

Deriving a site specific PFAS level for a site wide earthworks consent.

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Pattle Delamore Partners Ltd

Welcome to Palmerston North Airport



Mā te tahi mahi - Collaboration





KEY :
 AIRPORT ZONE



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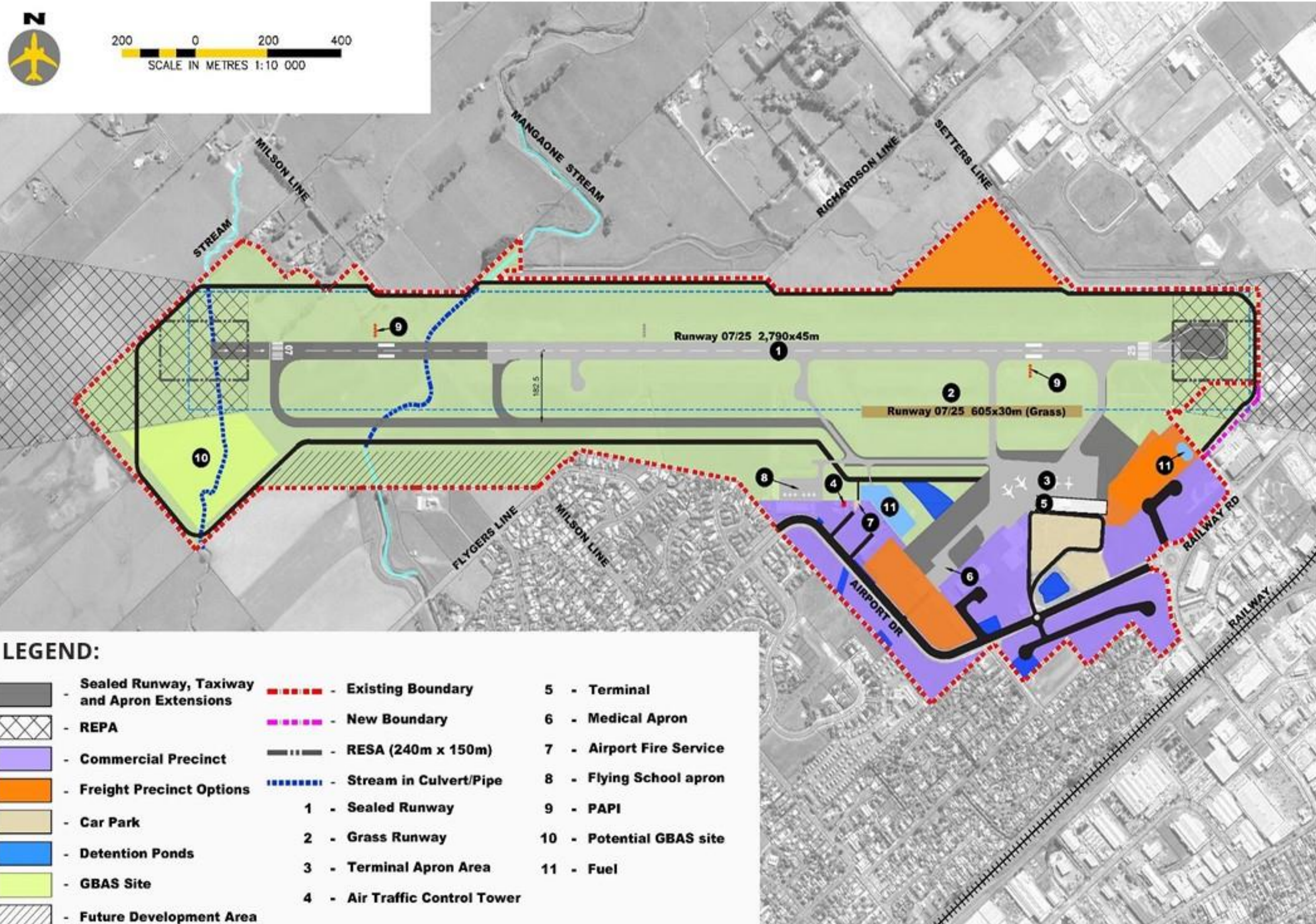
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FIGURE
FIG 1: SITE LOCATION PLAN

PROJECT
 PALMERSTON NORTH AIRPORT LIMITED PFAS CONTAMINATED SITE MANAGEMENT PLAN





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CLIENT
 PALMERSTON NORTH AIRPORT LIMITED

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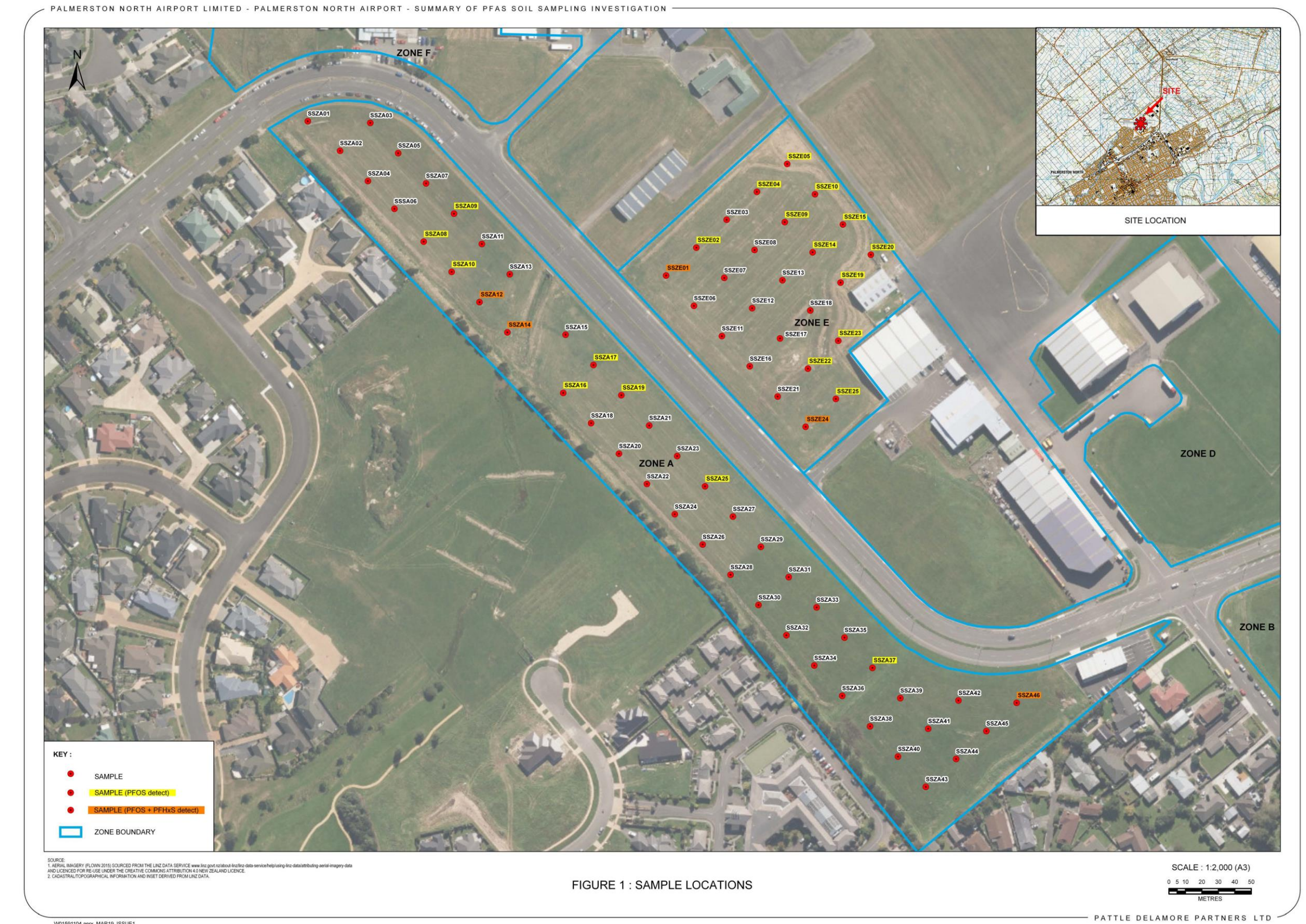
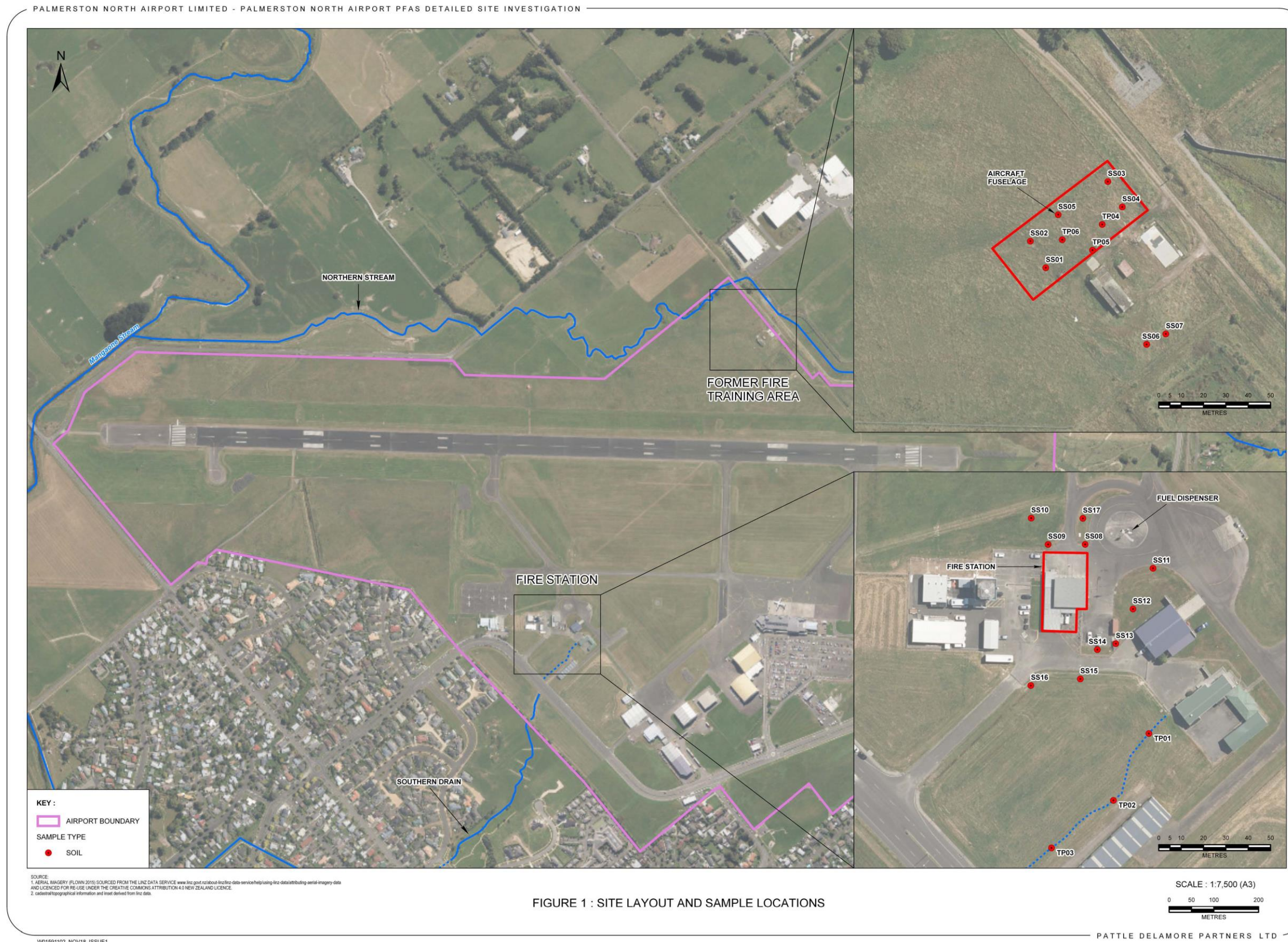
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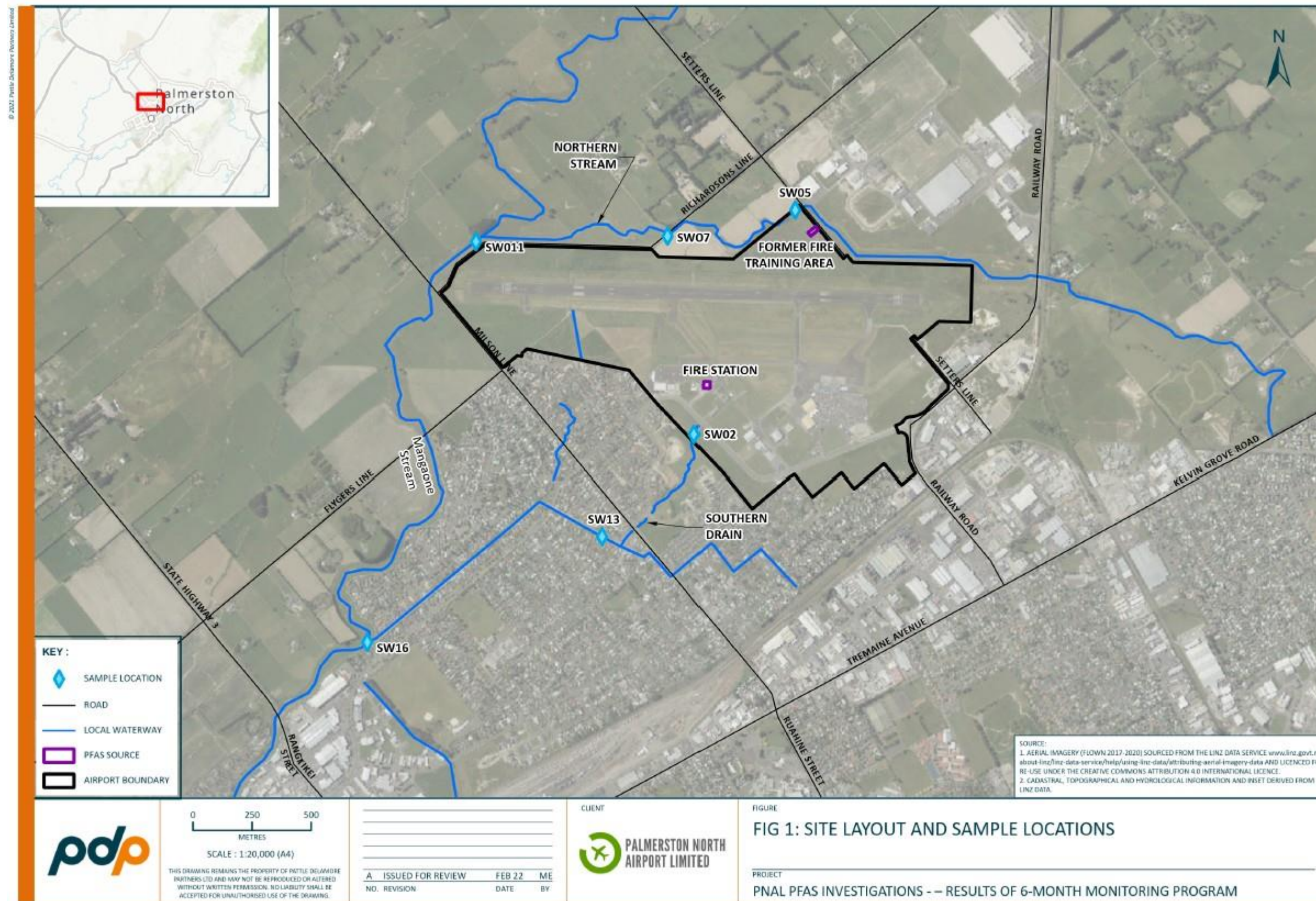
Mā te mahi tahi
 Driving impact through collaboration



soil, stormwater, surface water, deep bores, shallow bores, eels, slugs, water cress...



soil, stormwater, surface water, deep bores, shallow bores, eels, slugs, water cress...



The Challenge

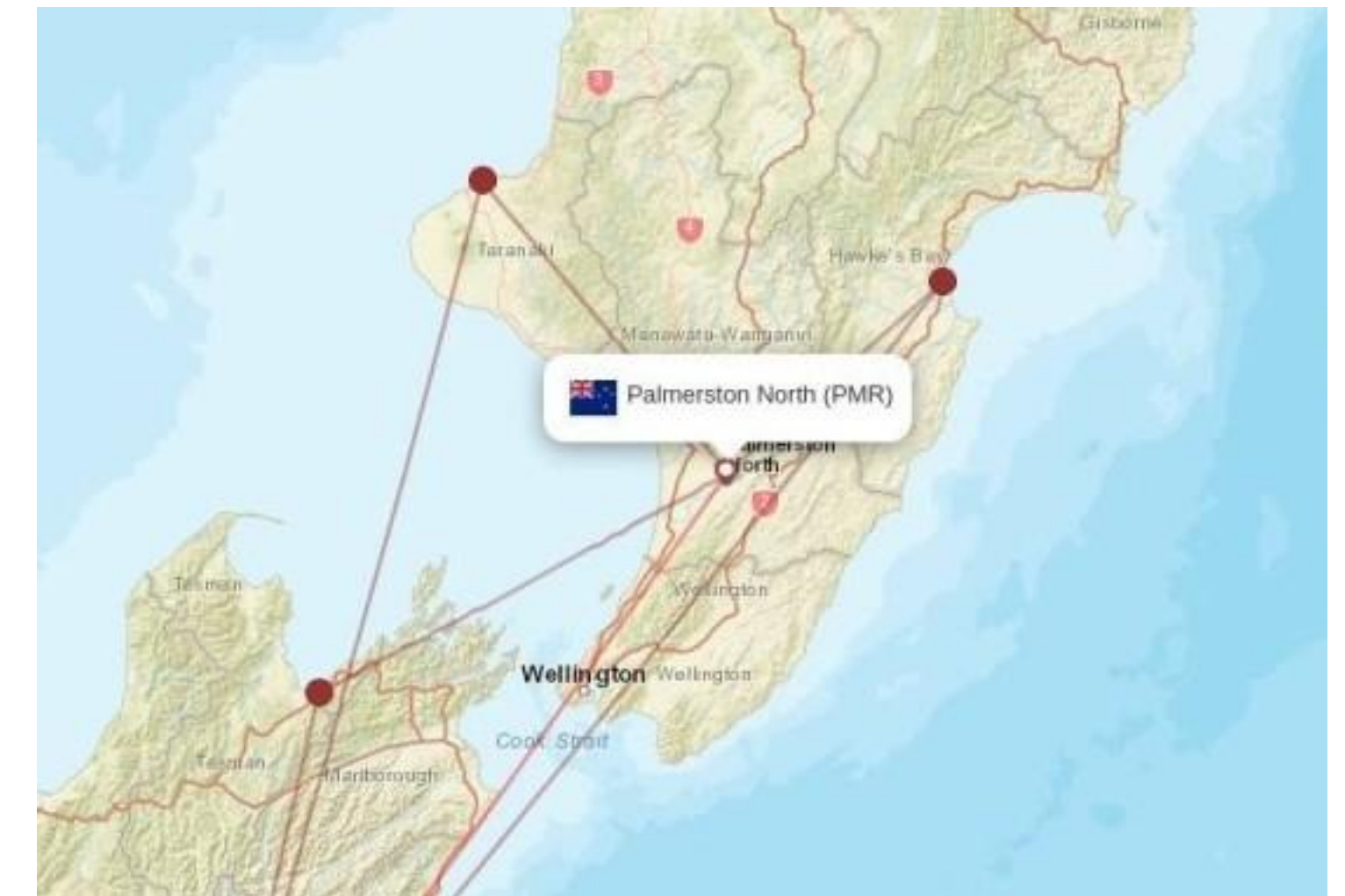
- Retain all soils on site – there is no available off site disposal
- Allow for the uncertainty of the development timetable
- Avoid repeated resource consent applications
- Minimise possible ongoing maintenance costs.



Options assessment

- Assessment Criteria

- o Costs: upfront and long term
- o Short and long term environmental impacts
- o Land availability: Is there space for this?
- o Practicality: Can this readily be managed?
- o Equipment required: Does this need specialist equipment?
- o Laboratory costs



Which way to go?

Options assessed

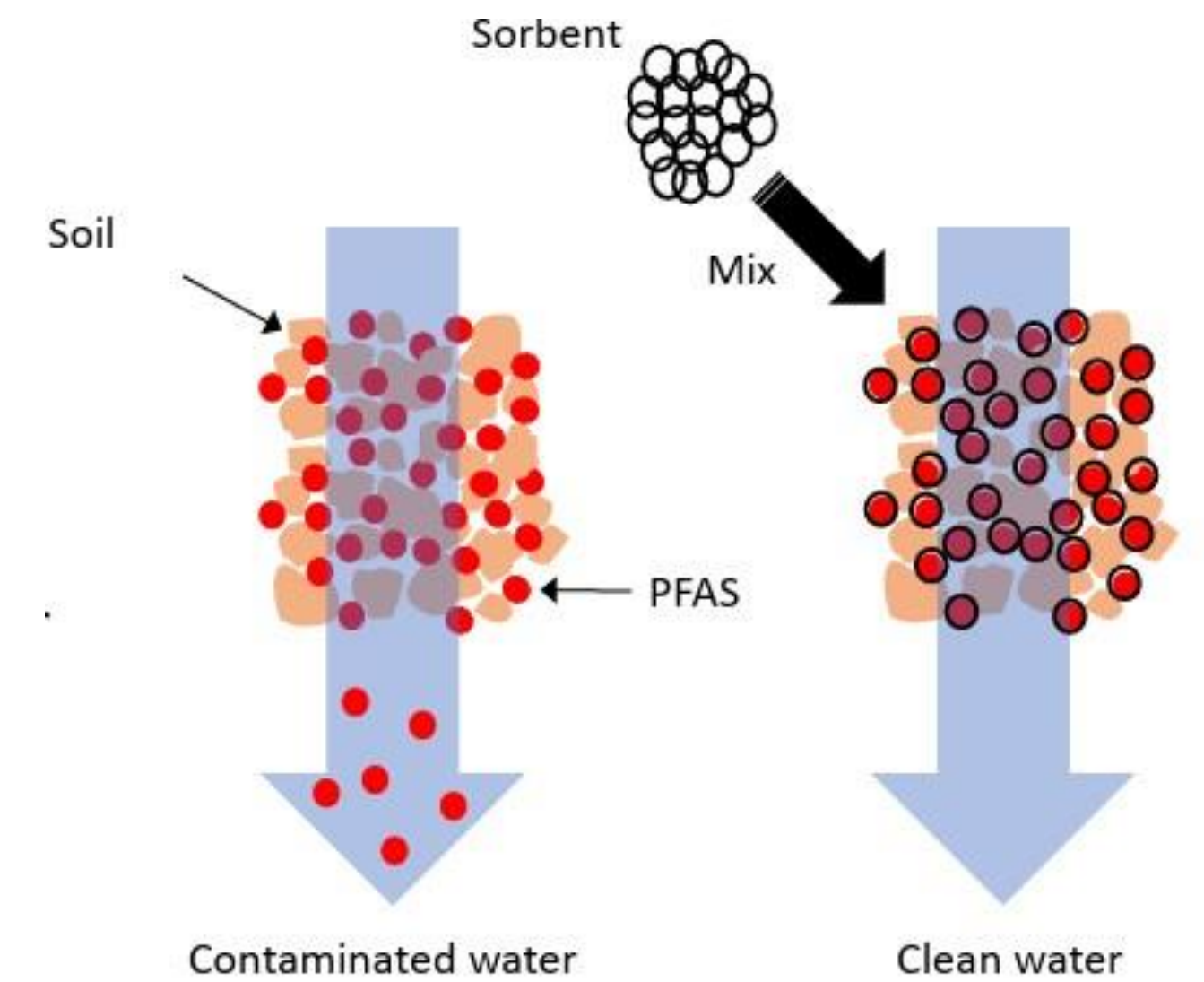
1. Insitu Treatment and Reuse
2. Ex Situ Treatment and Reuse
3. Dedicated RemBind Pad
4. Lined Longterm Storage Facility

Table 3: Cost vs Benefit Summary			
Option	Method	Pros	Cons
1 – In situ	A rotary hoe attached to a tractor can be used to churn the shallow soils to depths of 300 mm. RemBind™ can be sprayed onto exposed soils and allowed to stabilise over 24 to 48 hours.	No double handling of soils; Minimal equipment required; Soil matrix stabilised within 24 to 48 hours; No long-term constraints for re use on site, assuming no other contaminants of concern are present.	Not practical in all development areas due to space and operational uses.
2 – Ex Situ	A designated treatment zone with an impermeable surface can be constructed as a hub to treat and store impacted material. Once treated materials can be re used on site.	Soil matrix stabilised within 24 – 48 hours; No long term constraints for re use on site, assuming no other contaminants of concern are present.	Additional construction costs of a concrete pad and machinery; Long term space issues;
3 – Rembind Pad	A RemBind™ treatment pad by overtreating the in situ base soils, leaving excess RemBind™ in the matrix, which will act as a liner. Once treated soils can be stockpiled and treated in this area. Any leachate will be treated as is percolates. A drainage ditch containing AquaGate will treat any run off prior to discharge to the environment.	Minimal equipment required to set up with quick mobilisation; Dual use for treatment and storage;	Further expansion of the pad may create space issues; Potential for aggregate to require periodic replacement.



Option Chosen a Hybrid Solution

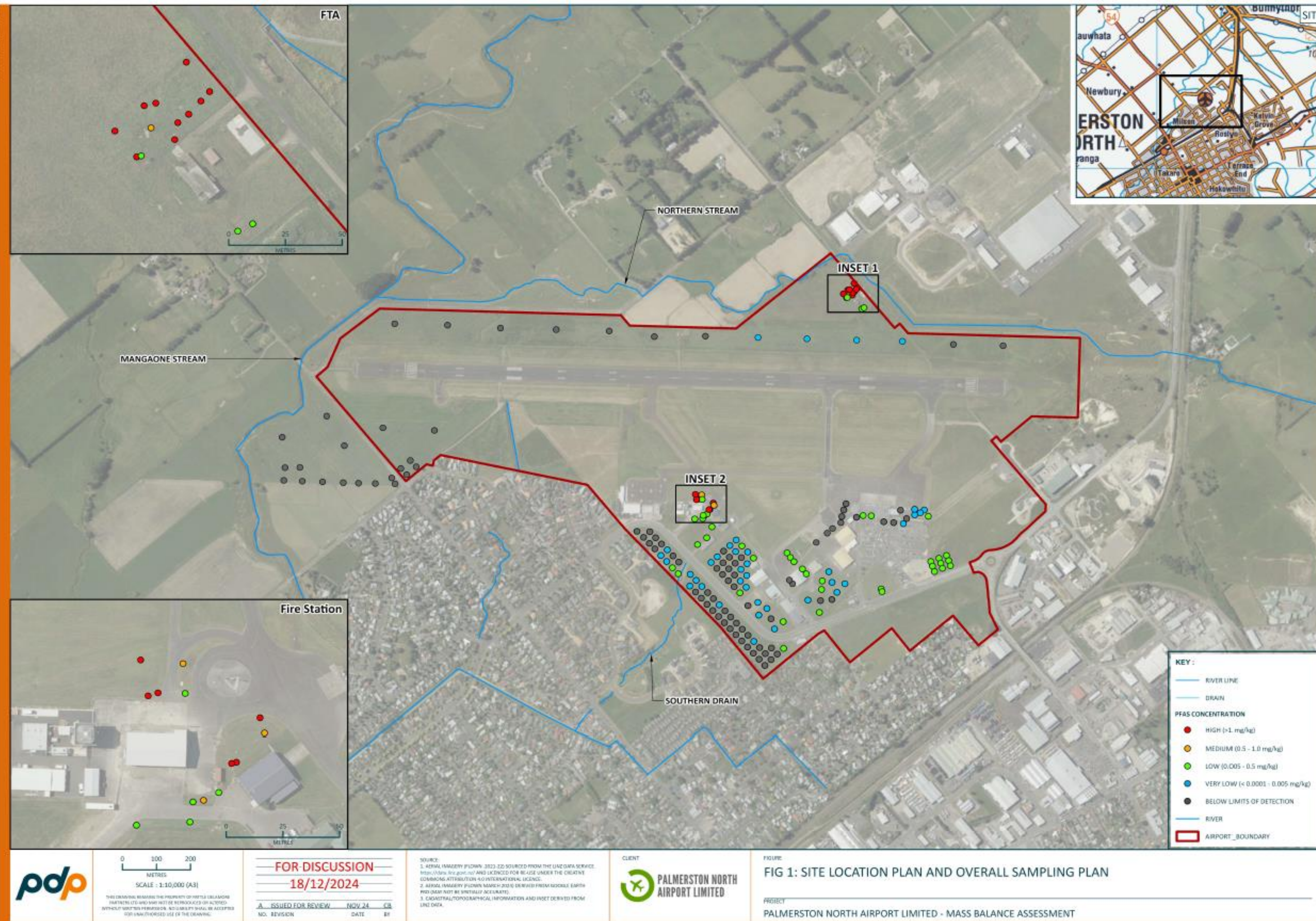
- Insitu Treatment and Reuse
- Ex Situ Treatment and Reuse



More Data...

- o Develop CSM
- o Site wide soil sampling
- o Literature review
- o Mass balance assessment
- o Bench trials for treatment
- o Biota sampling
- o Existing guidelines







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Mass Balance Assessment

1. Where does run-off contaminated with PFAS enter the streams?
2. Will moving impacted material to different areas of the site significantly change the flux of PFAS into surface water?

Table 1: Standard Parameters		
Parameter	Value	Source
Annual Rainfall	900 mm/year	The Climate and Weather of Manawatu-Wanganui, NIWA 2015. ¹
Annual Potential Evapotranspiration (PET)	731 mm/year	
Soil Thickness	0.3 m	Generally, investigations have found that the highest concentrations of PFAS contamination have been found in the top 300 mm of surface soils.
Soil Weight	1,900 kg/m ³	Soil weight used is the value outlined in PDP 2024k.
Leachate Multiplier	23.158	Development of PFAS Soil Reuse Trigger Value, PDP, 2024x

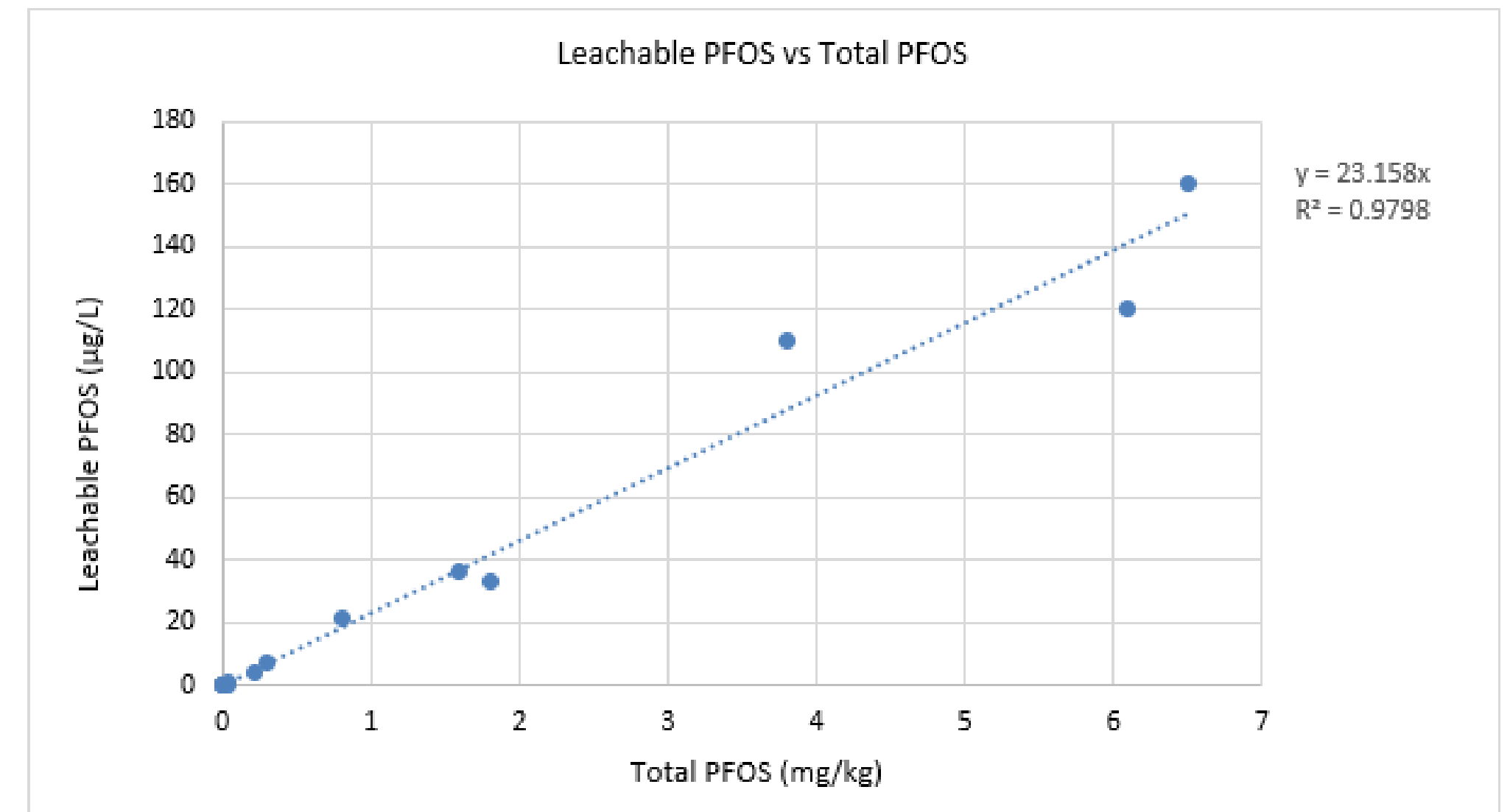
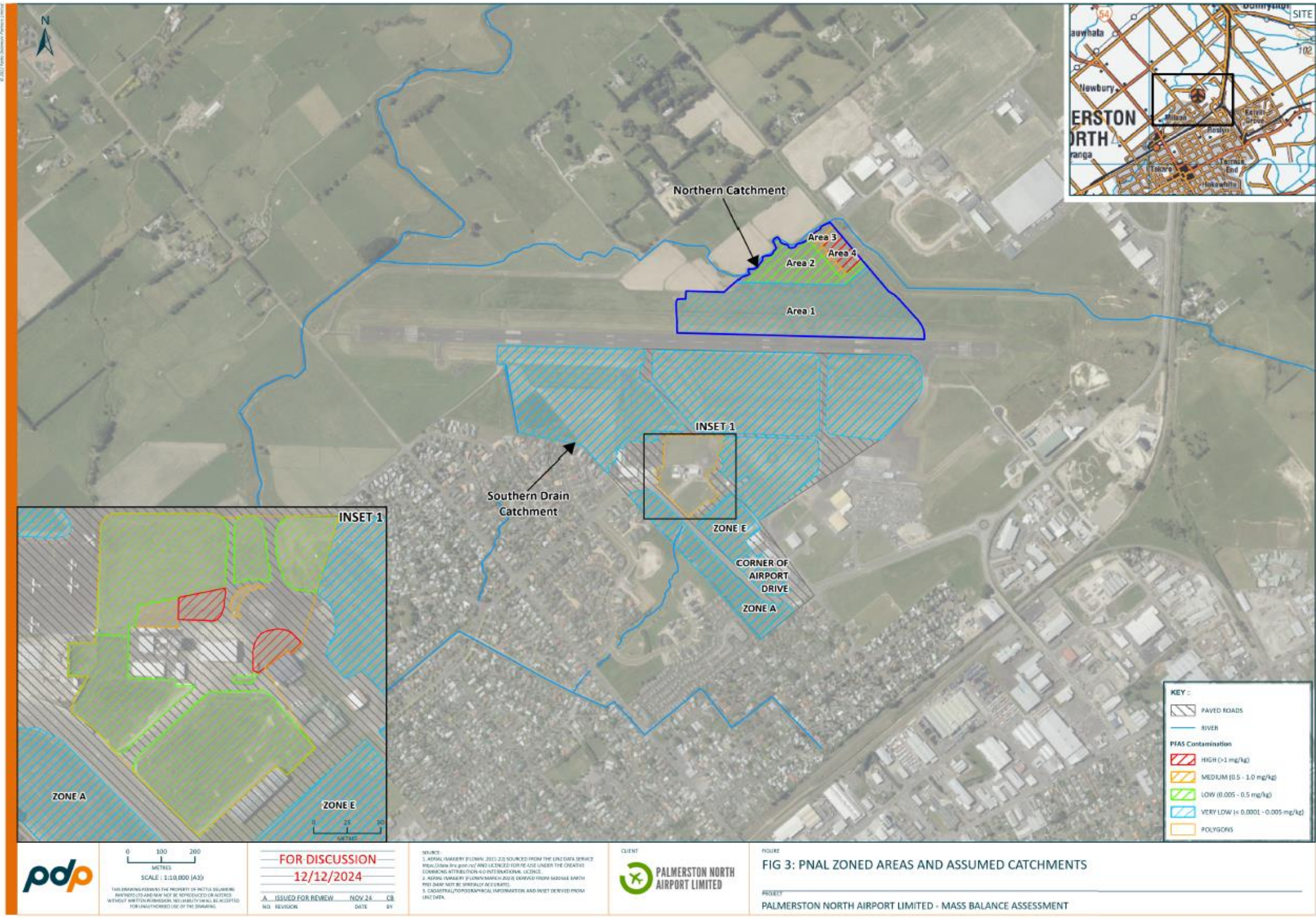


Chart 1: Relationship between total PFOS and leachable PFOS in soils





Mass Balance Assessment

Table 3: FTA Catchment Mass Balance

PFAS Zone	Median PFAS concentration (mg/kg)	Area in m ²	Mass of PFOS in the Soil (kg)	Volume of run-off (m ³ /year)	Leachate Concentration (ug/l)	Flux PFOS into stream (g/year)
High	2	7,400	8.44	1,251	46.32	57.92
Medium	0.5	7,400	2.11	1,251	11.58	14.48
Low	0.275	26,700	4.19	4,512	6.37	28.74
Very Low	0.0019	108,000	0.12	18,252	0.044	0.80

Table 4: Southern Drain Catchment Mass Balance

PFAS Concentration in Soil	Median PFAS concentration (mg/kg)	Area in m ²	Mass of PFOS in the Soil (kg)	Volume of run-off (m ³ /year)	Leachate Concentration (ug/l)	Flux PFOS into stream (g/year)
High	1.8	664	0.68	112	41.68	4.68
Medium	0.65	737	0.27	125	15.05	1.87
Low	0.057	22,572	0.73	3,815	1.32	5.04
Very Low	0.001-0.0025	427,456	1.00	72,240	0.14	3.78
Paved Areas	0	103,214	-	-	-	-

Table 5: PFAS Flux from FTA

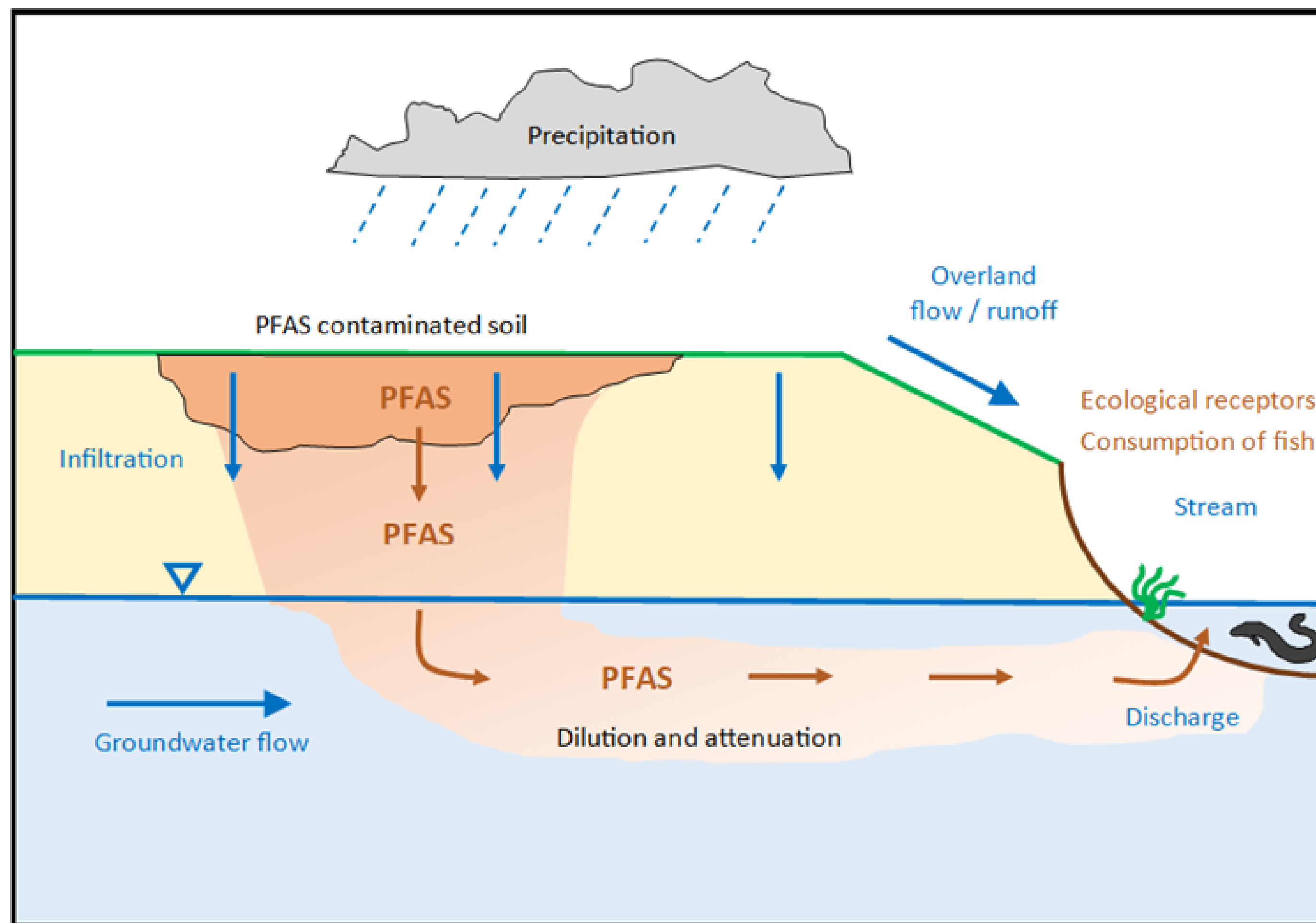
PFAS Concentration in Soil	Area (m ²)	% Flux into Surface Water Receiving Environment	% of Catchment Area
High	7,400	57%	4.95%
Medium	7,400	14%	4.95%
Low	26,700	28%	17.86%
Very Low	108,000	1%	72.24%

Table 6: PFAS Flux from Southern Catchment Area.

PFAS Concentration in Soil	Area (m ²)	% Flux Surface Water into Receiving Environment	% of Catchment Area
High	664	30%	0.12%
Medium	737	12%	0.13%
Low	22,572	33%	4.07%
Very Low	427,456	25%	77.07%
Paved Areas	103,214	0%	18.61%



CSM



Development of SSTVs

The steps undertaken to derive the SSTVs were:

1. Defining the CSM
2. More soil samples for total and leachable concentrations
3. Determining appropriate receptor concentration limits.
4. Applying a dilution and attenuation factor (DAF) limits identified in step 2.
5. Determining relationships between the total concentration and leachable concentration.
6. Calculating soil trigger values using the information gathered in steps 2, 3 and 4.
7. Undertaking an assessment of the current concentrations of PFAS in the surrounding environment.



The recommended numbers

Site Aquatic Ecosystem Values and Soil Trigger Values				
	PFOA	Total PFOS	Compound	SSTV
Ecological Freshwater Guideline 95% ecosystem protection	220 µg/L	0.48 µg/L	Total PFOS	0.05 mg/kg
Ecological Freshwater Guideline 99% ecosystem protection	19 µg/L	0.0091 µg/L	Total PFOA	15.6 mg/kg



Consenting Strategy

- Walk both authorities through the planned framework
- Lodge discharge consent with Horizons first
NES-CS with PNCC second
- Flowchart
- Works package approach
- CLMP and field guide version



Flow Chart for Soil Movement under the Global Consent

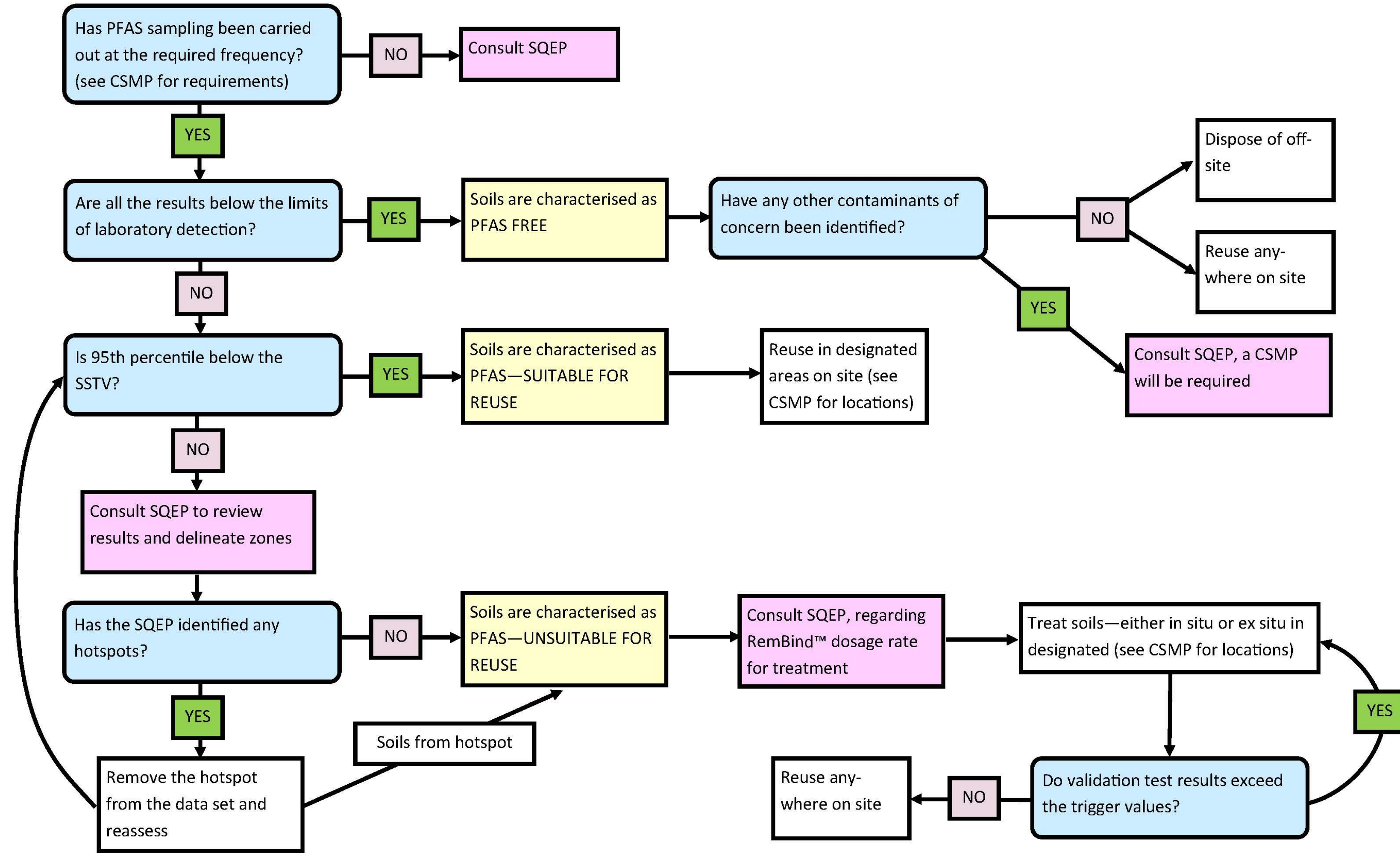


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Appendices

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- Appendix B: Site-Specific Trigger Values
- Appendix C: Mass Balance Assessment
- Appendix D: Soil Disposal Flow Chart
- Appendix E: RemBind™ Mixing Options

Result - Success!

– the first NZ site specific global consent for PFAS.

Te Mauri o Rangitāne o Manawatū – supported the application



APP-2025205204.00



Manawatū-Whanganui
Regional Council

RC LU 13.2025.935.1



Palmerston North City Council



Consents Issued until 2053

The Horizons ONE Plan contains rules for consent review every 10 years.

- Plus conditions for review e.g. changing standards
- A regular programme of off site water monitoring



Ngā mihi - haere rā!

