# Tiwai Peninsula - Ecological systems

## *Ecosystem connectivity and contaminant movement*

The site for the construction of the Tiwai Aluminium Smelter was chosen back in the 1960s. Tiwai Point was deemed an ideal location for the smelter as it is relatively flat, close to a deep water port, close to Invercargill, relatively close to the (then proposed) Manapōuri Power Station, and had a large source of freshwater in the underlying Tiwai Aquifer. 50 years ago there was little foresight about the potential contamination risks to the aquifer, coastal environment, and beyond.

Fast forward to today and we have a much better understanding of ecosystem connectivity at Tiwai, the types of contaminants (analytes) that have entered the environment, and pathways for contaminant movement. Contaminants from the smelter enter the surrounding environment via the air (gas and dust), soil, and groundwater. Summary diagrams for the smelter site and neighbouring landfill are given below*.

## Smelter site

- Soil samples taken by GHD show high levels of metals (including aluminium), fluoride and hydrocarbons in many locations – particularly in shallow soils.
- Groundwater samples taken by GHD show high levels of aluminium, fluoride, zinc, arsenic in many locations.**
- Red arrows indicate potential contaminant movement.

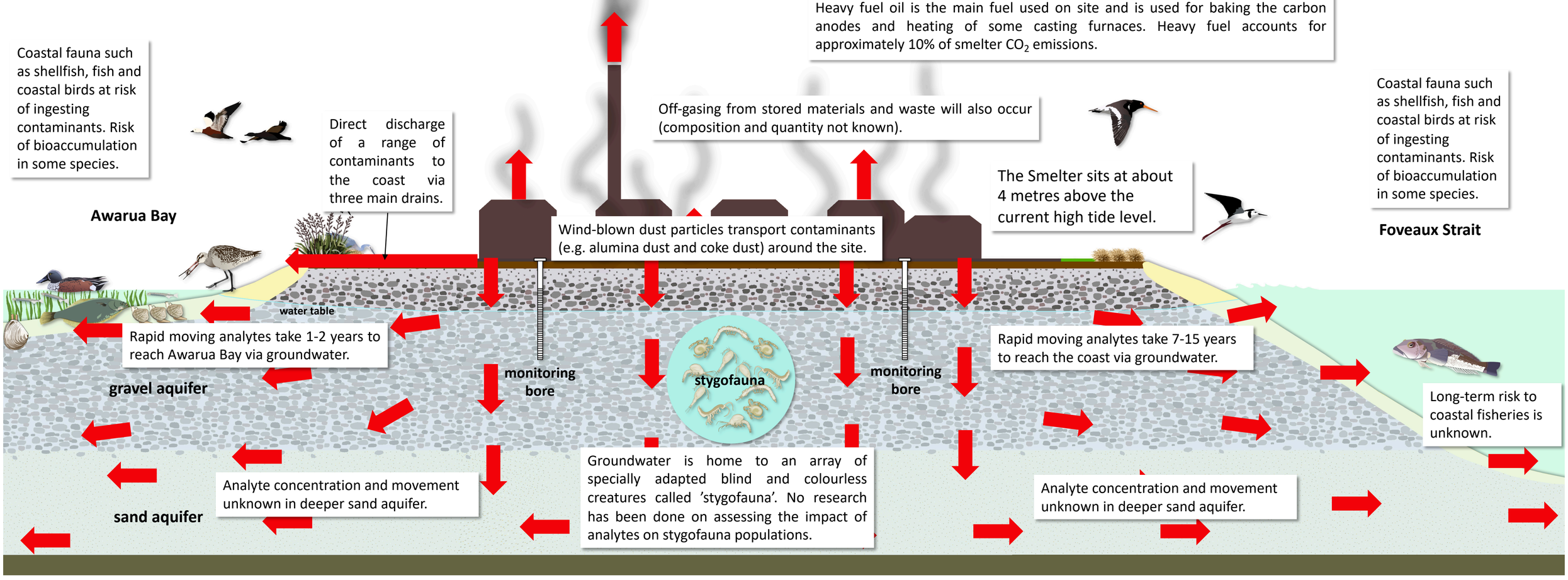
There are **3 main sources** of carbon dioxide ($CO_2$) emissions from the Tiwai smelter that are quantified in the annual NZAS environmental reports:

**1. Carbon Anodes**
Approximately 78-85% of the total $CO_2$ emissions from 2006-2020 were from the baking and consuming of carbon anodes.

**2. Perfluorocarbons**
Perfluorocarbons (PFCs) contribute to climate change in the same way that $CO_2$ does. PFCs are gases emitted from the aluminium production process when conditions in the cells become unstable. The percentage of PFC contribution to total $CO_2$ emissions increased from 6% in 2006 to 12.4% in 2020.

**3. Heavy Fuel**
Heavy fuel oil is the main fuel used on site and is used for baking the carbon anodes and heating of some casting furnaces. Heavy fuel accounts for approximately 10% of smelter $CO_2$ emissions.

Carbon emissions ($tCO_2e$) from the Tiwai Smelter estimated by AECOM in 2018 account for approximately 15.6% of Southland's total carbon emission, and about 71% of emissions from Southland's 'Goods Producing' industries.

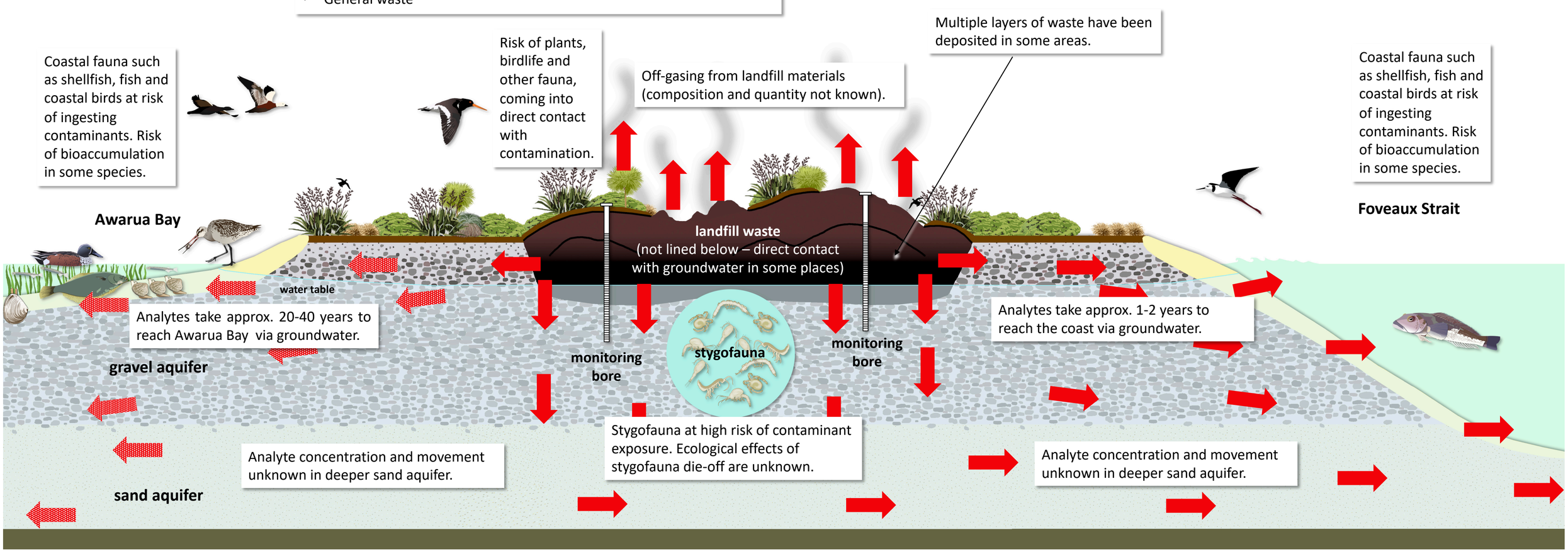



## Landfill site

Red arrows indicate potential contaminant movement.

Known landfill deposits:
- Refractory bricks
- Aluminium Dross and MRP Fines
- Carbons dusts
- Petroleum Coke and Meallurgical Coke, which contains Pitch and Iron
- Cryolite (the main fluoride component of the landfill contents)
- Aluminium
- Steel strapping – in significant quantities
- Asbestos
- Paint Tins
- Timber
- Mineral Fibres
- Plastic materials
- Waste Oils and Grease
- Copper Wire
- General waste

The landfill is approximately:
- 70 metres from the coastline to the east
- 180-230 metres from the coast to the west and north
- 600 metres from Tiwai Point to the south




*Note that these images have not been drawn to scale and are indicative of contaminant flow only. They highlight potential pathways for contaminant movement and subsequent risk to receiving environments.
**NZAS Contaminated Sites Detailed Site Investigation Report. See www.murihikuregen.org.nz for an Iwi response to this report.

Murihiku Regeneration