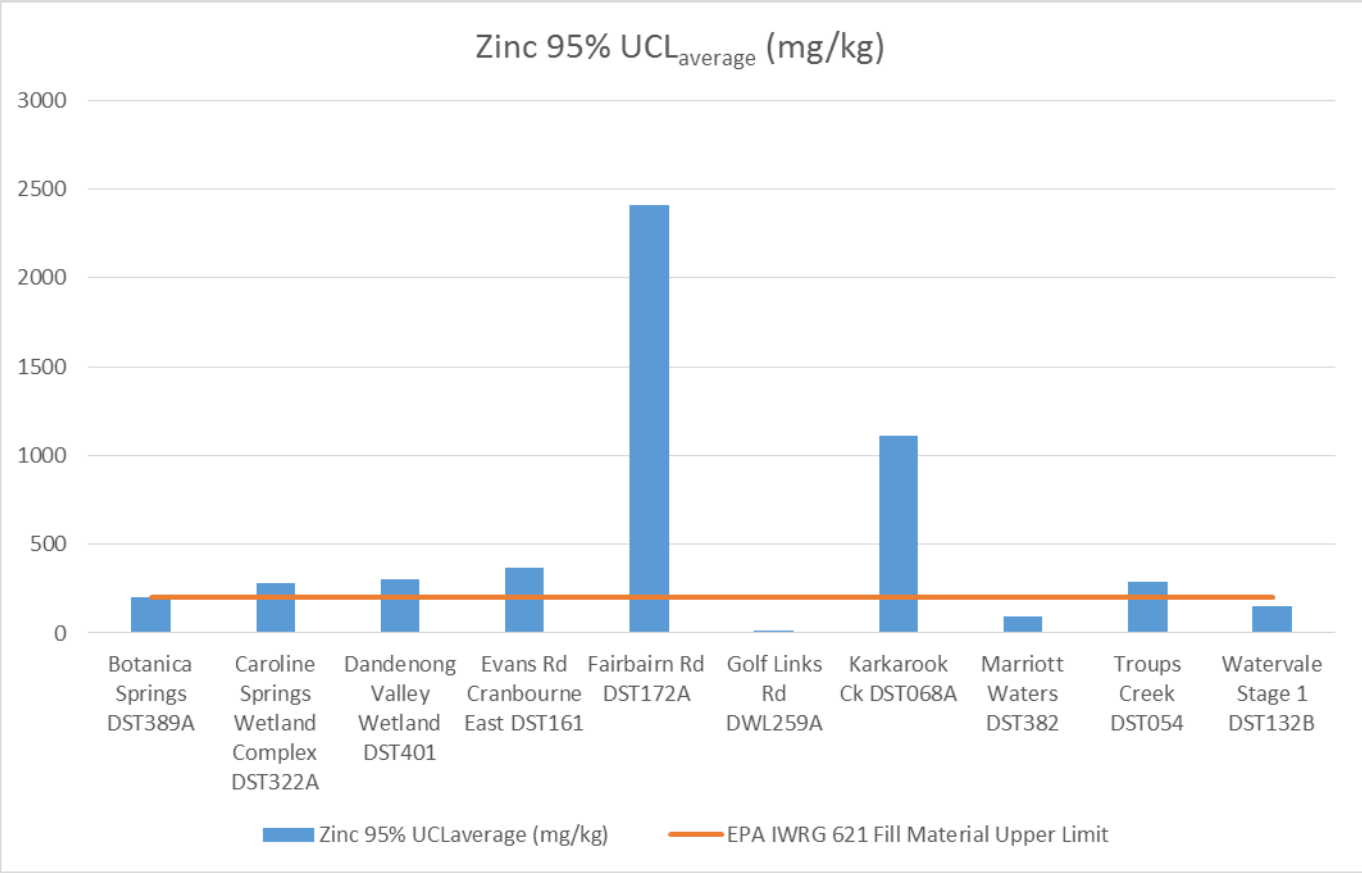
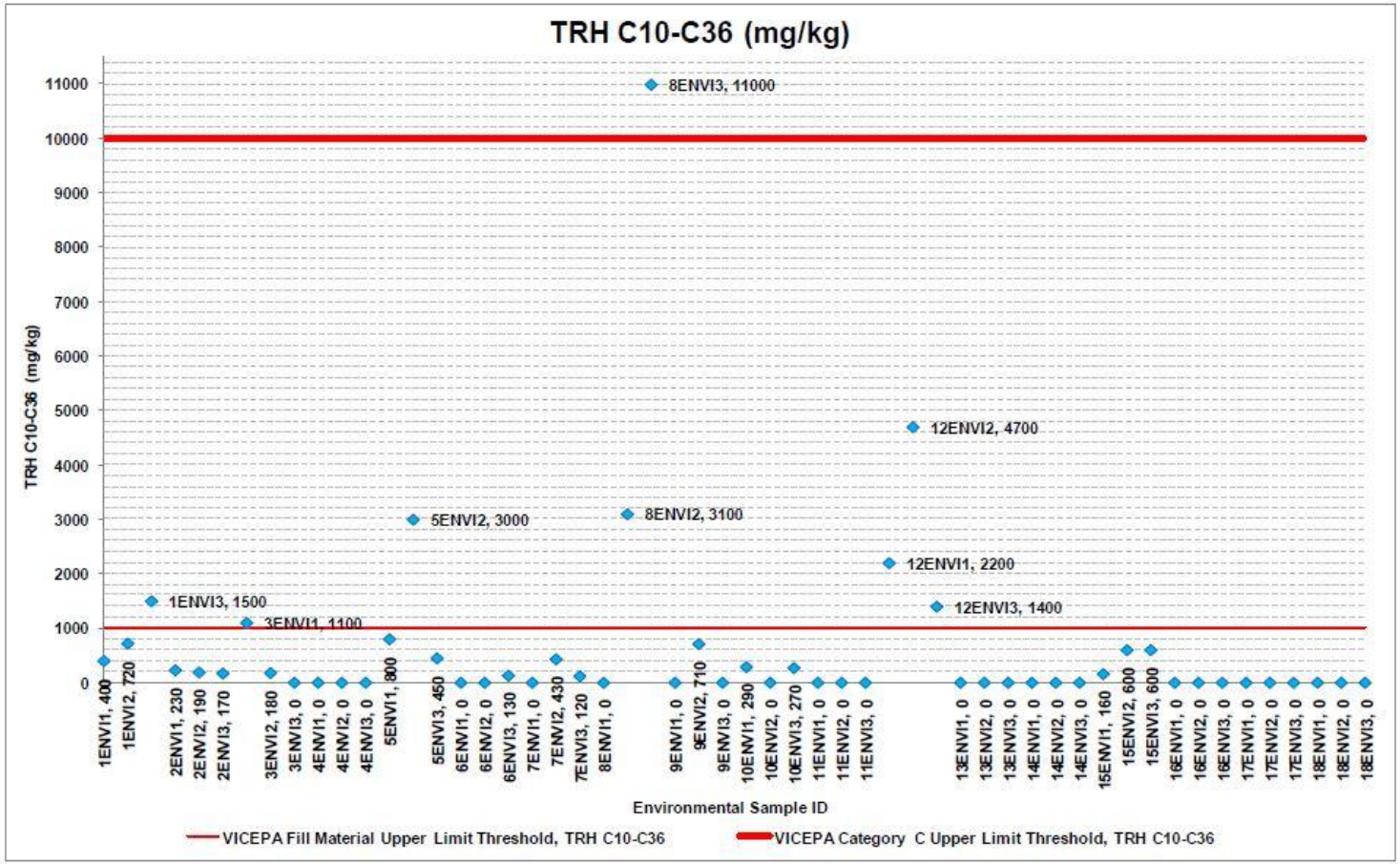


Prescribed waste implications - C10-C36 analyses



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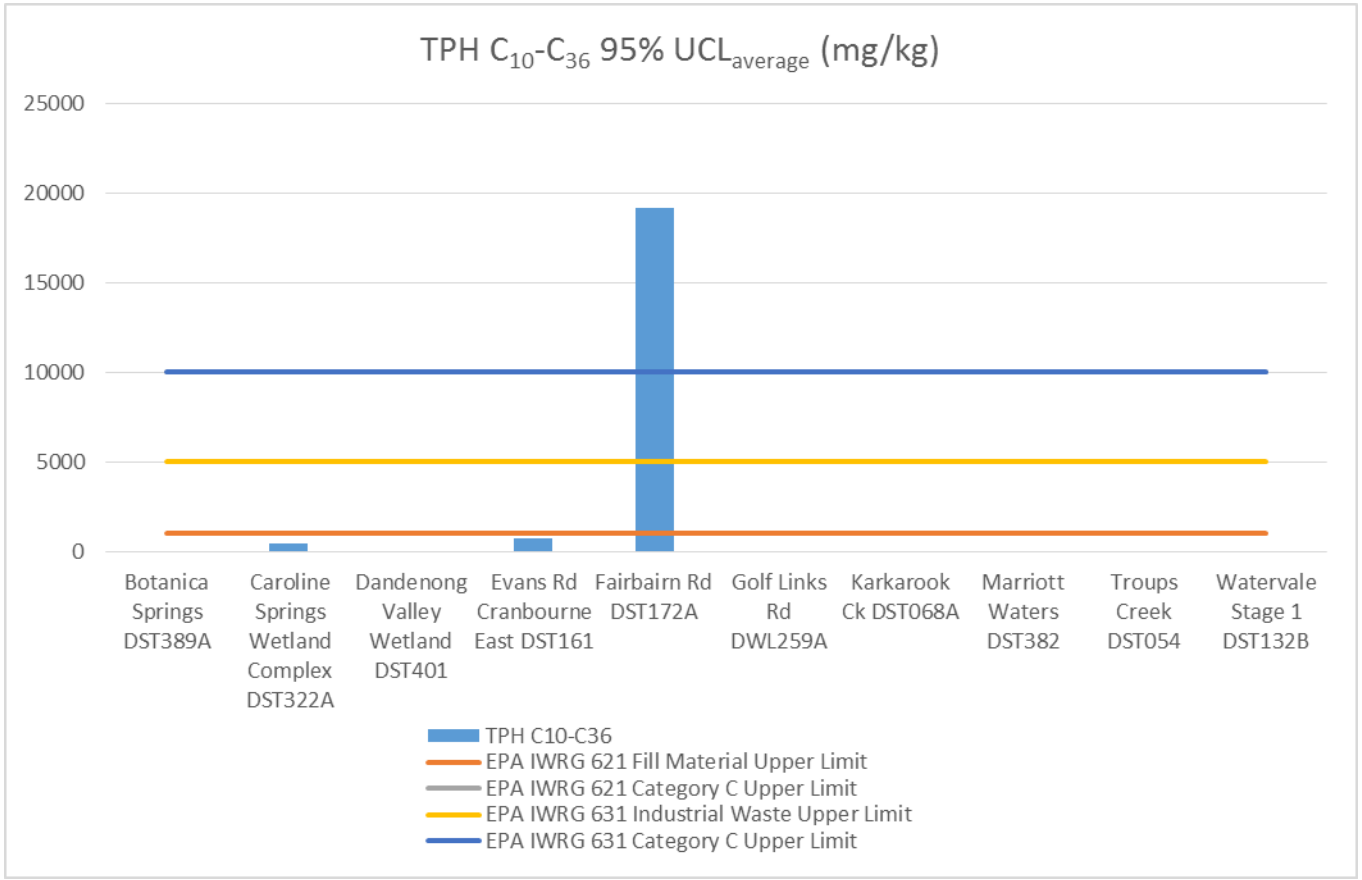

Dredging and Sediment Separation System tender

- Safe sediment removal all year round,
- Separate sediment fractions,
- Dewater sediments,
- Minimise impacts on public amenity.

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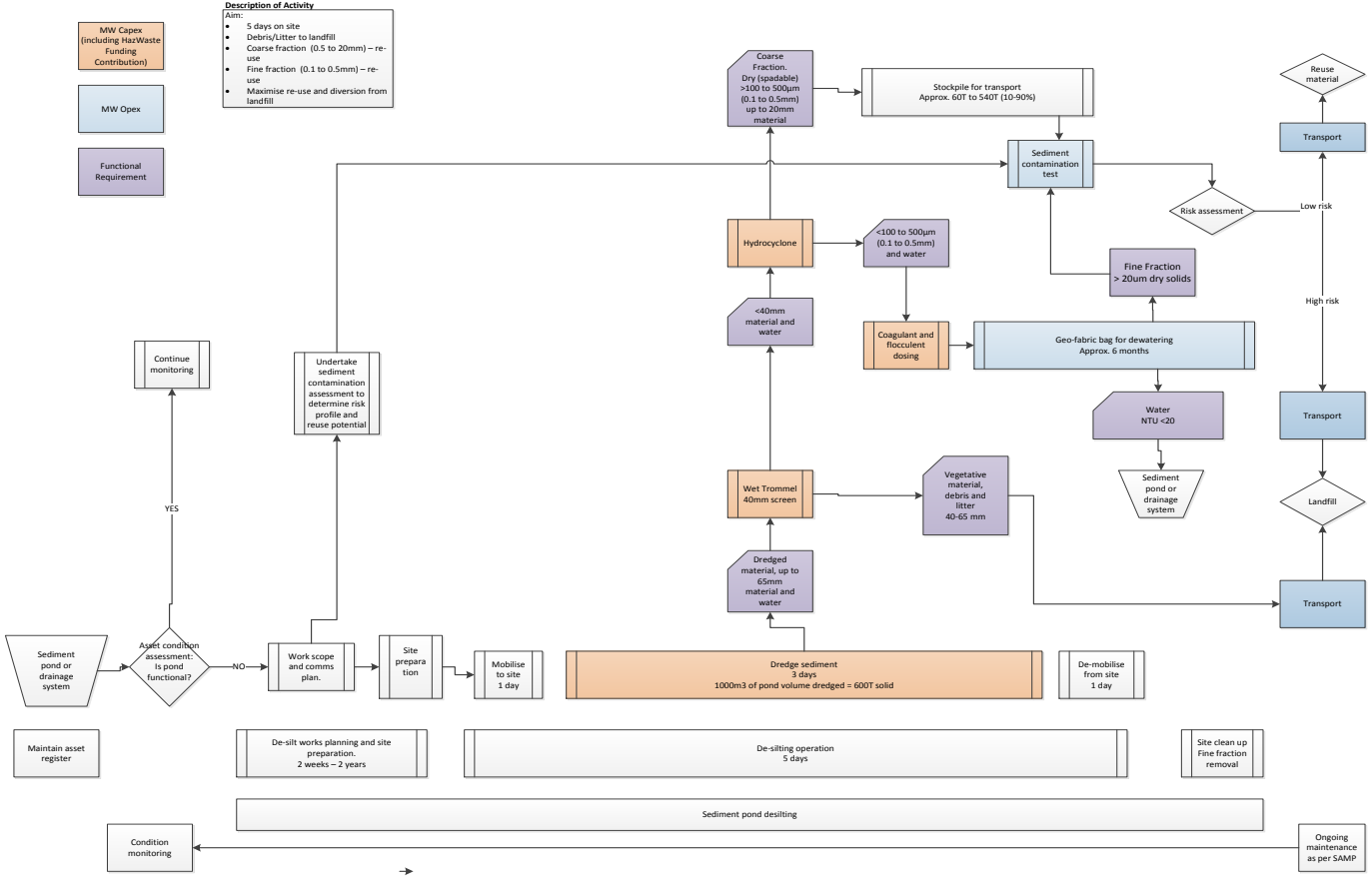
- Dewater sediments,
- Minimise impacts on public amenity.

- Maximise reuse of sediments – minimise landfill disposal,
- Minimise overall costs associated with sediment removal and disposal,
- Enable management of assets.

Dredging and Sediment Separation System tender

- Used earlier investigations and market research to define the problem,
- Pretender undertook international technology investigation,
- HazWaste Fund grant to introduce an innovative solution,
- Engaged consultant to provide independent review,
- Tight timeline.

Sediment - Dredge and Sediment Separation System (DSSS)



Preferred solution from tender

Local supplier selected to deliver solution and commission equipment.

Site preparation	Mini-AD Dredge
Sediment extraction	Mini-SD Dredge
Sediment processing	Mobile debris and coarse fraction separation
Process monitoring	Incorporated post tender
Fine fraction flocculation	Polymer dosing
Fine fraction dewatering	Geo-bag technology
O&M and SoP	Documentation and training

Urban Dredge (Mini AD) – site setup

Urban dredge – sediment extraction

Trailer deployed dredge with three day productivity of 1000m3 excavation. (600 tonne solids).

Mobile sediment separation

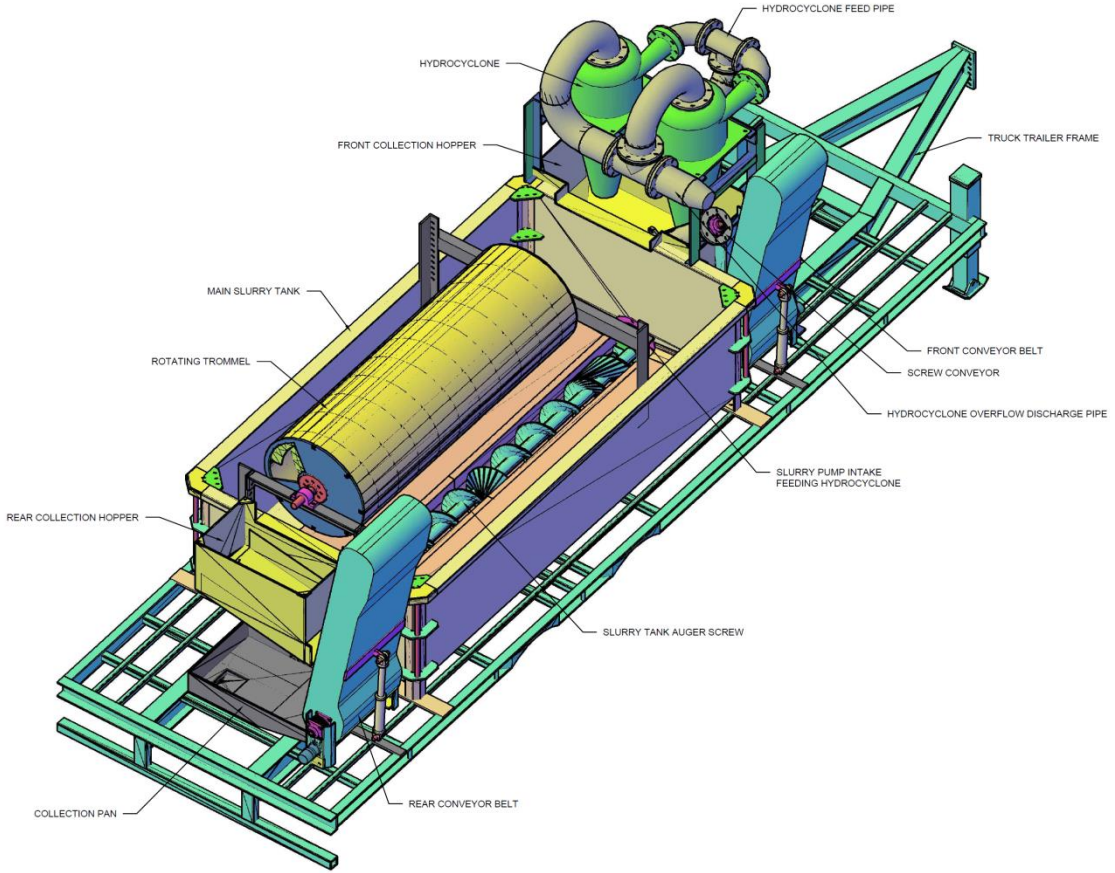
Trailer mounted unit to access majority of urban sediment ponds.

Separates:

Debris

300µm to 20mm

< 300µm



Mobile sediment separation

Mobile sediment separation

Solids measurement and Polymer dosing

Fine fraction dewatering

Photo credit: Apex Envirocare
Roselea Compensating Basin, Stirling (WA)

Operational trial

Ten stormwater systems
Eighteen ponds
>500 samples for analysis

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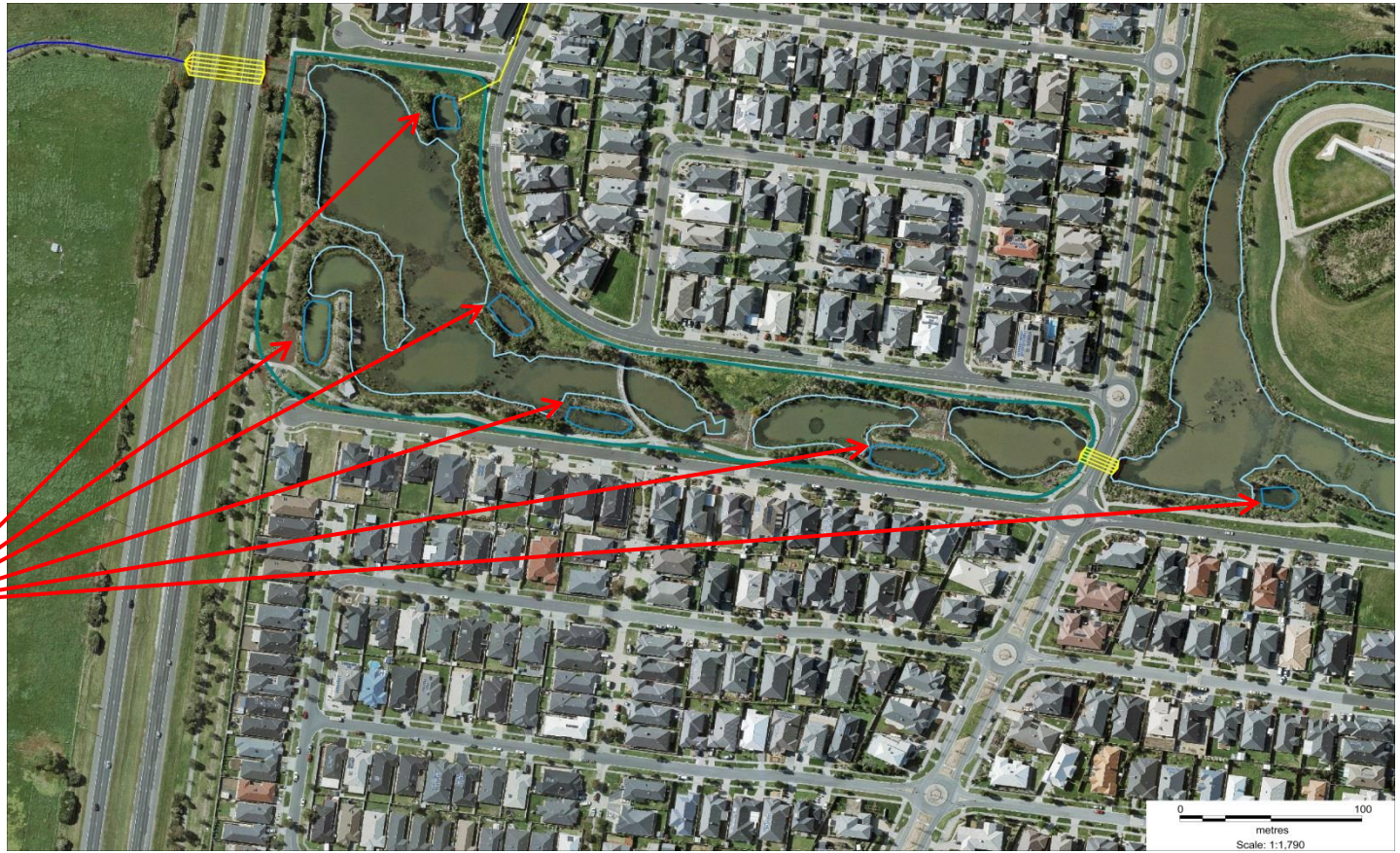
- **Mobility**
- **Sediment extraction and processing capacity**
- **Separation effectiveness**
- **Capture of fine fraction**
- **Ensure process meets EPA requirements**
- **Benefit to prescribed waste reduction**

Constrained urban context

Operational flexibility to be tested in tight urban setting.

Sediment ponds to be managed



Site Management plans

Dandenong Valley Wetlands DST401, 1100 Ferntree Gully Road, Scoresby

LEGEND

- Mini SD Dredge
- Mini AD Dredge
- Dredge Trailer
- Sediment Separation Trailer
- Geobag
- Fence
- Sediment Pond
- Site Amenities
- Stockpiles (Debris and Coarse Streams)

NOTES

1. Fencing around SD launch zone
2. Access pond via Ferntree Gully Road
3. Launch site to be cleaned up by AD.
3. Site amenities to include kitchen, toilet and lunch area.
4. Estimated volumes for removal
   1500m3
   - 400m3 - Bin skips
   - 1100m3 - Geobags
5. No work to occur during or immediately after inclement weather. Weather conditions, forecast and inflow to site to be reviewed at all times whilst in operation.
6. 20km/hr speed limit

WARNING
HIGH VOLTAGE OVERHEAD POWER

Prescribed waste reduction of 27% expected 2345 tonne

Melbourne Water Asset ID	Name	Prescribed waste category	Volume m^3	Material mass (t)	% >300µm	Volume >300µm m^3	Predicted Prescribed Material m^3	Predicted Prescribed Material mass (t)
DST401	Dandenong Valley Wetland	Category C	1500	2741	27	405	1095	2001
DWL259B	Golflinks Rd Wetland	Fill Material	800	1462	25	200		
DST322 A	Caroline Springs Wetland complex	Category C	300	548	44	130.5	170	310
DST322 C	Caroline Springs Wetland complex	Category C	300	548	19	56.25	244	445
DST322 D	Caroline Springs Wetland complex	Category C	300	548	16	87.696	460	841
DST132B	Watervale Stage 1 sediment ponds	Fill Material	600	1096	29	172.5		
DST132C	Watervale Stage 1 sediment ponds	Fill Material	100	183	13	13		
DST132E	Watervale Stage 1 sediment ponds	Fill Material	350	639	15	52.5		
DST161	Evans Rd RB	Category C	597	1091	50	297.0075	300	548
DST068A	Karkarook Sediment pond	Category C	600	1096	53	315	285	521
DST054	Troups Creek South	Category C	634	1158	9	58.645	575	1051
DST172 A	Fairbairn Rd	Category B	320	585	52	166.4	154	281
DST172 B	Fairbairn Rd	Category B	220	402	7	15.4	205	374
DST389A	Botanica Springs	Fill Material	172	314	17	29.24		
DST382A	Marriott Waters Sediment Ponds	Fill Material	189	345	51	95.445		
DST382D	Marriott Waters Sediment Ponds	Fill Material	268	490	27	71.02		
DST382E	Marriott Waters Sediment Ponds	Fill Material	396	723	57	225.72		

On-site sieve assessment

1180µm

300µm

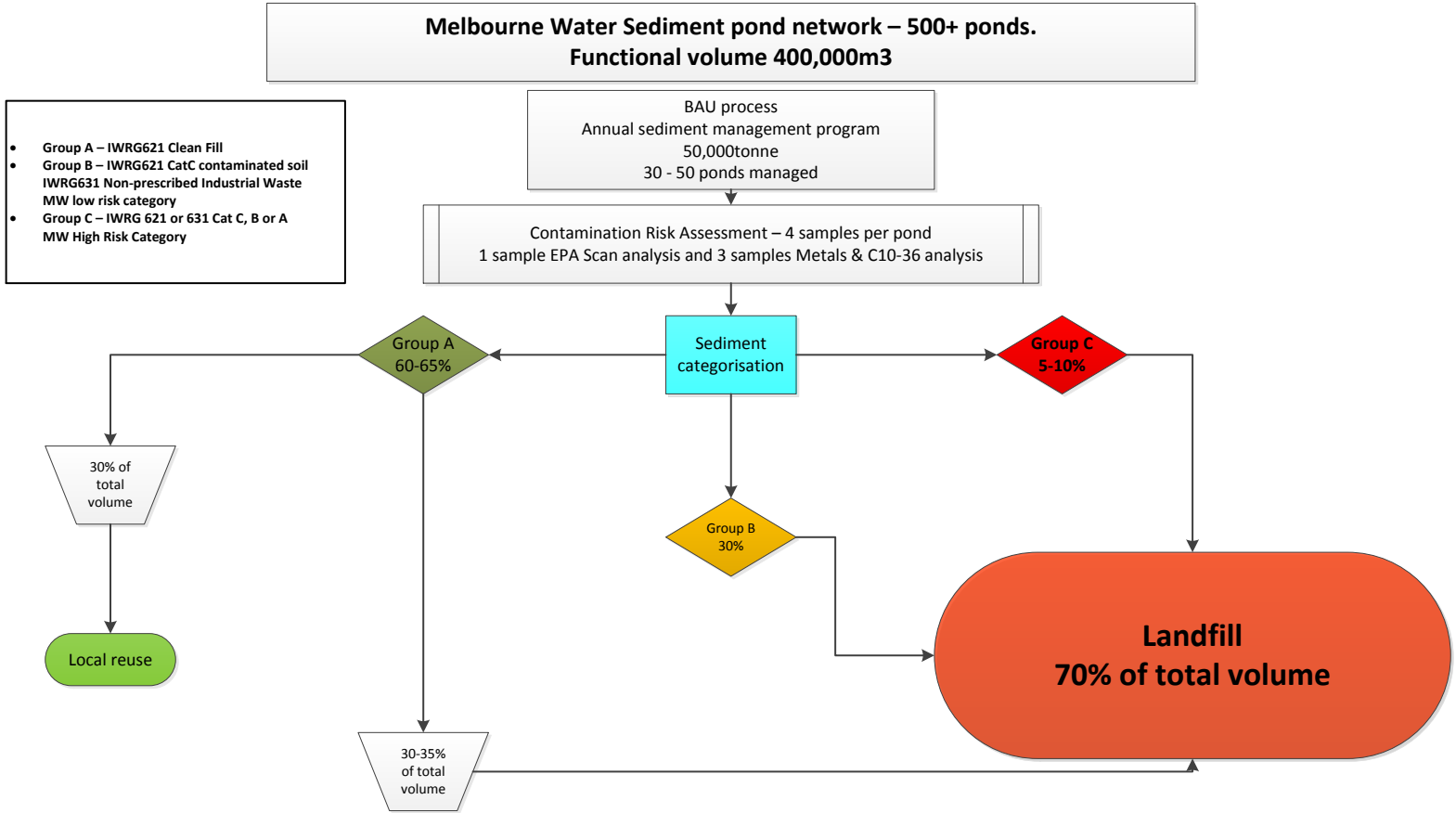
200µm

106µm

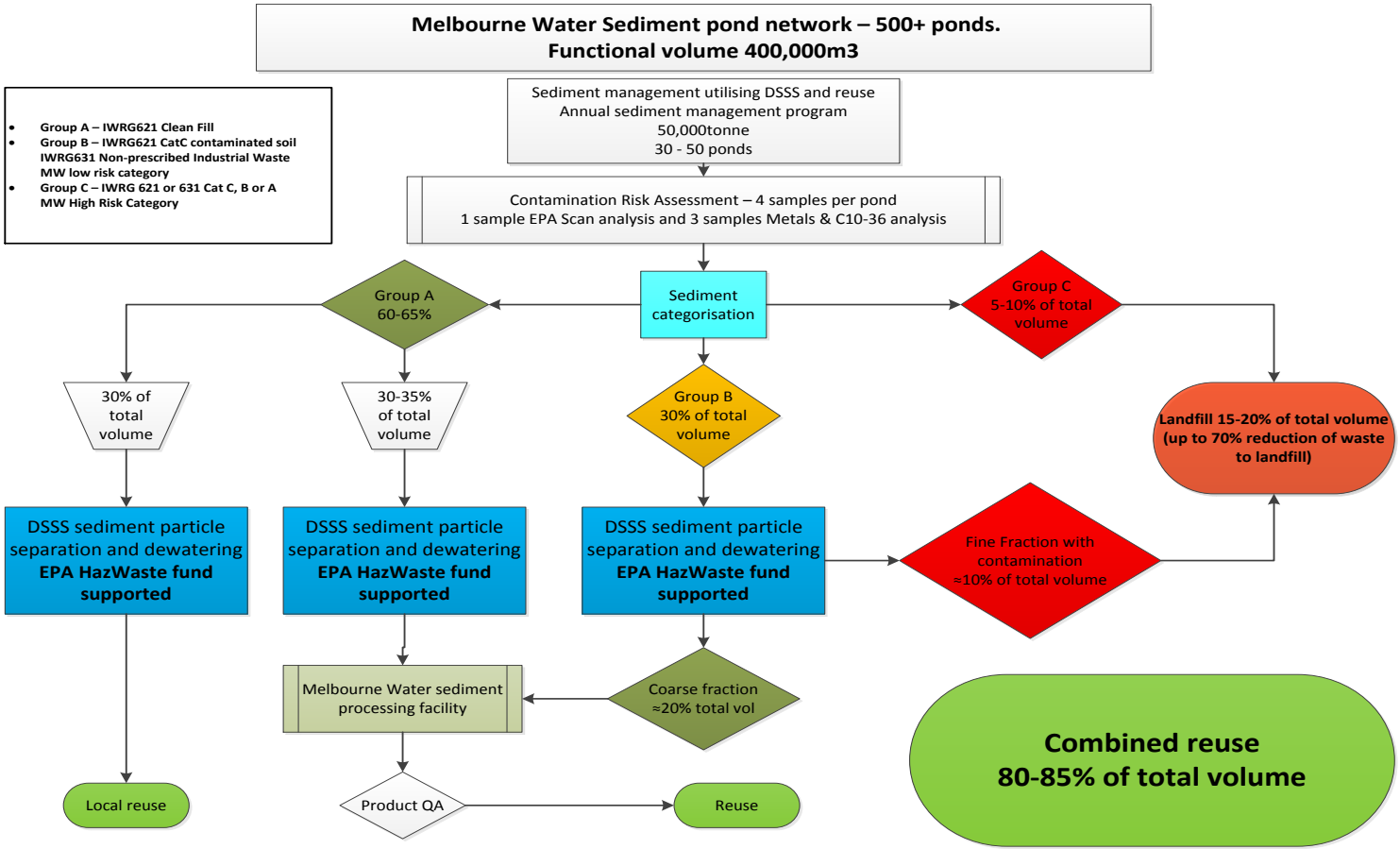
Sampling and Monitoring plan

Location	# Samples	Flow Volume	% Solids in slurry	Residual polymer test	pH	Turbidity	TSS	Redox	Soluble contaminates ANZECC suite	Contaminates EPA-IWRG621	Contaminates EPA-IWRG631	Asbestos	Particle size distribution	Total weight
Sediment pond In-situ sediments	10				✓					✓		✓	✓	
Sediment pond water	10				✓	✓			✓					
Dredger outlet	Continuous	✓												
Hydrocyclone inlet	Continuous	✓	✓		✓									
Rotary drum solids storage bin														✓
Hydro cyclone overflow outlet	Continuous	✓	✓		✓									
Hydrocyclone under flow solids storage bin	10				✓					✓		✓	✓	✓
Polymer dosing inlet	Continuous	✓												
Geo-textile bag filtrate	10			✓	✓	✓	✓	✓	✓					
Geo-textile bag – retained solids	10				✓					✓	✓	✓	✓	✓

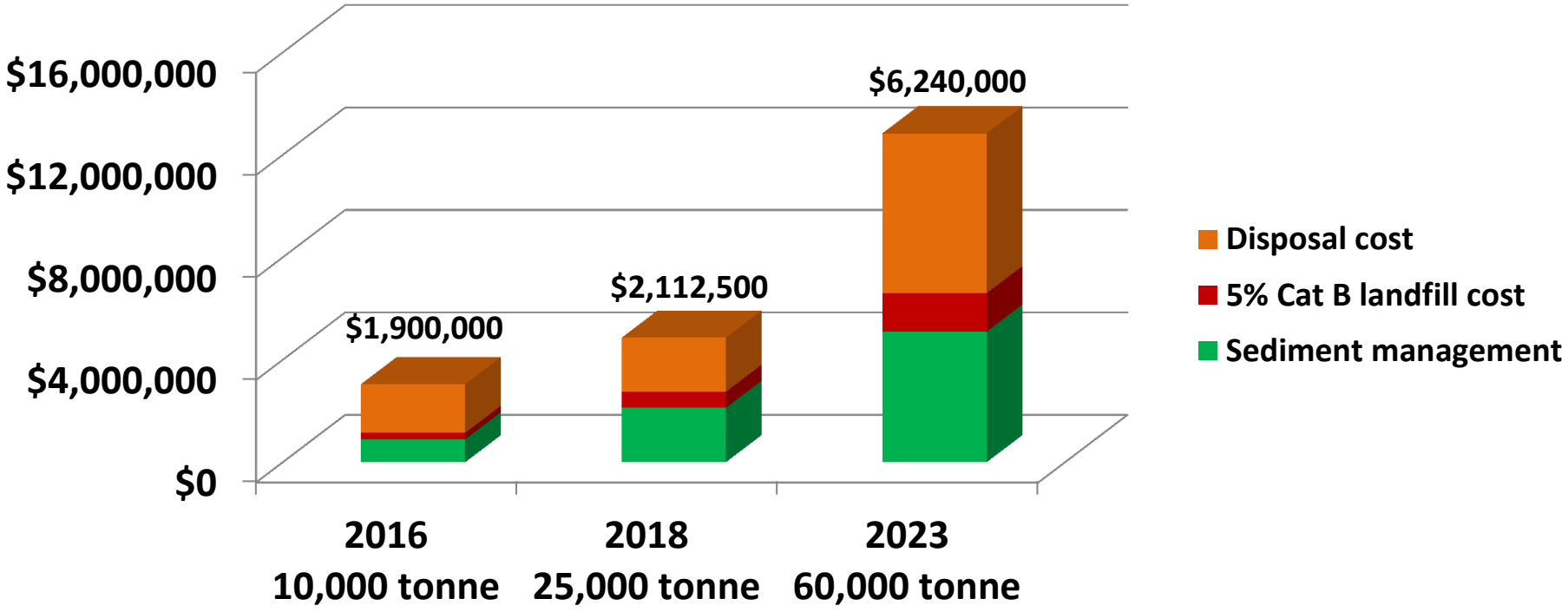
BAU sediment reuse vs landfill disposal



Future sediment reuse vs landfill disposal



Revised Sediment management costs



Approx $5.5M pa saving on disposal costs in 2023

Challenges

Manufacturing customised solution,

Defining environmental risks and mitigations,

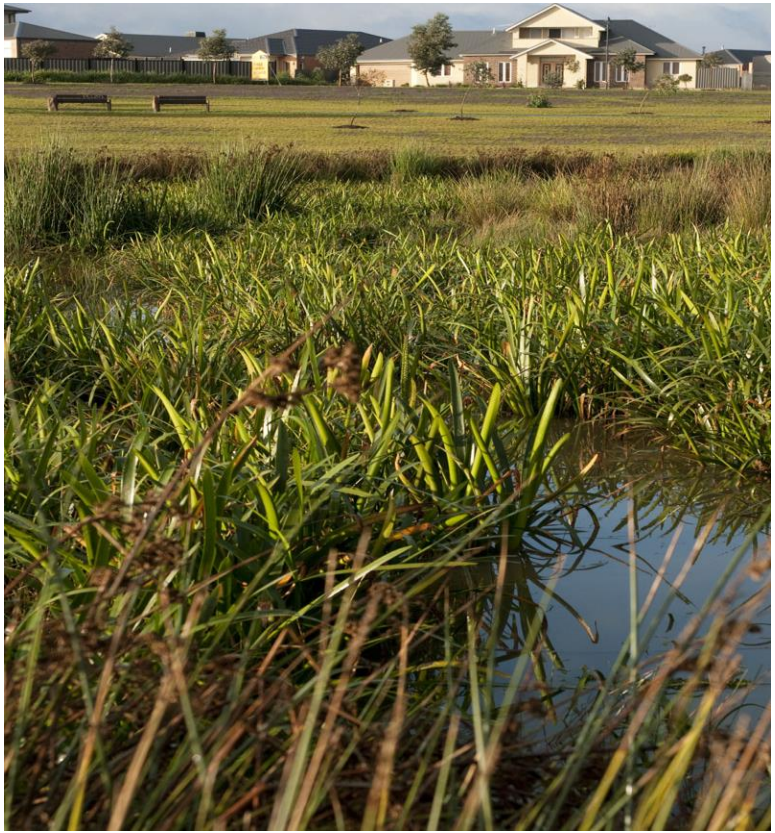
Stakeholder management,

Keeping to timeline,

Being safe.

Actions following commissioning trial

- **Complete trial and bring new method into business practice.**



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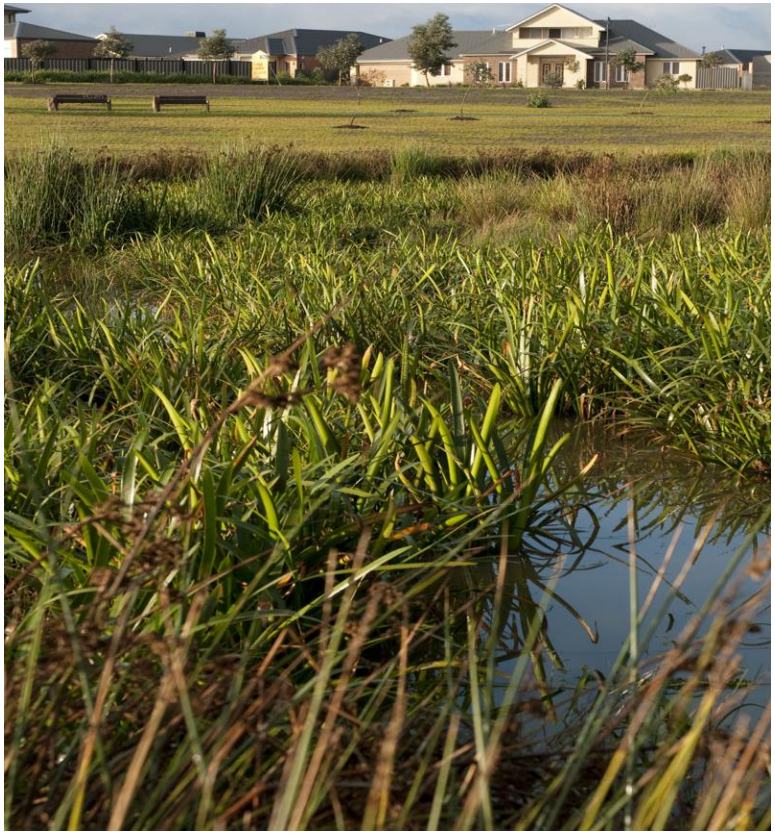
- **Report on benefits.**



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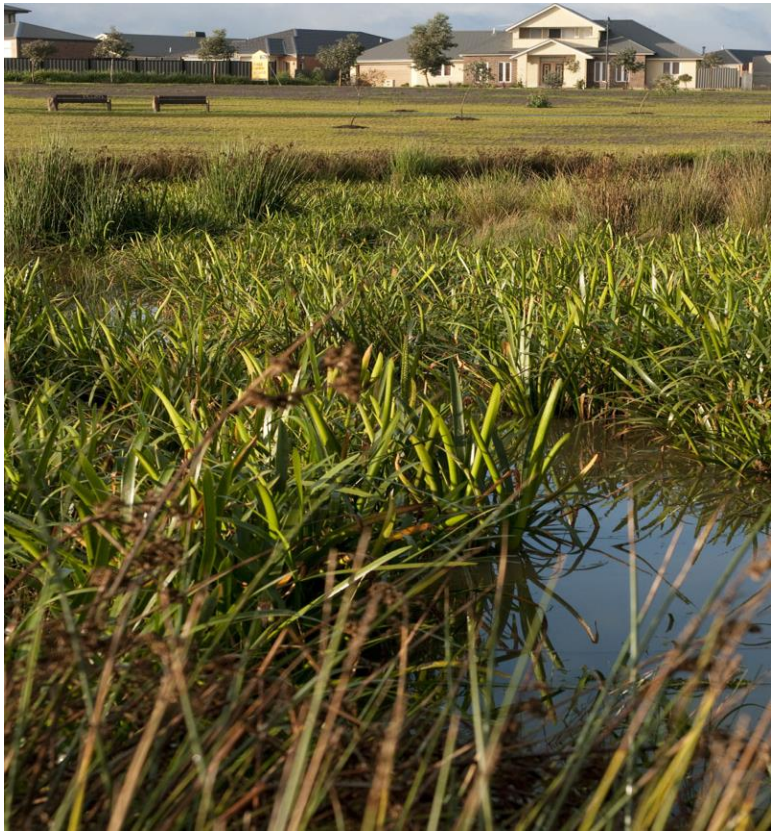
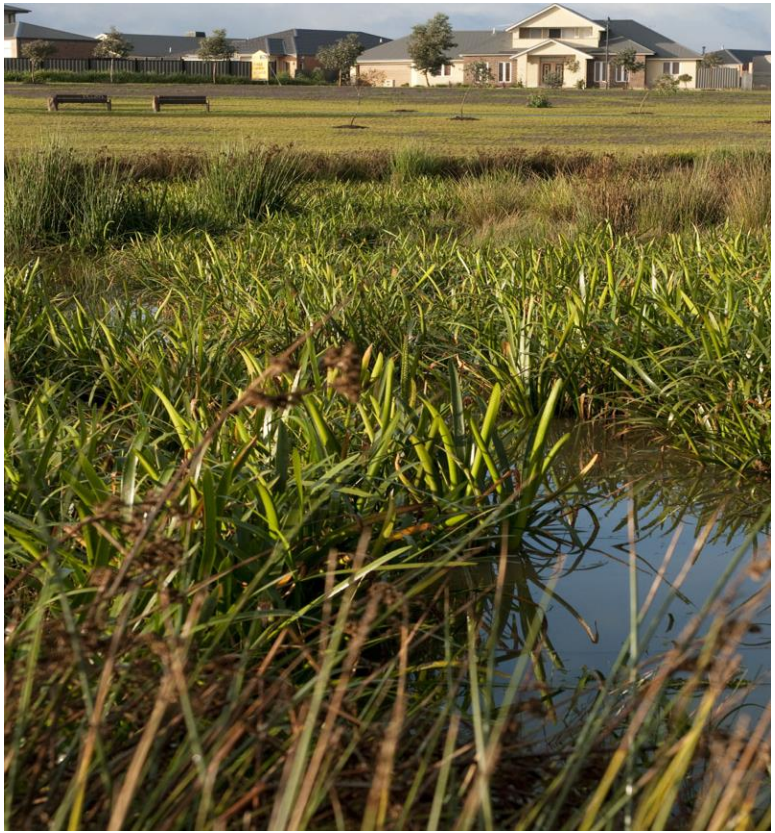


Actions following commissioning trial

- **Run trial and bring new method into business practice.**
- **Report on benefits.**
- **Ensure regulatory assets are maintained to provide design service.**
- **Define sediment treatment facility and improve reuse to drive down costs.**



Questions?

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Melbourne Water