TEESWORKS

SOUTH TEES DEVELOPMENT CORPORATION

ARCADIS

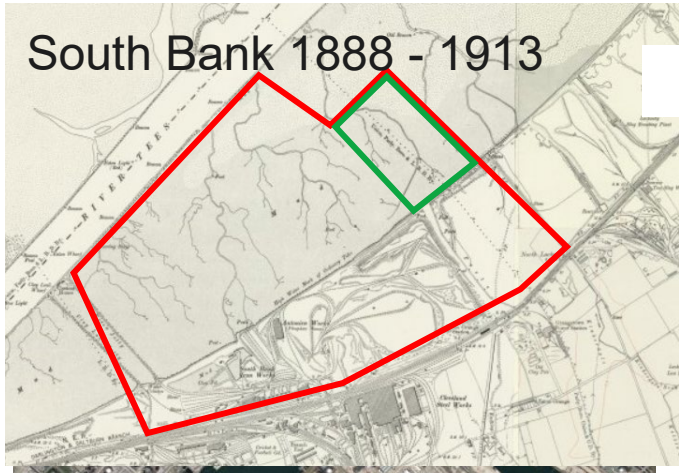
Design & Consultancy for natural and built assets

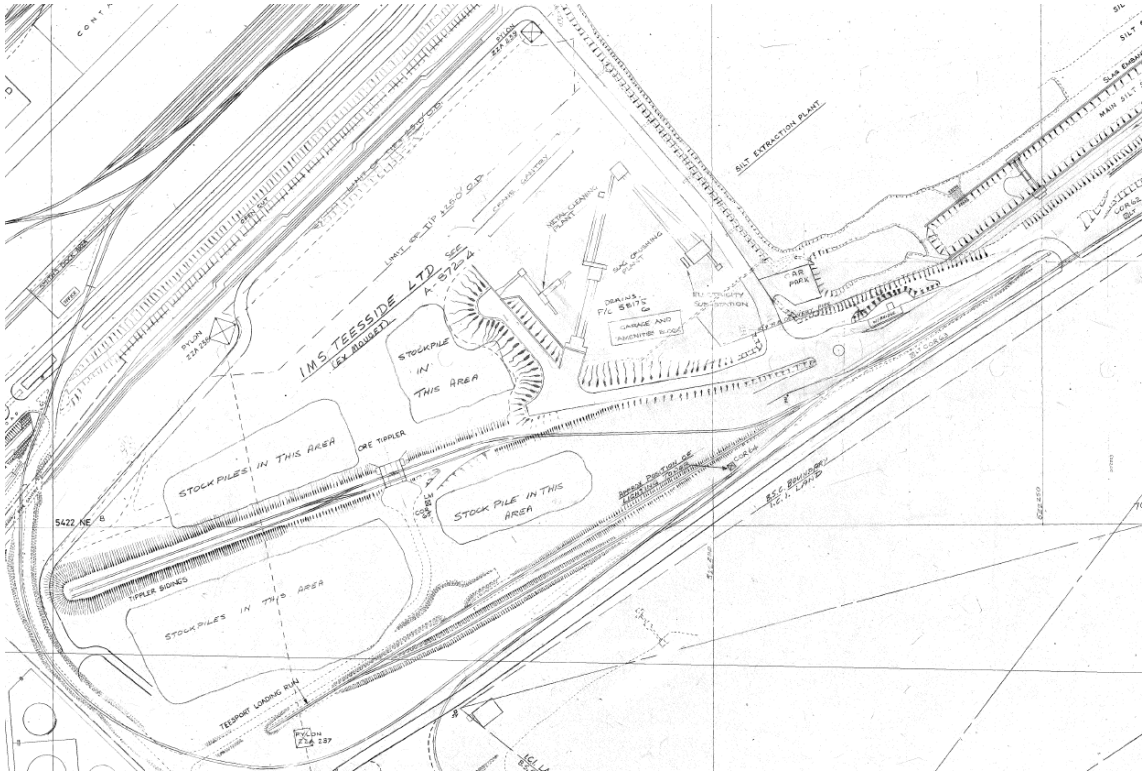
FORMER SSI STEELWORKS

Metals Recovery Area

Site History

- The MRA Area was formerly below the high tide limit (shown in green).
- The current development platform was established by reclaiming land from the estuary by placement of fill from 1890s to 1960s.
- The current layout was established by ~1974





Site Setting

- Current and historical use of site as materials stocking and processing area.
- Commercial / industrial setting for Human Health.
- Saline intrusion within aquifers identified at the MRA.
- Aquifers likely of limited resource value.

Water Resources	Aquifer	Made Ground (perched water)
		Tidal Deposits (Secondary A Aquifer) - Thin and discontinuous
		Mercia Mudstone (Secondary B Aquifer)
		Sherwood Sandstone (Principal Aquifer) - At depth 100 - 250m bgl
	Surface Water Features	River Tees Estuary (SSSI)
		Above ground water courses Cleveland And Lackenby Channels
		Planned attenuation infrastructure
		Planned drainage channels

GI Coverage

- Two intrusive investigations
  - Shallow soils (31 Trial Pits)
  - Deep Soils Ground and Surface Water
- Two further ground and surface water monitoring visits planned

10035117-AUK-XX-XX-RP-ZZ-0125-02-MPA_Shallow_Soils
10035117-AUK-XX-XX-RP-ZZ-0223-01-MPA_Deep_Soils

GI Findings - Soil Quality

- Site is covered by between 5 and 10m of slag rich made ground (>90% slag)
- No exceedances of Human Health screening criteria (40 samples throughout depth profile of Made Ground)
  - Comprehensive testing suite including metals, TPH, PAH, cyanides, phenols, VOC, SVOC, and PCB
  - Asbestos fibres identified in 3 samples up to 0.0025%

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Contaminant of Concern	Human Health (Commercial Worker)	GAC Source	Maximum Concentration Measured
Metals			
Antimony	470	USEPA	13
Arsenic	640	S4UL	230
Barium	19,000	Arcadis	800
Beryllium	12	S4UL	4
Boron, Water Soluble	240,000	S4UL	18
Cadmium	190	S4UL	2
Chromium	8,600	S4UL	710
Chromium, Hexavalent	33	S4UL	0
Copper	68,000	S4UL	1,500
Lead	2,300	C4SL	550
Mercury	*58**	S4UL	0.2
Molybdenum	5,540	Arcadis	68
Nickel	980	S4UL	150
Vanadium	9,000	S4UL	2,500
Zinc	730,000	S4UL	650
Inorganics			
Cyanide, Free	66	DQRA	0.0
Thiocyanate	230	USEPA	1.7
Petroleum Hydrocarbons			
Aliphatic C5-C6	*3200***	S4UL	0.0
Aliphatic C6-C8	*7800***	S4UL	0.0
Aliphatic C8-C10	*2000***	S4UL	0.0
Aliphatic C10-C12	*9700***	S4UL	2.1
Aliphatic C12-C16	*59000***	S4UL	7.9
Aliphatic C16-C21	1,600,000	S4UL	34
Aliphatic C21-C35	1,600,000	S4UL	890
Aromatic C5-C7	*26000***	S4UL	0.0
Aromatic C7-C8	*56000***	S4UL	0.0
Aromatic C8-C10	*3500***	S4UL	0.0
Aromatic C10-C12	*16000***	S4UL	0.0
Aromatic C12-C16	*36000***	S4UL	7.7
Aromatic C16-C21	28,000	S4UL	26
Aromatic C21-C35	28,000	S4UL	190
PAHs			
Naphthalene	*1,900*	Wood	0.04
Acenaphthylene	*83000***	S4UL	0.00
Acenaphthene	*84000***	S4UL	0.13
Fluorene	*63000***	S4UL	0.00
Phenanthrene	22,000	S4UL	1.00
Anthracene	520,000	S4UL	0.06
Fluoranthene	23,000	S4UL	1.20
Pyrene	54,000	S4UL	0.78
Benzo(a)anthracene	170	S4UL	0.23
Chrysene	350	S4UL	0.35
Benzo(b)fluoranthene	44	S4UL	0.34
Benzo(k)fluoranthene	1,200	S4UL	0.19
Benzo(a)pyrene	77	Wood	0.16
Indeno(1,2,3-c,d)pyrene	500	S4UL	0.10
Dibenzo(a,h)anthracene	3.5	S4UL	0.00
Benzo(g,h,i)perylene	3,900	S4UL	0.11

GI Findings Groundwater and Surface Water

- Tidal Flat Deposits (Secondary A) Aquifer are variable-ranging from thin <1.0m to locally 3 to 4m across the site, underlain by 2 to 5m unproductive Strata Glaciolacustrine Deposits and Glacial Till.
- Mercia Mudstone proven at between 10 and 17m bgl.
- Water present in made Ground, Tidal Flat Deposits, Glaciolacustrine Deposits, and Mercia Mudstone
- Wells screened across all aquifers identified brackish water the resource value of the aquifers is likely to be low.
- Groundwater flow appears to be towards River Tees
- Minor exceedances of WQS in soil leachate from Made Ground and groundwater samples from the Mercia Mudstone Formation and Tidal Flat Deposits.
- Some, but not all, dissolved contaminants in groundwater are consistent with soil leachate analysis results indicating that some leaching is occurring into shallow groundwater from the slag deposits.
- Surface water quality has not been noted to deteriorate as it passes the southern section of the site.

Borehole	Aquifer	Concentration NaCl (mg/l) 10 -12 November 2020
MPA_AUK_BH101D	Tidal Flat Deposits	1,055
MPA_AUK_BH102D	Mercia Mudstone	6,594
MPA_AUK_BH103D	Mercia Mudstone	577
MPA_AUK_BH104D	Tidal Flat Deposits	2,473
MPA_AUK_BH105D	Mercia Mudstone	4,121
MPA_AUK_BH106M	Glaciolacustrine Deposits	544
MPA_AUK_BH106D	Mercia Mudstone	577
MPA_AUK_BH107M	Tidal Flat Deposits	4,286
MPA_AUK_BH107D	Mercia Mudstone	2,308
MPA_AUK_BH108M	Tidal Flat Deposits	758
MPA_AUK_BH108(D)	Mercia Mudstone	791

Freshwater: <500 mg/l
Brackish Water: 500 to 30,000 mg/l
Saline Water: 30,000 – 50,000 mg/l

Remedial Stratergy

Earthworks Strategy – Excavation and turnover of Made Ground to 6.3m AOD to remove obstructions and reuse of material under an MMP to for a development platform to 8.8m AOD.

Human Health – Installation of a 100mm temporary cap of validated asbestos free material. A final cap will be installed by the third party developer consistent with their proposed development. Cap likely to be composed of mudstone imported from Sirius Wilton project.

Controlled Waters – Two further ground and surface water monitoring visits to be conducted along with tidal monitoring and aquifer permeability testing. We will be proposing that the exceedances in leachate and groundwater do not pose a significant risk to Controlled Waters and that the aquifers are of limited resource value given the site setting.

Unexpected contamination: Materials reused under an MMP will be sampled at a frequency of 2000m^3 given the homogeneity of the soils identified. Additional sampling and delineation will be undertaken if unexpected contamination is identified. Example tanks identified last week.