RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
	Name: Ensus UK Limited Location: Ensus UK Limited, Wilton, Middleway, Wilton International, Middlesbrough, Cleveland, TS10 4WS Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Name: Huntsman Polyurethanes (UK) Limited Location: Huntsman Polyurethanes (UK) Limited, Polyurethanes Area, PO Box 54, Middlesbrough, Cleveland, TS90 8JA Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Name: SABIC UK Petrochemicals Limited Location: SABIC UK Petrochemicals Limited, Olefins Manufacturing, Olefins Offices, PO Box 99, Redcar, Cleveland, TS10 4RG Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Historical Name: Sahaviriya Steel Industries Uk Limited Location: Sahaviriya Steel Industries Uk Limited, Steel House, Redcar, Cleveland, TS10 5QW	

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
	Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Name: British Steel Corporationltd(bsc) Location: British Steel Corporation ltd (bsc), Redcar Works, Redcar Hazardous Substance: Unknown Date: - Tier: Historical NIHHS Site Name: Sabic Uk Petrochemicals Limited Location: Sabic Uk Petrochemicals Limited, Teesport, Grangetown, Teesport Storage, Middlesbrough, Cleveland, TS6 6UE Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Name: Sabic Uk Petrochemicals Limited Location: Sabic Uk Petrochemicals Limited, Low Density Polyethylene, Po Box 99, Redcar, Cleveland, TS10 4YA Hazardous Substance: Unknown Date: - Tier: Historical NIHHS Site	

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
Hazardous Substance Storage / Usage	-	Distance: 220 m NW Reference: No Details Location: Dow (Wilton) Ltd, PO Box 1990, Wilton, Redcar, Redcar and Cleveland Borough Council, England, TS10 4RG Date: - Application Status: Approved Details: No Details Distance: 230 m E Reference: R/1999/0746/HD Location: British Steel Ltd, Teesside Site, Steel House, Redcar, TS10 5QW Date: 20/10/1999 Application Status: Historical Consent Details: Hazardous Substances application. No Enforcements Notified. Distance: 30 m SE Reference: R/2014/0440/HD Location: Sabic UK Petrochemicals, Central Control, Wilton International, Redcar, TS10 4RF Date: 09/07/2014 Application Status: Historical Consent Details: Hazardous Substances Consent application for the storage of butadiene. Distance: 200 m E

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Reference: R/2011/0798/HD Location: SABIC UK Petrochemicals, Olefins Offices, PO Box 99, Wilton, Redcar, Redcar and Cleveland Borough Council, England, TS10 4RG Date: 04/11/2011 Application Status: Approved Details: Paraxylene storage. No Enforcements Notified. Distance: 45 m W Reference: R/2009/0606/HD Location: Air Products plc c/o Invista Nylon Site, Wilton International, Middlesbrough, Redcar and Cleveland Borough Council, England, TS6 7SD Date: 16/09/2009 Application Status: Approved Details: Storage of hydrogen. No Enforcements Notified.
Historical Licensed Industrial Activities (ICP)	-	11 No.: Distance: 65 m N Name: Sembcorp Utilities (UK) Ltd Location: Sutl Power Station, PO Box 1985, Wilton, Middlesbrough, Cleveland, TS90 8WS Date: 5-11-2004 (Most Recent Effective) Status: Revoked (Now IPPC) Details: Combustion Processes 6 No.:

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 140 m W Name: Ineos Chlor Ltd Location: Edc Plant, Bain Offices, PO Box 54, Middlesbrough, Cleveland, TS90 8JA Date: 17-7-2000 (most Recent Effcetive) Status: Revoked Details: Petrochemical Processes 12 No.: Distance: 135 m N Name: Artenius UK Ltd Location: Pta Plant, Davies Office, Wilton Site, Middlesbrough, Cleveland, TS90 8JW Date: 12-6-2000 (Most Recent Effective) Status: Revoked (Now IPPC) Details: Manufacture And Use Of Organic Chemicals 11 No.: Distance: 120 m SE Name: Sabic UK Petrochemicals Location: Olefins, PO Box 99, Wilton Site, Redcar, TS10 4YA Date: 11-2-2002 (Most Recent Effective) Status: Revoked (Now IPPC) Details: Petrochemical Processes

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		1 No.: Distance: 25 m S Name: Ici Chemicals and Polymers Ltd Location: Inters 2, Nylon Production Area, Wilton Site, Middlesbrough, Cleveland, TS6 8JA Date: 17-7-1992 (Effective) Status: Surrendered Details: Inorganic Chemical Processes 10 No.: Distance: 105 m NW Name: Dow (wilton) Ltd Location: Eo Plant, PO Box 1990, Wilton, Redcar, TS10 4YF Date: 1-12-1999 (Most Recent Effective) Status: Revoked (Now IPPC) Details: Petrochemical Processes 8 No. Distance: 205 m SW Name: Dow (wilton) Ltd Location: PO Box 1990, Wilton, Redcar, TS10 4YF Date: 30-11-1998 (Most Recent Effective) Status: Revoked Details: Petrochemical Processes

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		5 No. Distance: 115 m SE Name: Huntsman Polyurethanes (UK) Ltd Location: Nitrobenzene Plant, PO Box 99, Wilton Site, Middlesbrough, Cleveland, TS10 4YA Date: 31-1-2003 (Most Recent Effective) Status: Revoked (Now IPPC) Details: Acid Processes 5 No. Distance: 200 m E Name: Corus UK Ltd Location: General Steels, Teesside Works, Steel House, Redcar, Cleveland, TS10 5QW Date: 22/11/1994 (Most Recent Effective) Status: Revoked Details: Combustion Processes 36 No. Distance: 200 m E Name: Corus UK Ltd Location: Redcar Sinter Plant, Steel House, Redcar, Cleveland, TS10 5QW Date: 09/03/2004 (Most Recent Effective) Status: Revoked – Now IPCC Details: Carbonisation And Associated Processes

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		24 No. Distance: 200 m E Name: Corus UK Ltd Location: Teesside Works, Redcar, Cleveland, TS10 5QW Date: 27/04/2004 (Most Recent Effective) Status: Revoked – Now IPCC Details: Iron And Steel 8 No. Distance: 200 m SE Name: Sabic UK Petrochemicals Location: Aromatics Business (paraxylene), Wilton Site, Middlesbrough, TS90 8JE Date: 20/12/1999 (Most Recent Effective) Status: Revoked – Now IPCC Details: Petroleum Processes
Historical Licensed Industrial Activities (Part A1)	-	3 No.: Distance: 80 m W Operator: REDCAR BULK TERMINAL LTD Installation Name: TEESIDE INTEGRATED IRON & STEELWORKS EPR/QP3338HU Date: 28/08/2018 (All Activities Effective) Status: Effective (All)

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Activity: Other Mineral Activities; Loading Etc Coal Etc (Except On Retail Sale) (Unless Exempt Location); Other Mineral Activities; Screening Etc Coal Etc (Unless Exempt Location); Ferrous Metals; Handling Etc >500,000 Tonnes/12 Months 3 No. Distance: 100 m W Operator: Northumbrian Water Ltd Installation Name: BRAN SANDS REGIONAL SLUDGE TREATMENT CENTRE Date: 29/09/2006 (Effective) Status: Superseded Activities: FUEL FROM WASTE; MAKING SOLID FUEL FROM WASTE BY USING HEAT (EXCEPT CHARCOAL) / OTHER WASTE DISPOSAL; HAZARDOUS WASTE >10T/D / COMBUSTION; WASTE DERIVED FUEL =>3MW BUT <50MW 2 No.: Distance: 120 m N Operator: British Steel Limited Installation Name: Teeside Integrated Iron & Steelworks EPR/VP3839DA and Teesside Beam Mill EPR/VP3839DA Date: 19/12/2018 (most Recent Effective) Status: Superseded Activity: Associated Processes

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		15 No. Distance: 65 m NW Operator: SEMBCORP UTILITIES (UK) LTD Installation Name: WILTON POWER STATION EPR/NP3438LK Date: 21/05/2020 (Most Recent Effective) Status: Effective Activities: Combustion; Any Fuel =>50mw / Associated Process / Other Mineral Activities; Loading, Unloading, Or Storing Pulverised Fuel Ash In Bulk Prior To Further Transportation In Bulk 4 No. Effective (18No. Superseded) Distance: 20 m W Operator: Northumbrian Water Ltd Installation Name: Industrial Effluent Treatment Works Date: 30/01/2020 Status: Effective Activities: (Effective Only): Disposal Of > 50 T/D Non-Hazardous Waste (> 100 T/D If Only Ad) Involving Biological Treatment; Disposal Or Recovery Of Hazardous Waste With A Capacity Exceeding 10 Tonnes Per Day Involving Biological Treatment; Temporary Storage Of Haz Waste; Disposal Of > 50 T/D Non-Hazardous Waste (> 100 T/D If Only Ad) Involving Biological Treatment. 2 No. Distance: 35 m W

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Operator: AIR PRODUCTS PLC Installation Name: WILTON HYDROGEN PLANT Date: 09/05/2013 (Most Recent Effective) Status: SURRENDER EFFECTIVE Activities: GASIFICATION, LIQUIFAC. AND REFINING; REFORMING NATURAL GAS Distance: 75 m W Operator: RENEW WILTON LIMITED Installation Name: WILTON HYDROTHERMAL UPGRADING FACILITY EPR/XP3703PE Date: 25/11/2020 (Effective) Status: Effective Activities: ORGANIC CHEMICALS; HYDROCARBONS EG AROMATICS 8 No. Distance: 140 m N Operator: NORTHUMBRIAN WATER LTD Installation Name: BRAN SANDS EFFLUENT TREATMENT WORKS Date: 12/01/2016 (Most Recent Effective) Status: Effective Activity: Disposal Or Recovery Of Hazardous Waste With A Capacity Exceeding 10 Tonnes Per Day Involving Biological Treatment / Created By Ied – Disposal Of > 50 T/D Non-Hazardous Waste (> 100 T/D If Only Ad) Involving Biological Treatment / Created By Ied - Disposal Or Recovery Of

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Hazardous Waste With A Capacity Exceeding 10 Tonnes Per Day Involving Biological Treatment 161 No. Distance: 135 m E Operator: Harsco Metals Group Ltd Installation Name: TEESIDE INTEGRATED IRON & STEELWORKS EPR/PP3338MT Date: 08/11/2021 (Most Recent Effective) Status: Surrender Effective Activity: Associated Processes 43 No. Distance: 135 m E Operator: Sahaviriya Steel Industries UK Limited Installation Name: TEESIDE INTEGRATED IRON & STEELWORKS EPR/JP3638HM Date: 16/09/2020 (Most Recent Effective) Status: Revoked Activity: Other Mineral Activities; Loading etc, coal etc (except on retail sale unless exempt location) 10 No. Distance: 25 m SE Operator: SEMBCORP UTILITIES (UK) LTD

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Installation Name: WILTON NO 2 GAS TURBINE EPR/XP3839XV Date: 27/05/2020 (Most Recent Effective) Status: Effective (Most Recent) Activities: COMBUSTION; ANY FUEL =>50MW / ASSOCIATED PROCESS 37 No. Distance: 140 m NW Operator: SEMBCORP UTILITIES (UK) LTD Installation Name: WILTON 10 POWER STATION / WILTON 10 POWER STATION EPR/NP3838LV / WILTON 11 EFW EPR/XP3436WB / WILTON WASTE TREATMENT PLANT - EPR/MP3136HW Date: 23/12/2015 (Most Recent Effective) Status: Effective Activities: Combustion; Any Fuel =>50mw / The Incineration Of Non-Hazardous Waste In An Incineration Or Co-Incineration Plant With A Capacity Exceeding 3 Tonnes Per Hour / Other Mineral Activities; Loading, Unloading, Or Storing Pulverised Fuel Ash In Bulk Prior To Further Transportation In Bulk (Most Recent) Distance: 200 m W Operator: DOW (WILTON) LTD Installation Name: - Date: - Status: Superseded by PAS Activity: Organic Chemicals; Oxygen Containing Compounds Eg Alcohols 3 No.

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 195 m NW Operator: DOW (WILTON) LTD Installation Name: Wilton Ethylene Oxide and Glycol Date: 21/11/2012 (Most Recent Effective) Status: Surrender Effective Activity: Organic Chemicals; Oxygen Containing Compounds e.g. Alcohols Distance: 75 m W Operator: HUNTSMAN POLYURETHANES (UK) LTD Installation Name: - Date: - Status: SUPERSEDED BY PAS Activities: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS 9 No. Distance: 15 m E Operator: HUNTSMAN POLYURETHANES (UK) LTD Installation Name: WILTON POLYURETHANES Date: 18/10/2016 (Most Recent Effective) Status: Effective (Most Recent) Activities: ORGANIC CHEMICALS; NITROGEN CONTAINING COMPOUNDS EG AMINES 3 No. Distance 35 m NE

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Operator: ENGIE SERVICES LIMITED Installation Name: Date: 31/07/2017 (Effective) Status: Effective Activities: ASSOCIATED PROCESS / ORGANIC CHEMICALS; NITROGEN CONTAINING COMPOUNDS EG AMINES 2 No. Distance: 30 m E Operator: ITI POWER (WILTON) LTD Installation Name: WILTON GASIFICATION PLANT EPR/UP3736US Date: 22/11/2016 (Most Recent Effective) Status: Revoked Activities: THE INCINERATION OF NON-HAZARDOUS WASTE IN AN INCINERATION OR CO-INCINERATION PLANT WITH A CAPACITY EXCEEDING 3 TONNES PER HOUR. 20 No. Distance: 125 m SE Operator: SABIC UK PETROCHEMICALS LIMITED Installation Name: WILTON OLEFINS INSTALLATION EPR/BS3590IE Date: 18/01/2022 (Most Recent Effective) Status: Effective Activities: COMBUSTION; ANY FUEL =>50MW / ORGANIC CHEMICALS; HYDROCARBONS EG AROMATICS

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 150 m NW Operator: ARTENIUS UK LTD Installation Name: WILTON TERAPHALIC ACID/MELINAR PLANT Date: 30/09/2004 (Effective) Status: Superseded Activities: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS Distance: 150 m E Operator: POWER MINERALS LIMITED Installation Name: BIOLITE TREATMENT CENTRE EPR/DB3606TQ Date: 26/11/2019 Status: Effective Activities: CHEMICAL FERTILISERS; PRODUCING ETC PHOSPHOROUS, NITROGEN OR POTASSIUM BASED FERTILISERS ETC 26 No. Distance: 235 m SW Operator: INVISTA TEXTILES (UK) LTD Installation Name: WILTON NYLON WORKS Date: 08/07/2011 (Most Recent Effective) Status: SURRENDER EFFECTIVE Activities: ORGANIC CHEMICALS; PLASTIC MATERIALS EG POLYMERS / ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		ALCOHOLS / ORGANIC CHEMICALS; NITROGEN CONTAINING COMPOUNDS EG AMINES 14 No. Distance: 210 m SW Operator: ENSUS UK LTD Installation Name: WILTON BIOETHANOL PLANT - EPR/VP3831XJ Date: 16/02/2022 (Most Recent Effective) Status: Effective Activities: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS / ASSOCIATED PROCESS / ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D 4 No. Distance: 90 m SE Operator: Sembcorp Utilities UK Ltd Installation Name: Date: 26/05/2020 (Most Recent Effective) Status: Effective Activities: Combustion; Any Fuel =>50MW 5 No. Distance: 250 m SE Operator: Sabic UK Petrochemicals Installation Name:

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Date: 01/10/2007 (Most Recent Effective) Status: Effective Activities: Organic Chemicals; Hydrocarbons e.g. Aromatics
Licensed Pollutant Release (Part A(2)/B)	-	Distance: 220 m NW Location: M&G Solid Fuels LLP, M&G Compound, Steel Works, Redcar, TS6 6UG Status: Current Permit Process: Coal & Coke Permit Type: Part B Enforcements: No Enforcements Notified
Licensed Discharges to Controlled Waters	Permit Number: 254/E/0286 Location: ESTON TRUNK SEWER OUTFALL, ESTON Receiving Water: TEES Date: 17/01/2002 (Revoked) Status: REVOKED (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Details: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - WATER COMPANY Permit Number: 254/1106 Location: Amoco-Cats Project, Tees Tunnel, Ic, Middlesbrough Receiving Water: Tees (Saline)	3 No. Distance: 15 m S Permit Number: 25/04/1646 Location: ESTON PUMPING STATION, ADJACENT TO BRAN SANDS STW, TEES DOCK ROAD, MIDDLESBROUGH Receiving Water: DABHOLM GUT Date: 29/05/2007 (Most Recent Effective) Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Details: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Distance: 50 m N Permit Number: 254/1462

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
	Date: 30/09/1992 (Revoked) Status: Revoked - Unspecified Details: Miscellaneous Discharges - Mine/Groundwater As Raised Permit Number: 25/04/1799 Location: TOD POINT 275KV SUBSTATION, TRUNK ROAD (WEST OF), REDCAR, CLEVELAND, TS10 5BW Receiving Water: SOAKAWAY - GROUNDWATER Date: 25/03/2011 (Revoked) Status: SURRENDERED UNDER EPR 2010 Details: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 25/04/1799 Location: TOD POINT 275KV SUBSTATION, TRUNK ROAD (WEST OF), REDCAR, CLEVELAND, TS10 5BW Receiving Water: SOAKAWAY - GROUNDWATER Date: 25/03/2011 (Revoked) Status: SURRENDERED UNDER EPR 2010 Details: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY	Location: BRAN SANDS TREATMENT PLANT, WILTON SITE CABINS, TEESSIDE Receiving Water: DABHOLM GUT Date: 29/03/2001 (Revoked) Status: REVOKED - UNSPECIFIED Details: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - WATER COMPANY X4 No. Distance: 10 m SW Permit No.: 254/1528 Address: Sembcorp Utilities Teesside Ltd, Sembcorp - Wilton, Teeside Operations, Wilton, Middlesbrough, Cleveland Status: New Consent (Wra 91, S88 & Sched 10 As Amended By Env Act 1995) Type: Making of Chemicals + Chemical Products / Basic Ind. Chemicals Organic Effluent: Trade Discharges - Process Effluent - Not Water Company / Trade Discharges - Unspecified Catchment Name: Tees (Lower), Leven, Tame 13 No. Distance: 45 m SW Permit Number: 254/1528 (Most Recent)

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Location: SEMBCORP - WILTON, TEESIDE OPERATIONS, WILTON, MIDDLESBROUGH, CLEVELAND Receiving Water: Dabholm Gut Date: 31/12/1999 (Revoked) Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Details: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Distance: 120 m S Permit Number: 254/A/0460 Location: IMPERIAL CHEMICAL INDUSTRIES LTD, WILTON WORKS MIDDLESBROUGH Receiving Water: MAINS DIKE Date: 05/10/1990 (Revoked) Status: REVOKED - UNSPECIFIED Details: Unspecified Distance: 45 m S Permit Number: 254/E/0667 Location: WILTON WORKS, WILTON Receiving Water: MAINS DIKE Date: 17/11/1976 (Revoked) Status: REVOKED - UNSPECIFIED

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Details: TRADE DISCHARGES - UNSPECIFIED Distance: 200 m SE Permit Number: 254/H/30 Location: CAVITIES WS7/WS8/WS9, WILTON WORKS, CLEVELAND Receiving Water: UNDERGROUND STRATA Date: 28/02/1991 (Revoked) Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Details: TRADE DISCHARGES - UNSPECIFIED Distance: 40 m E Permit Number: 254/H/33 Location: CAVITIES WS10/WS11, WILTON WORKS, CLEVELAND Receiving Water: UNDERGROUND STRATA Date: 28/02/1991 (Revoked) Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Details: TRADE DISCHARGES - UNSPECIFIED 90 No. Distance: 25 m S Permit Number: 25/04/1630 (Most Recent Revoked) Location: Bran Sands Treatment Works, Wilton, Redcar & Cleveland

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Receiving Water: Date: 31/03/2006 (Most Recent Revoked) Status: Varied By Application - (Wra 91 Sched 10 - As Amended By Env Act 1995) (Most Recent) Details: Sewage Discharges - Final/Treated Effluent - Water Company Distance: 75 m SW Permit Number: 25/04/1646 Location: ESTON PUMPING STATION, ADJACENT TO BRAN SANDS STW, TEES DOCK ROAD, MIDDLESBROUGH Receiving Water: DABHOLM GUT Date: 28/05/2007 (Revoked) Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Details: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY 59 No. Distance: 20 m SW Permit Number: 254/1920 Location: BRAN SANDS TREATMENT WORKS, WILTON, REDCAR & CLEVELAND Receiving Water: Dabholm Gut Date: 01/09/2011 (Most Recent Effective) Status: VARIED UNDER EPR 2010

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Details: Sewage Discharges - Stw Storm Overflow/Storm Tank - Water Company / Sewage Discharges - Pumping Station - Water Company / Sewage Discharges - Final/Treated Effluent - Water Company Distance: 25 m S Permit Number: 254/0169 Location: ICI PLC, WILTON, WILTON MIDDLESBOROUGH Receiving Water: TEES Date: 02/01/1992 (Revoked) Status: TRANSFERRED FROM COPA 1974 Details: TRADE DISCHARGES – PROCESS EFFLUENT – NOT WATER COMPANY Distance: 60 m S Permit Number: 254/B/0095 Location: RECLAMATION WORKS AT BRAN SANDS, WILTON Receiving Water: DABHOLM GUT Date: 05/10/1990 (Revoked) Status: REVOKED - UNSPECIFIED Details: TRADE DISCHARGES - BOILER BLOWDOWN EFFLUENT Distance: 85 m SW Permit Number: 254/B/0082 Location: Reclamation Works At Bran Sands, Wilton

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Receiving Water: Dabholm Gut Date: 21/09/1967 (Revoked) Status: Revoked - Unspecified Details: Trade Discharges - Boiler Blowdown Effluent 2 No. Distance: 70 m SW Permit Number: 254/0988 Location: HODGSON SPECIALITIES LTD, MIDDLESBROUGH Receiving Water: DABHOLME GUT Date: 15/06/1994 (Revoked) Status: REVOKED - UNSPECIFIED Details: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY
List 1 Dangerous Substances	-	Distance: 35 m SW Location: Sembcorb Utilities Teeside Ltd, TS6 8JA Receiving Water: River Tees Substances: Mercury (other), Cadmium Status: Active Distance: 140 m N Location: Northumbrian Water Ltd Receiving Water: River Tees Substances: Mercury (other), Cadmium

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Status: Active Distance: 135 m S Location: Ici Wilton Complex Main Effluent Receiving Water: River Tees Substances: Mercury (other), Cadmium, Chloroform, 1,2-dichloroethane Status: Active Distance: 210 m SW Location: Dow Wilton Ltd Redcar TS10 4YF Receiving Water: River Tees Substances: Mercury (other), Cadmium Status: Active Distance: 15 m E Location: Huntsman Polyurethanes Uk Ltd Wilton TS10 4YA Receiving Water: River Tees Substances: Mercury (other), Cadmium Status: Active Distance: 90 m SE Location: Sembcorp Utilities (UK) Ltd, Wilton, Middlesborough, TS90 8WS Receiving Water: Any

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Substances: Mercury (other), Cadmium Status: Active Distance: 75 m NW Location: Sembcorp Utilities UK Ltd TS90 8WS Receiving Water: River Tees Substances: Mercury (other), Cadmium Status: Active Distance: 230 m SW Location: Invista (uk) Ltd Wilton Site TS6 8JJ Receiving Water: River Tees Substances: Mercury (other), Cadmium Status: Active Distance: 110 m S Location: Huntsmen Petrochemicals UK Ltd Wilton TS10 4YA Receiving Water: River Tees Substances: Mercury (other), Cadmium, 1,2-dichloroethane Status: Active
List 2 Dangerous Substances	-	Distance: 30 m NE Location: Bulkhaul Limited Receiving Water: - Substances: Chromium, Nickel, Zinc

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Status: Active Distance: 30 m NE Location: Uk Tank Cleaning Services Ltd Receiving Water: - Substances: Toluene Status: Not Active Distance: 30 m NE Location: Bran Sands Treatment Works Combined Receiving Water: River Tees Substances: Copper Status: Not Active Distance: 30 m NE Location: Terra Vac Uk Ltd Receiving Water: Unknown Substances: Benzene, Toluene, Xylene Status: Not Active Distance: 30 m NE Location: Tj Thomson & Son Stockton Receiving Water: - Substances: Chromium, Copper, Lead, Zinc

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Status: Active Distance: 30 m NE Location: Cleanaway Ltd, Choppington Receiving Water: - Substances: Xylene (m+p) Status: Active Distance: : 25 m S Location: Bran Sands Outfall Receiving Water: River Tees Substances: Chromium, Copper, Lead, Nickel, Vanadium, Zinc, Benzene, Toluene, Xylene Status: Active Distance: 25 m S Location: Bran Sands Treatment Works Receiving Water: None Substances: pH Status: Active Distance: 25 m S Location: Sembcorp Wilton Receiving Water: River Tees

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Substances: Chromium, Copper, Cyanide, Zinc, Benzene, Toluene, Xylene Status: Active Distance: 150 m NE Location: Northumbrian Water Ltd Receiving Water: River Tees Substances: Copper Status: Active Distance: 15 m E Location: Huntsmen Polyurethanes Uk Ltd Wilton TS10 4YA Receiving Water: Unknown Substances: Benzene Status: Not Active Distance: 230 m SW Location: Invista (UK) Ltd Wilton Site TS6 8JJ Receiving Water: River Tees Substances: Copper Status: Active Distance: 230 m SW Location: Wilton Nylon Works TS6 8JJ Receiving Water:

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Substances: Copper Status: Not Active 2 No. Distance: 115 m SE Location: Huntsmen Petrochemicals Uk Ltd Wilton TS10 4YA Receiving Water: River Tees Substances: Zinc, Benzene, Toluene, Xylene Status: Active Distance: 115 m SE Location: Huntsmen Petrochemicals Middlesborough TS2 1TT Receiving Water: North Sea Substances: Benzene, Toluene, Xylene Status: Active Distance: 200 m E Location: Corus UK Ltd Redcar TS10 5QW Receiving Water: North Sea Substances: Cyanide Status: Active
Pollutant Release to Surface Waters	-	Distance: 50 m SW Permit Number: 254/1528 Location: SEMBCORP UTILITIES UK LTD, SEMBCORP - WILTON, TEESIDE

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		OPERATIONS, WILTON, MIDDLESBROUGH, CLEVELAND Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Type: Basic Ind. Chemicals Organic Effluent Type: TRADE DISCHARGES – UNSPECIFIED Catchment: Not Specified 3 No. Distance: 10 m SW Permit Number: 254/1528 Location: SEMBCORP UTILITIES TEESSIDE LTD, SEMBCORP - WILTON, TEESIDE OPERATIONS, WILTON, MIDDLESBROUGH, CLEVELAND Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Type: Making of Chemicals + Chemical Products / Basic Ind. Chemicals Organic Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Catchment: Not Specified
Pollution Incidents	Incident ID: 160665 Date: 25/05/2003 Air Category: 3 (No Impact) Land Category: 4 (No Impact) Water Category: 3 (Minor)	Distance: 185 m NE Incident ID: 721753 Date: 03/10/2009 Air Category: 2 (Significant) Land Category: 3 (Minor) Water Category: 4 (No Impact)

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
	Pollutant Type: Organic Chemicals/Products Pollutant: Other Organic Chemical or Product Incident ID: 106544 Date: 09/09/2002 Air Category: 4 (No Impact) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Sewage Materials Pollutant: Other Sewage Material	Pollutant Type: Atmospheric Pollutants and Effects Pollutant: Dust Distance: 40 m NE Incident ID: 1256199 Date: 15/07/2014 Air Category: 4 (No Impact) Land Category: 4 (No impact) Water Category: 2 (Significant) Pollutant Type: Sewage Materials Pollutant: Crude Sewage Distance: 20 m SW Incident ID: 495387 Date: 16/05/2007 Air Category: 3 (Minor) Land Category: 44 (No Impact) Water Category: 2 (Significant) Pollutant Type: Organic Chemicals / Products Pollutant: Other Organic Chemicals or Product Distance: 50 m N Incident ID: 1639506 Date: 01/08/2018

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Air Category: 2 (Significant) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Atmospheric Pollutants and Effects Pollutant: Other Odour 2 No. Distance: 50 m N Incident ID: 1638541 Date: 30/07/2018 Air Category: 2 (Significant) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Atmospheric Pollutants and Effects Pollutant: Chemical Odour Distance: 60 m N Incident ID: 23011 Date: 09/08/2001 Air Category: 4 (No Impact) land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Pollutant Not Identified Pollutant: Not Identified

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 110 m NE Incident ID: 156749 Date: 5/8/2003 Air Category: 4 (No Impact) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Sewage Materials Pollutant: Final Effluent 2 No. Distance: 130 m W Incident ID: 83574 Date: 07/06/2002 Air Category: 3 (Minor) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Atmospheric Pollutants and Effects Pollutant: Other Atmospheric Pollutant or Effect Distance: 240 m SW Incident ID: 114797 Date: 15/10/2002 Air Category: 4 (No Impact) Land Category: 4 (No Impact)

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Water Category: 2 (Significant) Pollutant Type: Organic Chemicals/Products Pollutant: Other Organic Chemical or Product Distance: 185 m N Incident ID: 1517389 Date: 21/04/2017 Air Category: 4 (No Impact) Land Category: 2 (Significant) Water Category: 4 (No Impact) Pollutant Type: Specific Waste Materials Pollutant: Other Specific Waste Material
Pollution Inventory Substances	-	3 No.: Distance: 80 m W Operator: Redcar Bulk Terminal Ltd Location: Teesside Integrated Iron and Steelworks Cleveland, TS10 5QW Activity: FERROUS METALS; HANDLING ETC >500,000 TONNES/12 MONTHS Regulated Industry Sector/Sub Sector: Ferrous Metals 36 No. Permit ID: 254/1920 and LP3439LK Distance: 125 m N Operator: NORTHUMBRIAN WATER LTD Location: Industrial Effluent Treatment Works, Bran Sands Tees Dock

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Road Cleveland Regulated Industry Sector / Sub Sector: Water Industry Distance: 15 m E Permit ID: BS8656IX Operator: HUNTSMAN POLYURETHANES (UK) LTD Location: Wilton Polyurethanes Polyurethanes Building PO Box 99 Wilton Cleveland Activity: ORGANIC CHEMICALS; NITROGEN CONTAINING COMPOUNDS EG AMINES Regulated Industry Sector/Sub Sector: Chemicals 13 No. Distance: 140 m NW Permit ID: XP3436WB / NP3838LV / Operator: Suez Recycling And Recovery Uk Ltd Location: Wilton 11 EfW Wilton International Redcar and Cleveland Activity: Disposal Or Recovery Of Hazardous Waste With A Capacity Exceeding 10 Tonnes Per Day Involving Physico-Chemical Treatment / Combustion; Any Fuel =>50mw / Incineration, Other Than In Course Of Burning Landfill Gas, Solid Or Liquid Waste, Of Any Gaseous Compound Containing Halogens In A Plant Which Is Not An Incineration Or A Co-Incineration Plant. Regulated Industry Sector/Sub Sector: Efw

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 20 m SE Permit ID: XP3839XV Operator: SEMBCORP UTILITIES (UK) LTD Location: Wilton No 2 Gas Turbine SembCorp UK Headquarters PO Box 1985 Wilton International Middlesbrough North Yorkshire Activity: COMBUSTION; ANY FUEL =>50MW Regulated Industry Sector/Sub Sector: Power / Combustion 14 No. Distance: 115 m W Permit ID: BS3590IE Operator: Sabic UK Petrochemicals Limited Location: Wilton Olefins Installation Olefins Offices Wilton International Redcar and Cleveland Activity: ORGANIC CHEMICALS; HYDROCARBONS EG AROMATICS Regulated Industry Sector/Sub Sector: Chemicals Distance: 200 m SW Permit ID: VP3831XJ Operator: Ensus Ltd Location: Wilton Bioethanol Plant Middleway Middlesbrough Redcar and Cleveland Activity: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS Regulated Industry Sector/Sub Sector: Chemicals

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		4 No. Distance: 245 m N Permit ID: MP3533TG / BX5379IE Operator: Alpek Polyester UK Ltd / NORTHUMBRIAN WATER LTD Location: Wilton Teraphalic Acid/Melinar Plant Tees Dock Road Middlesbrough / Wilton Polyester Manufacturing, Davies Offices Wilton International Wilton Redcar and Cleveland Activity: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS / ORGANIC CHEMICALS; HYDROCARBONS EG AROMATICS Regulated Industry Sector/Sub Sector: Chemicals 3 No. Distance: 210 m E Permit ID: RP3434HP Operator: Sahaviriya Steel Industries UK Limited Location: Teeside Integrated Iron & Steelworks,Steel House Cleveland Activity: Waste Landfilling; >10 T/D with capacity >25,000T excluding inert waste Regulated Industry Sector/Sub Sector: Non Hazardous Landfill Distance: 90 m SE Permit ID: LP3531UL Operator: SEMBCORP UTILITIES (UK) LTD Location: Package Boiler Island Sembcorp UK Headquarters Wilton International Cleveland

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Activity: COMBUSTION; ANY FUEL =>50MW Regulated Industry Sector/Sub Sector: Power Combustion Distance: 65 m NW Permit ID: NP3438LK Operator: SEMBCORP UTILITIES (UK) LTD Location: Wilton No. 1 Gas Turbine Wilton International Cleveland Activity: COMBUSTION; ANY FUEL =>50MW Regulated Industry Sector/Sub Sector: Power / Combustion 2 No. Distance: 250 m SE Permit ID: BU4520IZ Operator: Sabic UK Petrochemicals Location: Wilton Paraxylene, PARAXYLENE PLANT LITTLEBECK OFFICES PO BOX 99 CLEVELAND Activity: Organic Chemicals; Hydrocarbons e.g. Aromatics Regulated Industry Sector/Sub Sector: Chemicals
Pollution Inventory Waste Transfer	-	Distance: 80 m W Operator: Redcar Bulk Terminal Ltd Location: Teesside Integrated Iron and Steelworks Cleveland, TS10 5QW Activity: FERROUS METALS; HANDLING ETC >500,000 TONNES/12 MONTHS Regulated Industry Sector/Sub Sector: Ferrous Metals

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 70 m NW Operator: SEMBCORP UTILITIES (UK) LTD Location: Wilton No. 1 Gas Turbine Wilton International Cleveland Activity: COMBUSTION; ANY FUEL =>50MW Regulated Industry Sector/Sub Sector: Combustion / Power Distance: 210 m E Permit ID: RP3434HP Operator: Sahaviriya Steel Industries UK Limited Location: Teeside Integrated Iron & Steelworks, Steel House Cleveland Activity: Waste Landfilling; >10 T/D with capacity >25,000T excluding inert waste Regulated Industry Sector/Sub Sector: Non Hazardous Landfill Distance: 210 m E Permit ID: PP3338MT Operator: Harsco Metals Group Ltd Location: Teeside Integrated Iron & Steelworks, Steel House Cleveland Activity: Associated Processes Regulated Industry Sector/Sub Sector: Ferrous Metals 2 No.

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 155 m N Operator: NORTHUMBRIAN WATER LTD Location: Industrial Effluent Treatment Works,Bran Sands Tees Dock Road Cleveland Activity: Disposal Of > 50 T/D Non-Hazardous Waste (> 100 T/D If Only Ad) Involving Biological Treatment Regulated Industry Sector / Sub Sector 3 No. Distance: 145 m NW Operator: SEMBCORP UTILITIES (UK) LTD / Suez Recycling And Recovery Uk Ltd / CLEANSING SERVICE GROUP LTD Location: Wilton 10 Power Station Wilton / Wilton 11 Efw Wilton International Redcar And Cleveland / (Cleansing Service Group Limited) Wilton Waste Treatment Plant Wilton Waste Treatment Plant Boundary Road West Wilton International Cleveland Activity: INCINERATION, OTHER THAN IN COURSE OF BURNING LANDFILL GAS, SOLID OR LIQUID WASTE, OF ANY GASEOUS COMPOUND CONTAINING HALOGENS IN A PLANT WHICH IS NOT AN INCINERATION OR A CO-INCINERATION PLANT. / COMBUSTION; ANY FUEL =>50MW / DISPOSAL OR RECOVERY OF HAZARDOUS WASTE WITH A CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING PHYSICO-CHEMICAL TREATMENT Regulated Industry Sector / Sub Sector: EfW and Hazardous Waste

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Distance: 20 m SE Operator: SEMBCORP UTILITIES (UK) LTD Location: Wilton No 2 Gas Turbine SembCorp UK Headquarters PO Box 1985 Wilton International Middlesbrough North Yorkshire Activity: COMBUSTION; ANY FUEL =>50MW Regulated Industry Sector / Sub Sector: Combustion / Power Distance: 15 m E Operator: HUNTSMAN POLYURETHANES (UK) LTD Location: Wilton Polyurethanes Polyurethanes Building PO Box 99 Wilton Cleveland Activity: ORGANIC CHEMICALS; NITROGEN CONTAINING COMPOUNDS EG AMINES Regulated Industry Sector / Sub Sector: Chemicals Distance: 245 m NW Operator: Alpek Polyester UK Ltd Location: Wilton Polyester Manufacturing,Davies Offices Wilton International Wilton Redcar and Cleveland Activity: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS Regulated Industry Sector / Sub Sector: Chemical Distance: 120 m SE Operator: Sabic UK Petrochemicals Limited Location: Wilton Olefins Installation Olefins Offices Wilton International

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Redcar and Cleveland Activity: ORGANIC CHEMICALS; HYDROCARBONS EG AROMATICS Regulated Industry Sector / Sub Sector: Chemicals Distance: 200 m SW Operator: Ensus Ltd Location: Wilton Bioethanol Plant Middleway Middlesbrough Redcar and Cleveland Activity: ORGANIC CHEMICALS; OXYGEN CONTAINING COMPOUNDS EG ALCOHOLS Regulated Industry Sector / Sub Sector: Chemicals
Other Gases Connection Corridor		
Control of Major Accident Hazards (COMAH)	Current Name: South Tees Site Company Limited Location: South Tees Site Company Limited, Redcar, Steel House, Trunk Road, Redcar, Cleveland, TS10 5QW Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Name: BOC Limited Location: BOC Limited, Middlesbrough Tees Dock Road, Tees Dock Road, Middlesbrough, Cleveland, TS6 7RT Hazardous Substance: Unknown	250 m W: Name: Tees Hartlepool Port Authority Location: Tees & Hartlepool Port Authority, Tees Dock, Lackenby, Middlesbrough Hazardous Substance: Unknown Date: - Tier: Historical NIHHS Site

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
	Date: - Tier: Upper Tier Operator Historical Name: Sahaviriya Steel Industries Uk Limited Location: Sahaviriya Steel Industries Uk Limited, Steel House, Redcar, Cleveland, TS10 5QW Hazardous Substance: Unknown Date: - Tier: Upper Tier Operator Name: British Steel Corporationltd(bsc) Location: British Steel Corporation ltd (bsc), Redcar Works, Redcar Hazardous Substance: Unknown Date: - Tier: Historical NIHHS Site	
Hazardous Substance Storage	-	-
Licensed Industrial Activities Part A1	-	2 No.: Distance: 220 m N Operator: British Steel Limited Installation Name: Teeside Integrated Iron & Steelworks EPR/VP3839DA and Teesside Beam Mill EPR/VP3839DA Date: 19/12/2018 (most Recent Effective) Status: Superseded

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Activity: Associated Processes 3 No.: Distance: 80 m W Operator: Redcar Bulk Terminal Ltd Installation Name: Teeside Integrated Iron & Steelworks EPR/QP3338HU Date: 28/08/2018 (Effective All) Status: Effective (All) Activity: Other Mineral Activities; Loading Etc Coal Etc (Except On Retail Sale) (Unless Exempt Location); Other Mineral Activities; Screening Etc Coal Etc (Unless Exempt Location; Ferrous Metals; Handling Etc >500,000 Tonnes/12 Months 4 No. Effective (18No. Superseded) Distance: 20 m W Operator: Northumbrian Water Ltd Installation Name: Industrial Effluent Treatment Works Date: 30/01/2020 Status: Effective Activities: (Effective Only): Disposal Of > 50 T/D Non-Hazardous Waste (> 100 T/D If Only Ad) Involving Biological Treatment; Disposal Or Recovery Of Hazardous Waste With A Capacity Exceeding 10 Tonnes Per Day Involving Biological Treatment; Temporary Storage Of Haz Waste; Disposal Of > 50 T/D Non-Hazardous Waste (> 100 T/D If Only Ad) Involving Biological Treatment.

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		1 No.: Distance: 100 m W Operator: Northumbrian Water Ltd Installation Name: Bran Sands Regional Sludge Treatment Centre Date: 08/05/2006 (Effective) Status: Superseded Activity: Fuel From Waste; Making Solid Fuel From Waste by Using Heat (Except Charcoal) 2 No.: Distance: 100 m W Operator: Northumbrian Water Ltd Installation Name: Bran Sands Effluent Treatment Works Date: 29/09/2006 (Effective) Status: Superseded Activity: Other Waste Disposal; Hazardous Waste >10t/D; Combustion; Waste Derived Fuel =>3mw But <50mw
Licensed Discharges to Controlled Waters	-	Distance: 155 m SW 2 No.: Permit Number: 254/1423 Location: BOC LIMITED, TEES DOCK ROAD MIDDLESBOROUGH Receiving Water: Land Date: 26/07/2012 (Most Recent Effective) Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		ACT 1995) Details: TRADE DISCHARGES - COOLING WATER Distance: 95 m W 3 No. Permit Number: 25/04/1646 Location: ESTON PUMPING STATION, ADJACENT TO BRAN SANDS STW, TEES DOCK ROAD, MIDDLESBROUGH Receiving Water: DABHOLM GUT Date: 29/05/2007 (Effective) Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Details: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Distance: 220 m W Permit Number: 254/1462 Location: BRAN SANDS TREATMENT PLANT, WILTON SITE CABINS, TEESSIDE Receiving Water: DABHOLM GUT Date: 29/03/2001 (Revoked) Status: Revoked Details: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - WATER COMPANY 2 No.: Distance: 220 m SE Permit Number: 254/E/0045

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Location: Lackenby Steel Works, Hydraulic Pump, Lackenby Receiving Water: Dabholme Beck Date: 30/09/1996 (Revoked) Status: Transferred from R(PP)A 1951-1961 Details: Sewage Discharges (Final / Treated Effluent – Not Water Company) Distance: 225 m SE Permit Number: 254/E/0051 Location: Lackenby Steel Works, Lackenby, Grangetown, Middlesbrough Receiving Water: Dabholme Beck Date: 12/01/2014 (Revoked) Status: Revoked
List 2 Dangerous Substances	-	Distance: 125 m SE Location: Walon Ltd T/a Walon Uk Receiving Water: Unknown Substances: Benzene, Toluene, Xylene Status: Not Active
Pollution Incidents	-	Distance: 90 m W Incident ID: 1256199 Date: 15/07/2014 Air Category: 4 (No Impact) Land Category: 4 (No impact) Water Category: 2 (Significant) Pollutant Type: Sewage Materials

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Pollutant: Crude Sewage 2 No.: Distance: 175 m W Incident ID: 1638541 Date: 30/07/2018 Air Category: 2 (Significant) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Atmospheric Pollutants and Effects Pollutant: Chemical Odour Distance: 175 m W Incident ID: 1639506 Date: 01/08/2018 Air Category: 2 (Significant) Land Category: 4 (No Impact) Water Category: 4 (No Impact) Pollutant Type: Atmospheric Pollutants and Effects Pollutant: Other Odour
Pollution Inventory Substances	-	Distance: 85 m W Operator: Redcar Bulk Terminal Ltd Location: Teesside Integrated Iron and Steelworks Cleveland, TS10 5QW Activity: FERROUS METALS; HANDLING ETC >500,000 TONNES/12 MONTHS

RELEVANT FEATURE	ONSITE	OFFSITE (<250 m)
		Regulated Industry Sector/Sub Sector: Ferrous Metals
Pollution Inventory Waste Transfer	-	Distance: 85 m W Operator: Redcar Bulk Terminal Ltd Location: Teesside Integrated Iron and Steelworks Cleveland, TS10 5QW Activity: FERROUS METALS; HANDLING ETC >500,000 TONNES/12 MONTHS Regulated Industry Sector/Sub Sector: Ferrous Metals

Sensitive Land Use

Sites of Special Scientific Interest

10A.2.149 SSSIs provide statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. A summary of the SSSIs within 1 km of the Main Site and associated Connection Corridors is presented in Table 10A-38.

Table 10A-38: Summary of Sites of Special Scientific Interest within 1 km

SSSI SITE	APPROXIMATE DISTANCE/DIRECTION TO SITE
Teesmouth and Cleveland Coast	Main Site – Directly north CO_2 Export Corridor – Directly north Natural Gas Connection Corridor – Directly north Water Connection Corridor – Directly north Electrical Connection Corridor – Directly north Hydrogen Pipeline Corridor – onsite Other Gases – onsite

Ramsar Sites

10A.2.150 Ramsar sites are designated under the Convention on Wetlands of International Importance. A summary of Ramsar sites within 1 km of the Main Site and associated Connection Corridors in presented in Table 10A-39.

Table 10A-39: Summary of Ramsar Sites within 1 km

RAMSAR SITE	APPROXIMATE DISTANCE/DIRECTION TO SITE
Teesmouth and Cleveland Coast	Main Site – 150 m north Carbon Dioxide Export Corridor – 280 m north Natural Gas Connection Corridor – 570 m north Water Connection Corridor – 280 m north Electrical Connection Corridor – 280 m north Hydrogen Pipeline Corridor – on site

Nitrate Vulnerable Zones

10A.2.151 The Environment Agency defines Nitrate Vulnerable Zones (NVZs) as areas designated as being at risk from agricultural nitrate pollution.

10A.2.152 The majority of the Proposed Development Site is not located within an NVZ.

10A.2.153 The very western area of the Hydrogen Pipeline Corridor is located within an NVZ. The area is located along Haverton Hill Road and surrounding area.

Radon

10A.2.154 A summary of the radon potential at the Main Site and associated Connection Corridors is presented in Table 10A-40.

Table 10A-40: Radon Potential

LOCATION	RADON POTENTIAL
Main Site	The Main Site lies mostly within an area where between 1 and 3 % of homes are at or above the Action Level for radon. Radon protection measures are likely required under this scenario.
CO_2 Export Corridor	Mostly within an area where between 1 and 3 % of homes are at or above the Action Level for radon. Radon protection measures are likely required under this scenario. A small proportion of the CO_2 Export Corridor in the south-eastern corner lies within an area where less than 1 % of homes are at or above the Action Level.
Natural Gas Connection Corridor	Majority lies within an area where less than 1 % of homes are at or above the Action Level for radon. A small proportion of the Natural Gas Connection Corridor, in the north and north-western corner, lies within an area of elevated radon potential where the maximum radon potential is between 1 and 3 %. Radon protective measures are likely to be required in areas of elevated radon.
Water Connection Corridor	Majority lies within an area where less than 1 % of homes are at or above the Action Level for radon. A small proportion of the Water Connection Corridor to the north and west lie within an area where between 1 and 3 % of homes are at or above the Action Level. Radon protective measures are likely to be required within the areas of elevated radon.
Electrical Connection Corridor	Mostly within an area where between 1 and 3 % of homes are at or above the Action Level for radon. Radon protection measures are likely required under this scenario. The southern proportion of the Electrical Connection Corridor in the south-eastern corner lies within an area where less than 1 % of homes are at or above the Action Level.
Hydrogen Pipeline Corridor	The area of the Hydrogen Pipeline Corridor to the north of the River Tees, lies within an area where less than 1 % of homes are at or below the action level for radon. Elevated areas of radon (1% and 3%) are present from the boundary of the south of the River Tees to and encompassing the central area of Trunk Road. Radon protective measures are likely to be required in areas of elevated radon.
Other Gases Connection Corridor	The north of the Other Gases Connection Corridor within the South Tees Development Corporation (STDC) site is within an area where less than 1 % of homes are at or above the Action Level. To the south of the Other Gases Connection Corridor, the maximum radon potential is 1 to 3 %. Radon protective measures are likely to be required in the areas of elevated radon.

UXO

Main Site

10A.2.155 According to the Zetica Unexploded Ordnance (UXO) Risk Maps (Zetica, n.d.), the Main Site is considered to be in an area of Low risk. Mapping shows an area to the east of the Main Site was a historical Luftwaffe Target, therefore there may be a possibility of UXO being present.

10A.2.156 A Detailed Unexploded Ordnance (UXO) Desktop Survey (Annex D) was obtained for the Main Site and is summarised here:

- the Redcar Iron Works (located partially on-Site) was a primary Luftwaffe target;
- historical records identify significant bombing within the area and on-Site, with bomb damage recorded to the iron furnaces, mill boilers and a gas cleaning plant within the Redcar Iron Works; and
- it is considered highly likely munitions may have been stored, located and/or fired from the Site.

10A.2.157 The report concluded with given that extensive WWII bombing was recorded potentially on-site and/or in the immediate vicinity of the Main Site, combined with the extensive military installations and minefields located on-site and the possibility that the proposed intrusive works will encounter previously undisturbed ground below ground level in areas of the Main Site, a combination of the following was required:

- UXO Emergency Response Plan;
- UXO Safety and Awareness Briefing;
- Explosive Ordnance Disposal Engineer Watching Brief – for Open Intrusive Works; and
- Intrusive Magnetometer Survey – for Closed Intrusive Works.

CO_2 Export Corridor

10A.2.158 According to the Zetica UXO Risk Maps (Zetica, n.d.), the CO_2 Export Corridor is considered to be in an area of Low risk. Mapping shows a historical Luftwaffe Target located in the northern extent of the Corridor, therefore there may be a possibility of UXO being present at the corridor.

Natural Gas Connection Corridor

10A.2.159 According to the Zetica UXO Risk Maps (Zetica, n.d.), the Natural Gas Connection Corridor is considered to be in an area of Low risk. Mapping shows an area to the west of Corridor was a historical Luftwaffe Target (approximately 85 m W), therefore there may be a possibility of UXO being present at the corridor.

Water Connection Corridor

10A.2.160 According to the Zetica UXO Risk Maps (Zetica, n.d.), the Water Connection Corridor is considered to be in an area of Low risk. Mapping shows an area in the north-east

extent of the Corridor was a historical Luftwaffe Target, therefore there may be a possibility of UXO being present at the corridor.

Electrical Connection Corridor

10A.2.161 According to the Zetica UXO Risk Maps (Zetica, n.d.), the Electrical Connection Corridor is considered to be in an area of Low risk. Mapping shows there was a historical Luftwaffe Target located in the north-east area of the Corridor, therefore there may be a possibility of UXO being present at the corridor.

Hydrogen Pipeline Corridor

Due to the size of the Hydrogen Pipeline Corridor, the information regarding UXO at the Hydrogen Pipeline Corridor is summarised as to the north and south of the River Tees as follows:

North of the River Tees

10A.2.162 The majority of the Corridor is within an area of *Moderate* risk. A small area to the north of Greatham Creek is located within an area of *Low* risk.

10A.2.163 There are 3 No Decoy Sites Targets located within the Corridor boundary as summarised here:

- located approximately 125 m south from the Corridor near Seaton Carew Road;
- approximately 285 m south-west from the Corridor along Tees Road; and
- approximately 120 m east from the Corridor, along the A1185 Road.

10A.2.164 There are several Strategic Targets located within the vicinity of the boundary:

- 4 No. Luftwaffe Targets all located to the far south-west at approximately 115 m west, 395 m south-east, 500 m south-east and 605 m south-east.

South of the River Tees

10A.2.165 The majority of the Corridor to the south of the River Tees is located within an area of Low risk with a small area to the south-west within an area of Moderate risk.

10A.2.166 There are several Strategic Targets located within the vicinity of the boundary:

- 2 No. Decoy Sites, one located approximately 155 m south from the south-west area of the Corridor, and the other is located to the south of the Dabholme Gut, approximately 800 m west of the Corridor; and
- 2 No. Luftwaffe Targets located approximately 125 m east from the south-west extent of the Corridor and approximately 545 m north from the northern extent of the Corridor.

Other Gases Connection Corridor

10A.2.167 The Other Gases Connection Corridor is located within an area of Low risk. To southern half of the Other Gases Connection Corridor is located within an area of Moderate risk.

10A.2.168 There are two Strategic Targets located within the vicinity of the Other Gases Connection Corridor:

- Decoy Site (approximately 480 m west); and
- A Luftwaffe Target located approximately 700 m north.

Geoenvironmental and Possible Contaminative Land

10A.2.169 The geoenvironmental and possible contaminative land features associated with the Main Site and associated Connection Corridors are discussed within Appendix 10B and Appendix 10C (ES Volume III, EN070009/APP/6.4).

10A.3 Ground Conditions

Soils Anticipated

Main Site

Artificial Ground (Made Ground)

10A.3.1 Artificial Ground (Made Ground) has been mapped across the entirety of the Main Site, except for the north-east extent of the Main Site. This is displayed in the 1:10,000 mapping displayed in the Groundsure report (Annex A).

10A.3.2 Based on previous GIs completed across the Main Site and in the neighbouring sites, extensive Artificial Ground (Made Ground) deposits can be expected. These deposits are predominantly composed of Slag, a stony waste matter separated from metals during the smelting or refining of ore – in this case from iron ore, and other waste materials that are derived as waste products from the long industrial history of the Main Site.

10A.3.3 Information derived from an array of historical boreholes and previous GIs completed onsite, the Artificial Ground (Made Ground) is described as a black sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular and includes slag, concrete, black and clinker. S2-BHA01 also noted a hydrocarbon / creosote odour. NZ52NE53 describes the Made Ground more simply as gravel and cobble sized SLAG and brick.

10A.3.4 All exploratory holes analysed for this Report recorded the presence of Artificial Ground (Made Ground), outlining its abundance across the Main Site. S1-BH16 recorded the greatest thickness of Artificial Ground (Made Ground) at 7.00 m with NZ52NE50 only recording 0.90 m of the material. Typically, however, the depths of this Artificial Ground (Made Ground) can be expected to be 4 m to 5 m in thickness.

Blown Sands

10A.3.5 Though not encountered in the exploratory logs examined in this report, Blown Sands have been mapped to be present in close proximity to the north of the Main Site. The Blown Sands are described in the literature as deposits of sand that have been blown by the wind, thus are likely to be fine grained deposits overlying the coarser grained deposits of the Tidal Flat Deposits if encountered.

Tidal Flat Deposits

10A.3.6 The Tidal Flat Deposits have been mapped extensively across the wider Teesside region, and therefore are expected to be present across the entirety of the Main Site. This is displayed in the 1:10,000 mapping in the Groundsure report (Annex A).

10A.3.7 Historical BGS data and information obtained in previous GIs completed onsite confirm the mapped presence of the Tidal Flat Deposits.

10A.3.8 All exploratory holes analysed as part of this report encountered notable thicknesses of the Tidal Flat Deposits. S1-BH16 recorded the smallest thickness of 3.90m with NZ52NE50 recording a thickness of 12.50 m.

Glacial Till and Glaciolacustrine Deposits

10A.3.9 The Glacial Till is not displayed on the 1:10,000 mapping provided in the Groundsure report (Annex A). However, from BGS historical borehole records and previously completed GIs, Glacial Till is expected to be abundant underlying the soft cohesive layers of the Tidal Flat Deposits. As it is underlying the Tidal Flat Deposits, it was not captured by the surface mapping. Within the Glacial Till, Glaciolacustrine Deposits are also often encountered.

10A.3.10 It should be noted that the Glaciolacustrine Deposits layers have been infrequently observed with only NZ52NE55 and NZ52NE50 referencing them. It should also be noted that a couple of exploratory holes – S2-BHA01 and S2-BHA03 – did not observe the Glacial Till. Therefore, it could be inferred that the Glacial Till thins towards the north-west.

Redcar Mudstone Formation

10A.3.11 The Redcar Mudstone Formation has been identified, in the BGS 1:10,000 in the geological map, as being mostly present in the southwest of the Main Site. The top of the formation is anticipated, based on the mapping of the area, to traverse the Main Site in a northeast-southwest orientation, where the formation is overlain, stratigraphically, by the Penarth Group, though this formation has not been encountered by historical borehole records.

10A.3.12 Historical BGS data and information gathered from previous GIs describe the Redcar Mudstone Formation as an extremely weak to weak grey mudstone. The weathering is typically high close to the top of stratum, becoming moderate with depth. The formation can become sandy and sometimes fossiliferous with depth. The formation has been noted to be only partially weathered at 24.00 m bgl in S1-BH16.

10A.3.13 As alluded to in the in the 1:10,000 mapping provided in the Groundsure report (Annex A), the Redcar Mudstone Formation was predominantly encountered in the in S1-BH03 and S1-BH16. This formation was also encountered in S2-BHA03 area of the Main Site, outlining the assumption that the formation may be present across the wider Main Site.

10A.3.14 The base of the Redcar Mudstone was only encountered in S1-BH16, providing a confirmed thickness of 26.55 m. Based on this, it is assumed that this formation

thins rapidly towards the north-west where it disappears from the geological stratigraphy of the Main Site.

Penarth Group

10A.3.15 Though not encountered in exploratory holes analysed in this Report, the 1:10,000 geological mapping highlights the potential presence of this formation as a thin layer, overlying the Redcar Formation. As with the Redcar Mudstone Formation, the Penarth Group is oriented north-east to south-west.

10A.3.16 The BGS Lexicon of Named Units describes the Penarth Group as a *grey to black mudstones with subordinate limestones and sandstones*.

Mercia Mudstone Formation

10A.3.17 BGS Mapping outlines that the Mercia Mudstone Formation is present, directly underlying the superficial deposits, in the north-west of the Proposed Development Site. Therefore, it should be expected that the Mercia Mudstone Formation underlays the Glacial Till or Tidal Flat Deposits across the majority Main Site. Where the Redcar Mudstone Formation and Penarth Group are present, the Mercia Mudstone Formation underlies the overlying bedrock formations.

10A.3.18 BGS historical borehole records and previously completed GIs describe the Mercia Mudstone Formation as an extremely weak to weak red brown and grey-green mudstone with distinct to slight weathering close to the top of the formation. As highlighted in the historical boreholes, the mudstone typically becomes unweathered, but moderately to highly gypsiferous below 30.00 m bgl, with unweathered fractures becoming infilled with gypsum. It is understood that larger thicknesses of gypsiferous deposits may lead to dissolution features. Owing to the depth of the of the gypsiferous mudstone, it is considered that the gypsum shall be permanently submerged below a largely static water table, hence is likely to be stable.

10A.3.19 Exploratory holes, except for S2-BHA03, within the boundaries of the Main Site observed the Mercia Mudstone directly underlying the superficial deposits confirming the assessments provided in the mapping of the Groundsure report (Annex A). S1-BH16 encountered the Mercia Mudstone underlying the Redcar Mudstone Formation south-east of the Main Site, confirming the stratigraphical assumption that the Mercia Mudstone underlies the Redcar Mudstone. It should be noted that the Penarth Group was not recorded in between these two formations.

10A.3.20 The base of the Mercia Mudstone has not been confirmed by any borehole records analysed throughout this report but was observed to a maximum depth of 45.10 m bgl.

Connection Corridors

10A.3.21 The geology anticipated across the Connection Corridors comprises of Artificial Ground (Made Ground), varied complex Superficial Deposits and bedrock of the Mercia Mudstone Group, Penarth Group, Redcar Mudstone Formation and Sherwood Sandstone (outcropping north of the River Tees). A summary of the

geology anticipated and previous BGS boreholes is presented in Section 10A.2 and is not repeated here.

Engineering Properties

10A.3.22 None available for the Proposed Development Site. GI will be undertaken.

Significance of Geological Formations

10A.1.1 The Proposed Development Site is known to be underlain by a variable complex sequence of Artificial Ground (Made Ground) and Superficial Deposits. The Artificial Ground (Made Ground) is expected to be variable in composition and depth and possible contamination from past land uses with which it is associated with the underlying bedrock is concealed beneath the Proposed Development Site varying from predominantly water bearing sandstones of the Triassic Sherwood Sandstone in the west to mainly mudrocks of the Mercia Mudstone Group, Penarth Group and Redcar Mudstone in the east. The strata are known to dip gently to the east. There are few known faults, the one notable feature is the Saltholme Fault, identified in anhydrite workings from the mothballed mine near Billingham. Other faults are likely to be present.

Groundwater Conditions

Main Site

10A.3.23 At the Main Site there are three historical boreholes, NZ52NE55, NZ52NE56 and S1-BH01, which recorded groundwater strikes at 4.80 m bgl, 4.45 m bgl (Tidal Flat Deposits) and 4.00 m bgl (Made Ground), respectively.

10A.3.24 As part of monitoring in the 2017 GI (Allied Explorations), a seven-day period of continuous monitoring was undertaken within S2-BHA01 and S2-BHA03 to analyse the tidal effects in the Groundwater regime of the Main Site. It was observed that there was limited tidal influence on the groundwater.

10A.3.25 Owing to the proximity of the Main Site to the River Tees, it is anticipated that the groundwater flow will have a gradient in the direction of the river to the west / north-west. Though it should be noted that this shall be reliant on river levels, with higher river levels typically resulting in the flow regime reversing away from the river towards the east / south-east.

10A.3.26 This data should be caveated by the age of the results with groundwater levels potentially changing with time.

Connection Corridors

10A.3.27 Groundwater levels are unknown across the Connection Corridors and GI is required. It is anticipated that groundwater may be shallow and tidally influenced in some areas of the Connection Corridors.

10A.4 Preliminary Engineering Assessment

General

10A.4.1 A preliminary geotechnical risk register is given in Appendix 10D (ES Volume III, EN070009/APP/6.4) which describes the main ground related hazards for the Proposed Development Site (excluding ground contamination) and mitigation measures which may be implemented to eliminate or reduce the risk by means of further investigation or during the design.

10A.4.2 A preliminary engineering assessment has been undertaken and is presented in the following sections. The preliminary assessment suggests that shallow foundations, including shallow pad foundations, may be considered for the Proposed Development subject to the following provisos. Given the thickness of Artificial Ground (Made Ground) deposits, shallow foundations would need to bear directly on the Artificial Ground (Made Ground) deposits. As such, they would only be suitable for light loaded, settlement tolerant structures. Piled foundations shall be required where larger local bearing pressures and / or structures with tight settlement tolerance are anticipated. A detailed engineering assessment will be undertaken following interpretation of the site-specific confirmatory ground investigation data.

Foundations

10A.4.3 Shallow foundations, particularly large raft foundations should be considered where appropriate. Raft foundations have the advantage of being able to spread the loads over a larger area resulting in lower bearing pressures and lower settlements. Furthermore, the rigidity of the raft minimises differential settlement across the slab. However, this form of construction is likely only to be suitable for lightly to moderately loaded structures.

10A.4.4 Piled foundations should be considered to support structures with a high loading intensity and those that are most sensitive to settlement. Given the nature of the Artificial Ground (Made Ground) and superficial deposits, it is likely that piles will need to be driven, augured, or bored into underlying competent bedrock, though shall only be viable with the removal of existing obstructions or Artificial Ground (Made Ground). It is considered likely that, across the Main Site, an initial phase of site preparation earthworks will be performed involving the excavation, processing, replacement, and compaction in layers of the Artificial Ground (Made Ground) to make it more appropriate to be used as a load bearing material. The depth of Artificial Ground (Made Ground) excavation is yet to be confirmed, though where this occurs below the groundwater level, some mitigatory measures shall be required. This activity would be expected to remove most of the existing man-made obstructions in the ground.

10A.4.5 Therefore, issues with pile driving / augering / boring because of the obstructions onsite are considered unlikely post removal processing and replacement of this Artificial Ground (Made Ground).

10A.4.6 Based on experience with the types of material anticipated, given the potential of unpredictable heave and / or settlement occurring over the lifetime of the Proposed

Development, structure floor slabs and connecting services / infrastructure may need to be suspended (with or without the use of heave protection layers beneath the slab) or piled to reduce differential movements, particularly for settlement sensitive structures with onerous serviceability limit requirements. Considerations of heave acting onto the underside of the pile caps must also be examined to determine the extent to which the potentially expansive Artificial Ground (Made Ground) requires removing, remediating and replacing to prevent this.

10A.4.7 Groundwater is anticipated to be shallow across the Main Site. Temporary casings are likely to be required to support the pile bores within potentially unstable thick granular (coarse) Artificial Ground (Made Ground) and Tidal Flat Deposits below groundwater level. It should be noted that temporary casings will also be required above the water level in these soil types, to prevent collapse of the pile bore. Rotary pile bores will need to be filled with water or drilling mud to balance external water pressures and avoid base disturbance / softening during construction. Allowance should also be made for placing concrete by tremie.

10A.4.8 The presence of thick deposits of slag may have potential to generate ground displacements (heave and / or lateral expansion) because of chemical changes and / or variations in groundwater level. Potentially expansive ferrous slag could result in unpredictable additional uplift and lateral loading on piles after installation. Piled foundations will need to be designed to accommodate additional loading or could be sleeved over the expected zone of swelling. However, this form of construction would be more expensive than conventional piled foundations and should be allowed for in the geotechnical and construction risk registers. Consideration may be given to fully cased bored piles, under-reamed or extended pile rock sockets to resist uplift resulting from expansion of slag dominant Artificial Ground (Made Ground).

10A.4.9 Generally, slag will have a high acid neutralisation capacity (ANC) and acid corrosion due to sulphate or sulphide (usually calcium sulphide) content is unlikely to be a problem. However, the possible impact of brackish water and high chloride content on steel also needs to be considered, especially if ground movement (vertical heave and / or lateral expansion) could lead to cracks forming in steel reinforced concrete.

10A.4.10 The possible presence of unexploded ordnance (UXO) will also impact piling during construction. Probing shall be required at each pile position before the start of pile construction to prove the absence of UXO buried in natural soils below the more recent deep cover of Artificial Ground (Made Ground). Pre-construction clearance may require the use of a deep intrusive magnetometer survey. It should be noted that the presence of significant thickness of metalliferous material within the Artificial Ground (Made Ground) may impact the effectiveness of intrusive and non-intrusive survey techniques (i.e., magnetometer) that may be used to identify potential UXO at the Proposed Development Site.

Filled and Artificial Ground (Made Ground)

10A.4.11 Filled and Artificial Ground (Made Ground) can be highly variable meaning that the geotechnical properties of the soil may also be highly variable. This can cause

complications for foundation design. Additionally, Artificial Ground (Made Ground) may not be very stable if left as an unsupported excavation.

10A.4.12 Across the whole of the Main Site, it has been proven that, typically 4 m to 5 m, sometimes extending to 7 m of Made Ground containing large thicknesses of slag is present. Therefore, this could cause problems such as differential settlement based on experience with the type of material.

10A.4.13 A confirmatory GI will be undertaken to confirm the full extent of the Made Ground across this Proposed Development Site and to what amount the slag makes up the Made Ground.

Lateral Changes in Ground Conditions

10A.4.14 Lateral changes within the geology are also known to be present as highlighted below:

- different thicknesses and lateral extent of the Artificial Ground (Made Ground);
- different thicknesses and lateral extent of the soft cohesive layer within the Tidal Flat Deposits;
- the potential for the Glacial Till deposits not being present;
- the infrequent presence of the Glaciolacustrine Deposits; and
- the different bedrock geologies present across the Proposed Development Site that underlie the superficial deposits.

10A.4.15 Therefore, these lateral changes in ground conditions could affect engineering design. A confirmatory GI will be undertaken to confirm how the lateral changes in the ground conditions may affect the development at the Proposed Development Site, and what engineering requirements are needed to mitigate this.

Expansive ferrous slag deposits within the slag deposits and heave and shrinking in the clay soils of the Artificial Ground (Made Ground) (Main Site)

10A.4.16 Based on experience with the type of material, the presence of expansive slag dominant Artificial Ground (Made Ground) poses a risk of heave during Proposed Development Site construction and subsequent Proposed Development operation.

10A.4.17 Therefore, the confirmatory GI to be undertaken across the Main Site should aim to confirm the potential extent of the heave and lateral expansion hazard and should provide the basis to recommend how to mitigate against the consequences of risk of heave and / or expansion . As proposed for the adjacent NZT Site, the removal and remediation of the slag dominated Artificial Ground (Made Ground) may be required.

10A.4.18 Clay soils may be susceptible to shrink / swell in response to changes in moisture content within the cohesive Artificial Ground (Made Ground).

Inadequate Bearing Capacity

10A.4.19 The Main Site is anticipated to be underlain by a variable thickness of Artificial Ground (Made Ground) and layers of soft clay and loose to medium dense granular

Tidal Flat deposits. The Artificial Ground (Made Ground) is anticipated to be highly variable comprising cohesive, granular, slag dominant materials and hydraulic fill. These materials are likely to exhibit poor strength and compressibility.

10A.4.20 Conventional pad or shallow strip foundations are generally suitable only for lightly loaded, settlement-tolerant structures. Shallow raft foundations spanning the entire footprint of a structure are potentially suitable for lightly loaded and moderately loaded structures. Raft foundations bearing in Slag Dominant Artificial Ground (Made Ground) may provide a suitable option for some of the proposed structures, although there is a potential for differential movement with heave occurring below one area of the raft and settlement across other areas.

10A.4.21 Shallow foundations should not be underlain by unsuitable/unprocessed cohesive Artificial Ground (Made Ground) materials, which are commonly characterised by variable shear strength and compressibility.

10A.4.22 It is also recommended that static maintained load tests are undertaken on bearing soils for each structure supported by shallow foundations. Large plate load testing across the development footprint should also be considered to properly assess the performance of the near surface soils for shallow pad or raft foundations.

10A.4.23 Piles to transmit heavy loads to more competent soils and bedrock may comprise driven cast-in-situ concrete piles, driven steel piles, continuous flight auger (CFA) or bored piles. The first two piling techniques may be considered unsuitable owing to the ground conditions and potential obstructions unless the obstructions and Artificial Ground (Made Ground) is removed, processed, and placed back. Permanent sleeving may be used to mitigate heave effects. Further work is recommended to assess the preferred piling solution and to determine pile performance.

10A.4.24 However, it should be noted that due to the potential presence of the weathered upper mudstone, there may be poor end bearing capacity at the base of the piles. As a result, piles shall be designed to extend sufficiently deep to support safely the proposed loads. Similarly, during construction, it would be important to inspect the base of the piles to confirm they are clean of debris / loose material before pouring the concrete for the case of rotary bored piles.

10A.4.25 Where combinations of shallow and piled foundations are used, it is important to consider the impact of differential settlement that may result from the combined foundation techniques. Therefore, adequate design shall be required to mitigate against this differential movement.

Settlement

10A.4.26 Previous GIs proved soft, variable, compressible and saturated soils including the presence of poorly sorted and compacted Artificial Ground (Made Ground) and a significant thickness of normally consolidated Tidal Flat Deposits (soft clays and loose sands). The Tidal Flat Deposits pose a risk of long-term settlement due to a change in loading and changes to the groundwater regime. Where voids exist within the Made Ground, collapse settlement shall be of potential concern.

10A.4.27 Owing to the presence of the softer cohesive material, any change in current stresses is likely to result in consolidation settlements in the long-term conditions, which in turn may lead to potential negative skin friction (NSF) on piled foundations.

10A.4.28 Therefore, pile design of proposed structures shall allow for potential NSF arising from settling ground.

10A.4.29 It is recommended that a detailed ground investigation is undertaken at the Main Site as well as adoption of appropriate foundation solutions to transfer loads to soils or bedrock of adequate strength.

Groundwater

10A.4.30 High groundwater levels may result in uplift of buried structures such as basements and foundations. However, it should be noted that the impact of groundwater levels on new buried structures will depend on the finished ground elevations that are selected for the Proposed Development Site. Ideally, finished ground elevations should be sufficiently high above the groundwater table to ensure that excavations required for construction of shallow foundations, pile caps and buried pipes and cables can be carried out in dry conditions above the water table.

10A.4.31 Other risks posed by the high groundwater level include flooding of deep excavations that extend below the water table, difficulty in compacting soil layers that are underlain at shallow depth by the groundwater table, and ground water ingress into bored pile shafts during construction.

10A.4.32 Therefore, groundwater monitoring shall be required to ascertain the groundwater levels across the Proposed Development Site.

Excavations

10A.4.33 Temporary excavations within the Artificial Ground (Made Ground) and superficial deposits will be required. Superficial deposits may be loose and variable in nature, are likely to be unstable and, dependent upon depth, may require continuous support. Alternatively, temporary excavation faces will have to be battered back to a safe angle as determined onsite or require continuous support.

10A.4.34 Excavations extending below ground level are likely to encounter groundwater inflows particularly from coarse soils or water bearing granular layers within fine (clay, silt) and after prolonged periods of wet weather. Such materials will require continuous support. For shallow excavation below groundwater, pumping from sumps in the base of excavations may be feasible.

10A.4.35 At the Main Site, shallow excavations are anticipated to be stable in the short term within unsaturated slag and cohesive layers of the Artificial Ground (Made Ground). However, for excavations below the water table in granular Tidal Flats Deposits, running sand conditions would be expected, leading to rapid and progressive collapse of the excavation sides. Therefore, where required in excavations, especially when saturated or loaded from the sides, prior dewatering, retaining structures, or battering back shall be required.

10A.4.36 Construction within historical landfills should be avoided / limited in order to minimise ground disturbance and inflows of potentially contaminated groundwater into excavations and the need to handle / dispose of potentially contaminated material.

Ground Improvement

10A.4.37 It is considered likely that an initial phase of site preparation earthworks will be performed involving the excavation, processing, replacement, and compaction of the Artificial Ground (Made Ground). This is likely to be required across the Main Site where large obstructions are encountered or where expansive materials are identified. Excavation of Artificial Ground (Made Ground) above the groundwater table should be straight forward but excavation below may be complicated and require de-watering and / or stabilisation, both of which can add significant costs to construction.

10A.4.38 An added complication is the possibility that groundwater may be subject to tidal fluctuations due to the proximity of the Main Site to the River Tees and Tees Bay. Significant changes in water levels due to tidal fluctuations could hinder construction. However, preliminary continuous tidal monitoring undertaken during the 2017 GI (Allied Explorations) observed limited tidal influence. It is noted that monitoring well screens straddled across the Made Ground and Tidal Flat Deposits and as a result may mask trends within the different geological units.

10A.4.39 In-situ ground improvement such as dynamic compaction and high energy impact compaction may help to solve some of the likely settlement issues associated with the Artificial Ground (Made Ground) but will not solve other problems such as the presence of obstructions and may not be feasible due to adverse environmental impact from the noise and vibration generated and the presence of sensitive services that may be present near to or onsite. Typical depths of influence for dynamic compaction in loose course (cohesionless) soils or unsaturated fine (cohesive) soils may be between 7 m and 12 m. The depth of influence is largely dependent on the contractor proprietary equipment mobilised as well as the hammer weight, drop height that can be achieved and the depth to the water table. However, the depth of influence is likely to be further influenced by the variable density and depth of the Artificial Ground (Made Ground) anticipated across the Main Site and may not be suitable where saturated cohesive soils have been proved below the made ground.

10A.4.40 Feasibility of this option could be further assessed in conjunction with input from specialist priority ground improvement contractors as part of further phases of the Proposed Development design. In-situ ground treatment such as lime stabilisation or lime cement columns is not considered appropriate as the anticipated elevated sulphate and chloride concentrations within the soils and groundwater may result in postconstruction heave of treated soils, over and above the heave anticipated from expansive slag materials across the Main Site. In addition, the construction of this form of ground treatment is likely to be restricted by obstructions within the Made Ground present on Main Site.

10A.4.41 It is understood that STDC will complete remediation works required to create a suitable development area before the Applicant's commencement of the construction of the Proposed Development.

Earthworks, Obstructions and Voids

10A.4.42 Information on proposed levels and hence requirements for cut and fill activities are not known at this stage. It is considered likely that the Proposed Development will actively work towards achieving an earthworks balance. Any remediation works and removal of obstructions will need to be overseen by a qualified engineer. A requirement for import of additional quantities of engineered fill where required for purposes of raising Main elevations may emerge if a cut to fill balance cannot be achieved. The suitability of excavated materials (namely the anticipated slag dominated Made Ground) for re-use will be assessed as part of the confirmatory GI works. All earthworks' operations will need to be undertaken in accordance with BS6031:2009 'Code of Practice for Earthworks' and a design specification based on a recognised national standard such as National Highways (NH) guidelines included in their Manual for Contract Documents for Highway Works (MCHW) Series 600 'Earthworks'. Ground investigation is required to determine the geotechnical properties of materials which may be re-used in earthworks constructed onsite.

10A.4.43 It is important that a plan for the legitimate engineering re-use of the site won material is developed, where possible, such that the material is not surplus to the requirements of the development whereby it would be classified as waste. The designation of surplus materials as waste would have a significant impact on material disposal cost and the environmental impact of the Proposed Development. GI and testing followed by a Quantitative Risk Assessment in accordance with the Environment Agency's Land Contamination Risk Management guidance and BS10175:2011 + A2:2017 should be carried out. It is currently anticipated that STDC will complete remediation works required to create a suitable development area before the construction of the Proposed Development. The scope of STDCs remedial works will include mitigation of any identified risks to controlled waters and / or human health, with STDC to obtain all necessary consents and permits for the works. By this means it is anticipated that re-use of site won materials can be confirmed as valid.

10A.4.44 To adequately control the re-use of materials such as soils and crushed concrete, suitable controls will be in place and developed and implemented as specified in a Final Construction Environmental Management Plan(s) (CEMP), a Final Site Waste Management Plan (SWMP), Materials Management Plan (MMP) and an Asbestos Management Plan (AMP). A Framework CEMP (EN070009/APP/5.12)) has been submitted with the DCO Application. The Final CEMP(s) will be produced prior to construction and will be produced in accordance with the Framework CEMP, secured via Requirement of the Draft DCO (EN070009/APP/4.1).

10A.4.45 Ground obstructions from the former Redcar Steelworks and the Redcar Iron and Steel Works are likely to be abundant across the Main Site. Obstructions shall likely result from gravel, cobble and boulder sized pieces of slag, very dense material, relict buried foundations, walls, ground slabs, tunnels and possibly pile foundations

from former infrastructure. Identification of obstructions and time for removal and/or coring through encountered obstructions will need to be considered during future project stages.

Services

10A.4.46 Widespread services are likely to be abundant across the Proposed Development Site owing to the historical industrial development. Therefore, prior to any works being completed on the Proposed Development Site, in engagement with asset owners/landowners, a full PAS128 types D to B survey shall be required; with a PAS128 type A survey required where work is required, and the location of the service cannot be fully confirmed.

10A.4.47 Existing services could be affected by the development depending upon their location. In engagement with asset owners / landowners, the location of any services should be determined prior to design development and confirmed before undertaking ground investigation in accordance with the requirements of CDM Regulations 2015. Prior to any intrusive works service clearance work required at each investigation location is to be undertaken in accordance with HSE guidance note HSG47 (Third edition) publication – Avoiding Danger from Underground Services.

10A.4.48 Where groundwater is encountered, service excavations may need to be battered back to a safe angle as determined onsite or require dewatering and / or continuous support as described above.

10A.4.49 Proposed services could be affected by Artificial Ground (Made Ground) that may contain high concentrations of PAHs. Where high PAHs are present appropriate measures should be taken and services will need to be laid in trenches, infilled with clean inert bedding materials, where appropriate separated by suitable geotextiles and protected.

10A.4.50 Consideration should be given to the use wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.

UXO

10A.4.51 According to the Detailed Unexploded Ordnance Desktop Survey (Annex D) completed for the Main Site, Luftwaffe aerial reconnaissance photography identified the Redcar Iron Works (located partially on-site) as a primary bombing target.

10A.4.52 Historical records identified evidence of significant bombing within Redcar and the surrounding area. Notably, multiple high explosive bomb strikes were recorded impacting in the vicinity of Redcar Iron Works (located on-site and in the vicinity) in 1941/1942, with at least seven known to have directly impacted the works. In addition, supplementary research identified numerous high explosive bomb strikes in the vicinity of the Site, the closest being on and around Bran Sands Bombing Decoy (located 200m south-west).

10A.4.53 Historical records identified bomb damage to the iron furnaces, mill boilers and a gas cleaning plant within the Redcar Iron Works, due to the bomb strikes. Extensive military activity has also been documented on-site previously. For example, numerous anti-invasion installations were built within the Site including four minefields, five pillboxes and AAA (Anti-Aircraft Artillery) gun batteries. As a result, it is considered highly likely that munitions may have been stored, located and/or fired from this site during WWII.

10A.4.54 Given that extensive WWII bombing was recorded potentially on-site and/or in the immediate vicinity of the Site, combined with the extensive military installations and minefields located on-site and the possibility that the proposed intrusive works will encounter previously undisturbed ground below ground level in areas of the Site, a combination of the following shall be required:

- UXO Emergency Response Plan;
- UXO Safety and Awareness Briefing;
- Explosive Ordnance Disposal Engineer Watching Brief – for Open Intrusive Works; and
- Intrusive Magnetometer Survey – for Closed Intrusive Works.

Adverse Ground Chemistry

10A.4.55 The presence of the chemical weathering of sulphides to sulphates can react with substructure concrete causing significant degradation.

10A.4.56 Therefore, the Aggressive Chemical Environment for Concrete (ACEC) Classification shall be required for the Proposed Development Site, allowing for the correct concrete mix to be determined.

10A.4.57 Proposed services could be affected by Made Ground with potentially high concentrations of Polycyclic Aromatic Hydrocarbons (PAHs). Where high PAHs are present appropriate measures should be taken and services will need to be laid in trenches, infilled with clean inert bedding materials, where appropriate separated by suitable geotextiles and protected.

10A.4.58 Consideration should be given to the use of wrapped steel or ductile iron, copper, and polyethylene (PE) barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.

10A.4.59 Chemically aggressive ground also impacts the durability of the proposed structures. Concrete design needs to consider the chemical nature of the ground and an appropriate chemical classification to ensure it does not impact over the duration of the Proposed Development.

Frost Susceptibility

10A.4.60 Frost susceptibility issues may arise where silty lithologies are present. The California Bearing Ratio (CBR) values and frost susceptibility of the sub-grade soils and groundwater conditions will need to be further assessed by means of intrusive ground investigations and laboratory testing. A confirmatory GI will be undertaken

prior to the design and construction of the Proposed Development, refer to Section 10.5 of Chapter 10: Geology, Hydrogeology and Contaminated Land (ES Volume I, EN070009/APP/6.2) for further details.

Gas Exclusion

10A.4.61 Potentially harmful gases may be generated by Made Ground and could cause harm to ground workers during construction. Gas monitoring in the Made Ground suitable to assess the potential risk to ground workers during excavation / construction is proposed as part of future GI works. Containment areas shall be required at the Proposed Development Site compound in case of a toxic gas release onsite.

10A.4.62 Following the gas monitoring programme proposed as part of future GI works it may be that ground gas protection measures may be required for the structures onsite to mitigate risks to human health and the development dependent upon the results.

Embankments

10A.4.63 It is not known whether permanent earthworks embankments are to be formed as part of the Proposed Development. However, low height landscaping / noise mitigation bunds may be expected to be formed to screen the Main Site. In addition, local cut and fill bulk earthworks to create level development platform areas is likely to be required. Details will be finalised during detailed design. Preliminary geotechnical risks identified with this activity are discussed in Appendix 10D (ES Volume III, EN070009/APP/6.4).

Subgrade

10A.4.64 The following broad guidance for preliminary pavement road foundation design is provided. This is based on guidance with CD 225 2020:

- In-situ Cohesive Material – likely to comprise a mixture of Cohesive Made Ground, fine grained Tidal Flat Deposits and Glacial Till (with inclusions of Glaciolacustrine Deposits). Material behaviour will be controlled by plasticity and undrained shear strength when exposed onsite. However, a CBR value of <2.5 % is considered likely. Improvement by modification using cement and/or lime or through excavation and replacement with granular material may be necessary.
- Imported General Cohesive Material – likely to be controlled by material plasticity and undrained shear strength onsite. A CBR value of 2.5 % can be assumed at this stage.
- 500 to 1000 mm of imported General Granular or Selected Granular Material – where this is proposed to form the subgrade, the upper limit on design surface modulus for areas of improvement of the subgrade shall be 50 MPa.

10A.4.65 CBR values will require confirmation and ground investigation is recommended to assess the ground conditions and determine CBR values below proposed pavements.

10A.4.66 Where expansive ferrous slag is proved below proposed pavements there is a risk that this may cause heave resulting in rough, undulating or cracked pavement surfaces. GI to determine the mechanical properties of slag to evaluate its swelling behaviour is recommended. The removal of this material may be required where ground conditions are determined to be too poor for subgrade to be satisfactorily constructed. As also mentioned above, an assessment of the cohesive layers in the Tidal Flat deposits is also required. This is to understand the long-term consolidation and settlement effects of the material under the paved areas and plant roads.

Structures

10A.4.67 Piled foundations are likely to be required for heavily loaded structures on the Main Site, or those that are sensitive to movement for example rotating equipment. Given the nature of the Made Ground and superficial deposits, it is likely that piles will need to be augured or bored into underlying competent bedrock. There is a risk to the progress of pile bore augering because of the obstructions on Main Site. In order to further anticipate the extent of this risk, consideration may be given to probing ahead of piling operations. Methods of construction which can overcome extensive obstructions include rotary drilling and / or pre-boring in advance of the full pile bore commencement.

10A.4.68 Structure floor slabs and connecting services / infrastructure may also need to be piled to reduce differential movements, particularly for settlement sensitive structures with tight serviceability limit requirements.

10A.4.69 Groundwater is anticipated to be relatively shallow across the Main Site although ground investigation data (including post site works monitoring) is minimal. Temporary casing would be required to support the pile bores within thick granular (coarse) Artificial Ground (Made Ground) and Tidal Flat Deposits below groundwater level and pile bores would therefore need to be filled with water or drilling mud to balance external water pressures to avoid base disturbance during drilling. Allowance should also be made for placing concrete by tremie.

10A.4.70 The presence of thick deposits of slag at the Main Site may have potential to generate ground displacements (heave and / or lateral expansion) as a result of chemical changes and / or variations in groundwater level. Expansion of ferrous slag could result in unpredictable additional uplift and lateral loading on piles after installation. Piled foundations will need to be designed to accommodate additional loading or could be sleeved over the expected zone of swelling. However, this form of construction would be more expensive than conventional piled foundations and should be allowed for in the geotechnical and construction risk registers.

10A.4.71 Generally, slag will have a high acid neutralisation capacity, and acid corrosion due to sulphate or sulphide (usually calcium sulphide) content is unlikely to be a problem. However, the possible impact of brackish water and high chloride content on steel also needs to be considered, especially if ground movement (vertical heave and / or lateral expansion) could lead to cracks forming in steel reinforced concrete.

10A.4.72 The possible presence of UXO will also impact piling during construction. Probing will be required at each pile position before the start of pile construction to prove

the absence of UXO buried in natural soils below the more recent deep cover of Made Ground. Pre-construction clearance will likely require the use of a deep intrusive magnetometer survey.

10A.4.73 Shallow foundations, particularly large raft foundations should be considered where appropriate for lightly to moderately loaded structures. Raft foundations have the advantage of being relatively settlement tolerant due to their rigidity relative to their applied bearing pressures and are therefore able to accommodate differential settlements / heave without significant structural distress. Tying adjacent individual foundations together could also be considered as a means of reducing the likelihood of differential settlement occurring between adjacent structures. However, this form of construction is likely only to be suitable for lightly to moderately loaded structures where serviceability limits are not critical.

Contaminated Land

10A.4.74 Contaminated land that may have a detrimental effect on the structural integrity of construction materials, such as concrete and steel that is used for the shallow and piled foundation, may have to be removed. Therefore, an assessment of this material, most likely to be present within the Made Ground, shall be required. Where there are no suitable options for onsite reuse or remediation, removal of the material may be required. Added cost shall be incurred where the material is to be taken to licensed landfill or where remedial processing is required. A full contaminated land risk assessment has been undertaken and is provided at Appendix 10C (ES Volume III, EN070009/APP/6.4).

10A.5 Annex A: Groundsure / Envirocheck Reports

Envirocheck - 284970768_1_1 – 21/09/2021 (Main Site);

Envirocheck - 233803971_1_1 – 10/02/2020 (Main Site and All Connection Corridors);

GISP-2022-13154-11993 – 05/12/2022 (Hydrogen Pipeline Corridor);

GSIP-2023-13293-12624_A_1 to G_1 – 06/12/2022 (Hydrogen Pipeline Corridor);

GS-9167762 – 01/11/2022 (Main Site and All Connection Corridors);

GS-9167693 – 01/11/2022 (Hydrogen Pipeline Corridor);

GS-9167761 – 01/11/2022 (Main Site) GS-9167761 – 01/11/2022 (Hydrogen Pipeline Corridor);

GS-9167787 – 01/11/2022 (Hydrogen Pipeline Corridor and Electrical Connection Corridor);

GS-9167692 – 01/11/2022 (Hydrogen Pipeline Corridor);

GS-9167765 - 01/11/2022 (Hydrogen Pipeline Corridor);

GS-9167694 – 01/11/2022 (Main Site and All Connection Corridors); and

GS-9366848 – 20/02/2023 (The Main Site and Hydrogen Pipeline Corridor)
GS-9167696 01/11/2022 (Hydrogen Pipeline Corridor).

10A.6 Annex B: Site Walkover Summary

Main Site

10A.6.1 Information pertaining to the Main Site has been summarised from the site walkover conducted on 17 November 2022. During the time of the walkover, the Main Site in the north was undergoing a phase of demolition and it is understood that this is now complete, information from the visit is summarised as follows:

- boreholes from previous phases of intrusive investigation were observed across the Main Site and surrounded by pedestrian barriers;
- the north of the Main Site was in the process of demolition related to the power station, coking plant, and by-product plant;
- hardstanding groundcover was observed to remain in some areas following previous demolition, and standing water was observed across the Main Site;
- the topography of the Main Site was relatively flat apart from bunds which were noted to separate the northwest area from the rest of the Main Site and some raised areas of ground;
- substations in fibreglass housing were noted across the area;
- ecological receptors were noted to be present and pheasants were observed;
- in the centre, a Propane Compound was noted adjacent to the power station building; and
- a service corridor was present with a high voltage electrical cable.

10A.6.2 Associated infrastructure from the former steelworks was observed including a blast furnace – understood to now be demolished (circa November 2022) by blasting. The area was observed to be relatively flat with some areas of soft standing, and areas of hardstanding remained in the footprints of former buildings.

- within the southern section of the Main Site, a railway line was observed running east to west adjacent to the southern boundary;
- to the north-west of the southern section, a large area was being used as storage for soil and rubble from the demolition in the north, and a liquid waste storage area, IBC and 205L metal drums were observed;
- in the south-west was a bulk materials vendor operating onsite and offsite to the west, substations were also noted within this area;
- some demolition was noted having taken place in the south-west with a pile of bricks present and the corner of a building remaining with a valve;
- a presumed active fire hydrant was observed in the south-west in the area of former buildings; and
- ecological receptors were observed including a barn owl and multiple hares.

10A.7 Annex C: Previous Reports Summary

Desk Studies

CH2M (2017), SSI1 Redcar Works – Phase 1 Geo-Environmental Desk Study, Report Reference: 678079_SSI1_001.

10A.7.1 This Desk Study report focuses predominantly on the southern half of the Main Site, however, does include additional land 300 m south and 700 m east of the plot within the scope.

10A.7.2 In total, 31 trial pits and two boreholes (cable percussive) were undertaken in the Sahaviriya Steel Industries 1 (SSI1) site.

10A.7.3 CH2M noted that exploratory holes located within SSI1 from the 2004 Enviros Ground Investigation, returned the following results:

- soil pH was alkaline to highly alkaline (up to 12.7);
- acid Soluble Sulphate (1,000 mg/kg) and Water-Soluble Sulphate as SO4 (1,200 mg/kg) returned exceedances of the 'Tier 1 Soil Screening Criteria' for the majority of samples;
- zinc (720 mg/kg), PAH Total EPA16 (40 mg/kg), Boron (3 mg/kg), Lead (750 mg/kg) returned exceedances of the 'Tier 1 Soil Screening Criteria' for several samples;
- groundwater pH returned values between 7.8 and 10; and
- no surface water testing was conducted within SSI1.

CH2M (2017), SSI2 Redcar Works – Phase 1 Geo-Environmental Desk Study, Report Reference: 678079_SSI2_001.

10A.7.4 This Desk Study report focuses predominantly on the northern half of the Main Site, however, does include additional land up to 700 m east of the plot within the scope.

10A.7.5 In total, 58 trial pits and nine boreholes (cable percussive) were undertaken within the Sahaviriya Steel Industries 2 (SSI2) site.

10A.7.6 CH2M noted that exploratory holes located within SSI2 from the 2004 Enviros Ground Investigation, returned the following results:

- widespread exceedances of Sulphate, Cyanide and isolated exceedances of Heavy Metals within groundwater;
- Redcar and Cleveland Borough Council provided information relating to notable exceedances in 2016 of Environmental Quality Standards (EQS) for Benzo(a)pyrene and Fluoranthene and general exceedances of ammoniacal nitrogen various metals, inorganic compounds dioxins; and
- asbestos (Chrysolite and Amosite) found onsite.

Arcadis (2018), Site Condition Report, Report No. Redcar Steelworks-AUK-XX-XX-RP-GE-0001-02-SSI1_SSI2A_GI_SCR.

10A.7.7 This Desk Study report covers the entirety of the Main Site, which includes the areas covered by the CO_2 Export Corridor and Natural Gas Connection Corridor. The northern extents of the Water Connections Corridor, Electrical Connection Corridor, Hydrogen Pipeline Corridor and Other Gases Connection Corridor are included within the report boundary. The Site Condition Report reviewed the data provided by AEG and developed a Conceptual Site Model (CSM) which would form the basis of future risk assessments by undertaking a detailed assessment of the information available including the historical site use and ground investigation information.

10A.7.8 The report highlights risk from the Made Ground from asbestos, metals and inorganics, polyaromatic hydrocarbons, total petroleum hydrocarbons. The report notes that concentrations of metals within the natural deposits and hydraulic fill are *"generally consistent within the same order of magnitude with each other and with the Hydraulic Fill."*

10A.7.9 Within the groundwater, exceedances of metal, inorganic ions and petroleum hydrocarbons are recorded at levels presenting a concern although no significant sources of volatile organic compounds, semi-volatile organic compounds or phenols were identified.

10A.7.10 The CSM goes on to identify pathways which may allow contaminants to interact with receptors. These were identified to be:

- inhalation of dust;
- inhalation of vapours;
- migration of ground gases;
- direct contact with contaminated material;
- leaching of contaminants from Made Ground to the superficial deposits;
- migration of contaminants to the bedrock;
- migration of groundwater;
- leaching of contaminates from Made Ground to surface water runoff; and
- migration of surface water runoff.

10A.7.11 This assessment presents the same ground model as the Geotechnical Risk Assessment, though provides further detail with respect to the likely groundwater regime, stating that previous investigations have indicated that groundwater is present at elevations of between 4.5 m AOD and 1.5 m AOD. Table 10A-41 outlines in more detail the groundwater levels expected from the respective strata.

Table 10A-41: Ground Levels for the Strata Encountered at the Main Site

STRATA	RANGE IN DEPTH TO GROUNDWATER (m bgL)	RANGE IN GROUNDWATER ELEVATION (m AOD)
Made Ground and Superficial Deposits	1.60 to 4.90	2.29 to 5.48
Mercia Mudstone	4.40 to 5.20	2.42 to 1.35

Arcadis (2022a) Phase 1 Environmental Assessment, Land West of Warrenby, Teesworks

10A.7.12 A Desk Study was undertaken by Arcadis (2022a) for a parcel of land within the South Tees Development Corporation (STDC) site, which includes the area of the adjacent NZT site and a small parcel of land within the Connection Corridors.

10A.7.13 Within the Desk Study, a number of previous reports were reviewed which identified the following:

- A GI undertaken by Enviros in 2004 identified Made Ground up to 7 m thick. Exceedances of the screening values for pH and sulphate were recorded in soil samples, as well as localised exceedances of PAH, lead and zinc. The groundwater was identified as flowing in a north / north-east direction, and elevated arsenic, copper and cyanide were identified in groundwater samples.
- A GI was undertaken by AEG in 2021 which encountered bedrock (Redcar Mudstone) at 37.7 m bgl. Non-Aqueous Phase Liquids (NAPL) and tar hotspots were identified within structures and Made Ground.
- A geo-environmental risk assessment was undertaken which identified a low risk to future site users and controlled waters and a very low risk to members of the public. An overall low geotechnical risk was also identified. It was recommended that investigation within areas of data gaps should focus on the extent of Made Ground and potential contaminants present within Made Ground.

Factual Reports

CH2M (2017c), SSI Redcar – SSI1, Factual Report – Initial Trial Pitting, South Tees Site Company, November 2017

10A.7.14 A GI was undertaken between November 2016 and April 2017 by CH2M (2017c) within the South Tees Development Corporation (STDC) site, which includes the Main Site; the western and central extent of the Water Connection Corridor and CO_2 Export Corridor and northern extent of the Other Gases Connection Corridor, Natural Gas Connection Corridor, Hydrogen Pipeline Corridor (south of the River Tees) and Electrical Connection Corridor.

10A.7.15 The GI comprised 328 trial pits to a maximum depth of 4.5 m bgl.

10A.7.16 Geo-environmental laboratory testing was undertaken on soil samples for asbestos, metals, inorganics, petroleum hydrocarbons, PAHs, PCBs, phenols, VOCs and SVOCs. Soil leachate testing was undertaken for metals and inorganics.

CH2M (2017d), SSI Redcar – SSI2, Factual Report – Initial Trial Pitting, South Tees Site Company, November 2017

10A.7.17 A GI was undertaken in May 2017 by CH2M (2017d) within the South Tees Development Corporation (STDC) site, which includes the north-western extent of the Main Site; northern extent of the Natural Gas Connection Corridor, Electrical Connection Corridor, Water Connection Corridor, CO_2 Export Corridor and additional land to the north of the Hydrogen Pipeline Connection Corridor and Other Gases Connection Corridor.

10A.7.18 The GI comprised 68 trial pits to a maximum depth of 4.5 m bgl.

10A.7.19 Geo-environmental laboratory testing was undertaken on soil samples for asbestos, metals, inorganics, petroleum hydrocarbons, PAHs, PCBs, phenols, VOCs and SVOCs. Soil leachate testing was undertaken for metals and inorganics.

Allied Exploration and Geotechnics ltd (2018 a) Former SSI Steelworks Redcar – Advance Boreholes in SSI 1, Areas C & D, Final Factual Report, 2018

10A.7.20 Intrusive investigation was conducted at the Former SSI Steelworks Redcar between 25 July to 7 August 2017 comprising seven cable percussive boreholes, one extended using rotary coring techniques, with SPT and Variable Head Permeability Testing throughout. A factual report was produced following the investigation. All borehole locations were located within a parcel of land immediately south of the Main Site, CO_2 Export Corridor and Water Connection Corridor, and to the south of the north-western extent of the Natural Gas Connection Corridor, Electrical Connection Corridor, Other Gases Connection Corridor and Hydrogen Pipeline Corridor (south of the River Tees) within the Hydrogen Pipeline Corridor, BH21 and BH25 were also within the Electrical Connection Corridor and BH24 was also within the Water Connection Corridor.

10A.7.21 A summary of the findings is presented here:

- During drilling, visual or olfactory evidence of contamination was observed within BH23 (moderate hydrocarbon odour within superficial deposits), BH25 (hydrocarbon odours within Made Ground), BH26 (creosote and chemical odours within Made Ground and superficial deposits) and BH28 (chemical and possible ammonia odours within Made Ground and superficial deposits);
- Made Ground was observed to a maximum depth of 7.80 m bgl (BH23) and clinker, slag and burnt shale was identified across boreholes;
- Elevated concentrations of methane and carbon dioxide were detected during one or more round of post-investigation monitoring within BH25, BH26 and BH28. The highest detected concentrations were 65.2 % v/v for methane and 22.40 % v/v for carbon dioxide within BH28;

- The soil pH across the Site was found to be alkaline with the highest pH being 10.5 (BH23);
- Elevated concentrations of metals within soil samples including arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, vanadium and zinc were observed across the site;
- Elevated concentrations of petroleum hydrocarbons (BH23, BH25, BH26, BH27, BH28) and PAHs (BH21, BH23, BH25, BH26) were observed within soil samples;
- Elevated sulphates were observed within soil samples with the maximum concentration being 1100 mg/l within BH24;
- Marginally elevated soil VOC/SVOC concentrations were identified (BH23, BH25, BH27 and BH28);
- Within water samples, the pH was observed to be alkaline with the highest pH being 9.5 (BH27);
- Possible obstructions were observed within Made Ground (BH21 and BH23).

Allied Exploration & Geotechnics Limited (2018), Ground Investigation Contract, Report Reference: 4153 & 4154 (Area A)

10A.7.22 This Ground Investigation assessed the entirety of the Main Site, including that of the adjacent NZT Site. The information that was analysed from, a Geotechnical perspective, for the purposes of this report is outlined in Table 10A-42.

Table 10A-42: Boreholes from 2018 AEG Investigation Relevant to the Main Site

EXPLORATORY HOLE NUMBER	DRILLING METHOD	COMPLETION DEPTH (m bgl)	DEPTH OF INSTRUMENTATION	INSTRUMENT RESPONSE ZONE (m bgl)	REMARKS
S1-BH01	CP+RO+RC	40.00	50 mm to 6.00 m bgl 50 mm to 24.00 m bgl	1.00 to 6.00 23.00 to 24.00	Water strike at 4.00 m – water level rose to 3.98 m bgl (20 mins).
S1-BH03	CP	13.00	50 mm to 6.50 m bgl	1.00 to 6.50	-
S1-BH10	CP	11.00	50 mm to 7.05 m bgl	0.95 to 7.05	-
S1-BH16	CP +RC	41.00	50 mm to 7.00 m bgl	1.00 to 7.00	-
S1-BH17	CP	18.20	50 mm to 6.00 m bgl	3.50 to 6.00	-
S2-BHA01	CP+RC	41.00	50 mm to 5.50 m bgl 50 mm to 21.00 m bgl	1.00 to 5.50 20.00 to 21.00	-

EXPLORATORY HOLE NUMBER	DRILLING METHOD	COMPLETION DEPTH (m bgl)	DEPTH OF INSTRUMENTATION	INSTRUMENT RESPONSE ZONE (m bgl)	REMARKS
S2-BHA03	CP	40.00	50 mm to 7.00 m bgl	1.00 to 7.00	-

10A.7.23 Nine groundwater samples were scheduled for chemical analysis (metals, inorganics, total petroleum hydrocarbon (TPHs), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs) and polychlorinated biphenyl (PCBs)). No interpretation was undertaken as part of AEGs report.

10A.7.24 Furthermore, 65 soil samples were scheduled for chemical analysis (metals, inorganics, TPH, PAH, PCBs and asbestos). No interpretation was undertaken as part of AEGs report.

Interpretative Reports

CH2M, Former SSI Steelworks, Redcar – Initial Ground Investigation Works – Geoenvironmental Summary, South Tees Site Company Ltd. May, 2018.

10A.7.25 A Geoenvironmental Summary Report was prepared by CH2M (2018) using data obtained from the SSI1 and SSI2 2017 trial pitting GI and a supplementary GI comprising seven rotary and percussive boreholes to between 15.5 m bgl and 40.3 m bgl. The report includes land within the Main Site and the northern extent of the Water Connection Corridor, Electrical Connection Corridor, Natural Gas Connection Corridor, CO_2 Export Connectino Corridor, Hydrogen Pipeline Corridor (south of the River Tees) and Other Gases Connection Corridor.

10A.7.26 Key points are summarised as follows:

- Asbestos was identified in 34 samples, out of 256 samples tested;
- Exceedances of naphthalene and >EC10-EC12 aromatics were recorded in soil samples from Made Ground;
- Exceedances of arsenic, boron, cadmium, chromium, copper, manganese, mercury, selenium, zinc, cyanide total, cyanide free, cyanide complex and ammoniacal nitrogen were recorded in soil leachate samples from Made Ground. The report noted that it is unlikely for the site to be a source of leachate from heavy metals and inorganics;
- An exceedance of zinc was recorded in a soil leachate sample from natural ground;
- Exceedances of arsenic, boron, cadmium, chromium, copper, mercury, nickel, selenium, zinc, cyanide total, aliphatics (C5-C5, C6-C8, C8-C10, C10-C12, C16-C21, C5-C25), aromatics (C5-C7, C7-C8, C12-C16, C5-C35), total TPH, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene,

benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, phenol, vinyl chloride and benzene were recorded in groundwater;

- Slag testing was undertaken which identified varying quantities of blast furnace slag and basic steel slag;
- Ground gas monitoring was undertaken in seven boreholes in four monitoring rounds between 17 / 18 August 2017 and 30 January 2018. The report suggested that the Characteristic Situation for the site is designated as CS1. However, data from BH25 from 15 September and BH28 from 30 January were disregarded as CH2M interpreted the results as anomalous. It is noted that significant flow rates (26l/hr) are absent, and if included would result in a CS4. Overall, it is recommended that the site is a CS2 and gas protection measures are required; and
- The results of the BRE testing indicate that a Design Sulphate Class of DS-5 and an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-5 would be appropriate for Made Ground.

Arcadis (2018), Geotechnical Risk Assessment Report, Report No. Redcar Steelworks-AUK-XX-XX-RP-GE-0001-P1-SSI1_SSI2A_GI_GRA

10A.7.27 The report is located across the entirety of the Main Site and CO_2 Export Corridor, The northern extents of the Natural Gas Connection Corridor, Electrical Connection Corridor and Hydrogen Pipeline Corridor (south of the River Tees, and the western and central extent of the Water Connections Corridor, are included within the report boundary.

10A.7.28 This Geotechnical Risk Assessment was completed over the wider steelworks site that encompasses all of the Main Site. The assessment also covers the adjacent NZT area to the east where similar ground conditions are expected.

10A.7.29 The report supports the inferred geological stratigraphy that is outlined throughout this report. It highlights the presence of the Made Ground deposits of differing compositions owing to the industrialised setting of the Site. Made Ground overlies the superficial deposits of the Wind-Blown Sand, Tidal Flat Deposits, Glacial Till and Glaciolacustrine Deposits. The bedrock geology comprises the Redcar Mudstone, Penarth Group, and the Mercia Mudstone. The spatial presence of the deposits varies across the Site, which is discussed in greater detail throughout the present report.

10A.7.30 The Geotechnical Risks that were highlighted in the Arcadis risk assessment are the following and are discussed in further detail in the next sections of the present report:

- inadequate bearing capacity of Made Ground to support proposed structures;
- anticipated total and differential settlement/heave more than the tolerable limits;
- potential collapse compression because of surface water infiltration and groundwater movement;

- potential heave because of chemical changes causing expansion of the ferrous slag;
- sulphate attack of concrete;
- potential for UXO to be present within normally consolidated Tidal Flat Deposits;
- obstructions within the made ground (boulder size fragments of slag and buried underground structures);
- the potential for the presence of harmful ground gas;
- presence of services across the Main Site;
- long term creep settlement of natural soils; and
- Areas of hydraulic fill associated with sluiced sand to raise levels at the Main Site. However, review of historical as built drawings have indicated that the area for this study was not filled with Hydraulic fill.

Arcadis (2022c) Land West of Warrenby, Teesworks, Redcar, Site Condition Report, Generic Quantitative Risk Assessment and Detailed Quantitative Risk Assessment, South Tees Development Corporation, REPORT NO: 10035117-AUK-XX-XX-RP-ZZ-0428-03-LWoW_DQRA

10A.7.31 Arcadis (2022c) undertook a DQRA for the adjacent NZT site including a small parcel of land within the CO_2 Export Connection Corridor, Water Connection Corridor, Electrical Connection Corridor, Natural Gas Connection Corridor, Hydrogen Pipeline Corridor (south of the River Tees) and Other Gases Connection Corridor using data obtained from previous GI.

10A.7.32 Key points are summarised as follows:

- Groundwater was encountered between 2.02 m bgl and 4.84 m bgl and between 1.91 m bgl and 4.38 m bgl during the 2017 and 2021 GI respectively. The groundwater levels at the interface of Made Ground and Tidal Flat Deposits was encountered between 1.8 m bgl and 4.58 m bgl during the 2017 GI.
- Groundwater was encountered within Tidal Flat Deposits at 4.71 m bgl during the 2017 GI, and the 2021 GI recorded groundwater within both the Tidal Flat Deposits and Glacial Till Deposits between 2.4 m bgl and 4.01 m bgl;
- Groundwater within mudstone was only recorded during the 2021 GI at depths between 1.98 m bgl and 5.69 m bgl;
- Arcadis suggested that groundwater within the Made Ground is likely in hydraulic continuity with the underlying Tidal Flat Deposits and flows towards the north. It is noted that the groundwater flows in a north / northeast direction within the Redcar Mudstone Formation;
- A review of the salinity of groundwater identified potential brackish conditions in the north of the site and freshwater conditions towards the south;

- The results of the Generic Quantitative Risk Assessment (GQRA) identified the following exceedances:
  - An exceedance of benzo(b)fluoranthene and three exceedances of dibenzo(a,h)anthracene in soil samples. A rare black crystallised tar was identified in Made Ground within the same location as a dibenzo(a,h)anthracene exceedance.
  - Asbestos was identified in 23 samples out of a total of 220 samples analysed between 0.5 m bgl and 4.4 m bgl, of which 13 samples were recorded lower than the limit of quantification and 10 recorded 0.001 – 0.333%m/m.
  - No exceedances of the GAC for industrial workers were identified for inhalation of potential contaminants from groundwater.
  - Exceedances of the Water Quality Standards (WQS) were identified in soil leachate samples for metals (arsenic, cadmium, copper, iron, lead, manganese, mercury and nickel), inorganics (ammoniacal nitrogen, cyanide and sulphate), TPH and PAH in Made Ground. Leachate exceedances of metals (arsenic, copper, iron, mercury and nickel), inorganics (ammoniacal nitrogen, cyanide and nitrite), TPH and PAH's were identified in superficial deposits. Leachate samples from the bedrock also identified exceedances of iron, mercury, nickel, ammoniacal nitrogen, TPH and fluoranthene.
  - Exceedances of metals, inorganics, TPH, PAH, VOC / SVOC recorded in groundwater samples from Made Ground, superficial deposits and bedrock.

10A.7.33 The report notes that tar was visually identified in the north-east and in the south / south-east of the adjacent NZT site. However, the presence of NAPL was not identified during groundwater monitoring undertaken in 2004, 2018 and 2021.

- Elevated metals, PAH and TPH were recorded throughout the NZT site within soil samples, and a similar trend was identified with groundwater samples. Arcadis suggested this reflected a diffuse source of contamination.
- A DQRA was undertaken for the risk to controlled water receptors which identified exceedances of the Site Specific Assessment Criteria (SSAC) at the 50 m compliance point for manganese, ammoniacal nitrogen, cyanide total, sulphate, TPH (aromatic >EC10-EC12 and >EC16-EC21), fluoranthene and anthracene. Exceedances at the 200m compliance point were recorded for ammoniacal nitrogen, cyanide, sulphate and thiocyanate. The report suggested that most exceedances at the 50m and 200m compliance points are non-hazardous.
- The report concluded that there is not a significant risk to the North Sea for most contaminants except for likely non-hazardous contaminants (ammoniacal nitrogen, cyanide, sulphate and thiocyanate). There is a theoretical risk to the North Sea from a limited number of inorganics, although the risk was considered to be overestimated and did not consider dilution. It was also noted

that the NAPL and tar is not presenting a risk to water or ecological receptors. There is also a potential chronic exposure risk to human health for onsite workers associated with asbestos, PAH and tar.

Remediation Strategies

Arcadis (2018), Ground Remediation Options Appraisal Report, Report No. Redcar Steelworks-AUK-XX-XX-RP-GE-0001-02-SSI1_SSI2A_GI_ROA.

10A.7.34 The report is located across the entirety of the Main Site and CO_2 Export Corridor. The northern extents of the Natural Gas Connection Corridor, Electrical Connection Corridor and Hydrogen Pipeline Corridor (south of the River Tees, and the western and central extent of the Water Connections Corridor are included within the report boundary.

10A.7.35 Following the Site Condition Report, a remediation options appraisal was undertaken to assess which method of remediation would be most suitable for the site.

10A.7.36 Remediation methods assessed included:

- engineering controls;
- excavation, screening, treatment and reuse;
- excavation and disposal; and
- capping in situ.

10A.7.37 The above methods were compared against each other for their suitability to meet the environmental targets for the site and if they would meet the geotechnical conditions require for future development.

10A.7.38 Based on a review of the results of the ranking process, site specific knowledge, consideration of the key remediation objectives, and view that the risk to human health receptors is the key driver for remediation at the site, Arcadis identified capping in situ as a preferred remediation strategy for the asbestos identified at the site and engineering controls as the preferred strategy to address the geotechnical constraints.

Arcadis (2022b) Land West of Warrenby, Teesworks, Redcar, South Tees Development Corporation, REPORT NO. 10035117-AUK-XX-XX-RP-ZZ-0417-05-Rem_Strat_LwoW

10A.7.39 A Remediation Strategy was prepared by Arcadis (2022b) under the instruction of South Tees Development Corporation to address environmental constraints to ground conditions within the adjacent NZT site, which includes a parcel of land within the H2Teesside Utility Connection Corridors.

10A.7.40 Previous GI from the CH2M 2017 reports, Arcadis 2018 reports and AEG 2021 report were summarised within the Remediation Strategy and noted the following types of Made Ground:

- slag dominant Made Ground comprising gravel to boulder sized fragments including brick, concrete, coal, sandstone and clinker;
- granular Made Ground comprising a sandy gravel with clay, cobbles and gravel as well as brick, concrete, demolition materials and the presence of slag within the soil matrix;
- cohesive Made Ground comprising soft to very stiff clay with brock, concrete, demolition materials and slag within the soil matrix;
- sinter comprising a black fine gravel used as a surfacing material; and
- waste comprising metal, wood and plastic.

10A.7.41 It is noted that there is a potential GI data gap within the area of the former blast furnace stock house, which was inaccessible at the time of writing due to ongoing demolition works.

10A.7.42 Arcadis recommended that further ground gas monitoring is required prior to redevelopment of the site.

10A.7.43 The following geotechnical constraints were identified:

- potential damage to structures associated with slag deposits and refractory bricks;
- potential inadequate bearing capacity of Made Ground and Tidal Flat Deposits associated with long term creep settlement;
- variability in ground conditions both laterally and vertically;
- potential impacts of loading and the groundwater regime on total and differential settlement and heave;
- aggressive ground conditions associated with sulphate; and
- obstructions within Made Ground associated with underground structures and boulder sized fragments.

10A.7.44 The results of a Detailed Quantitative Risk Assessment (DQRA) undertaken by Arcadis were summarised which identified the following:

- potential risk to human health receptors associated with the presence of asbestos fibres within shallow soils;
- exceedances of the screening criteria for PAH within shallow soils require remediation; AND
- Arcadis note that NAPL and tar impacted material should not be reinstated and requires treatment or disposal at an appropriate facility. Potential NAPL contamination was identified in seven exploratory hole locations from the CH2M 2017 and AEG 2021 GI.

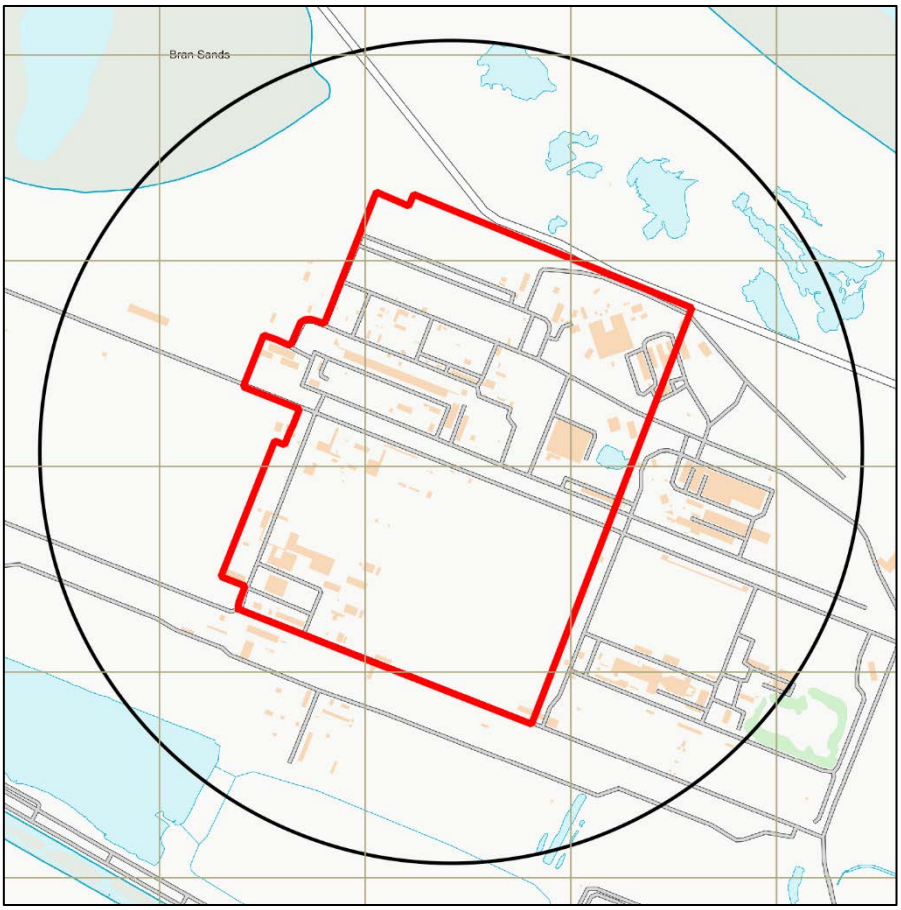
10A.7.45 The following remediation objectives were identified:

- management of contamination, including the NAPL soils, which is above the screening levels;
- management of the source-receptor-pathway pollutant linkage for asbestos containing materials;
- make excavated soils suitable for reuse under DoWCoP to maximise the reuse of soils; and
- mitigate the potential risks associated with unexpected contamination by developing an unexpected contamination strategy.

10A.8 Annex D: Detailed Unexploded Ordnance Desktop Survey

Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment

Meeting the requirements of *CIRIA* C681 'Unexploded Ordnance (UXO) A Guide for the Construction Industry' Risk Management Framework



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PROJECT	The Foundry	**REVIEWED BY**	B. Wilkinson
CLIENT	AECOM	**RELEASED BY**	L. Gregory
VERSION	1.0	**DATE**	11th November 2022
UXO RISK RATING	**HIGH** - This Study Site requires further action to reduce risk to ALARP during intrusive activities.		

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Acronyms and Abbreviations

AA	Anti-Aircraft
AAA	Anti-Aircraft Ammunition
ALARP	As Low As Reasonably Practicable
AOD	Above Ordnance Datum
ARP	Air Raid Precaution
AXO	Abandoned Explosive Ordnance
BD	Bomb Disposal
BDO	Bomb Disposal Officer
bgl	Below Ground Level
BGS	British Geological Survey
BH	Borehole
BPD	Bomb Penetration Depth
CDP	Cast Driven Piles
CFA	Continuous Flight Auger
CIRIA	Construction Industry Research and Information Association
CPT	Cone Penetration Testing
CS	County Series
EO	Explosive Ordnance
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
GI	Ground Investigation
GIS	Geographic Information Systems
GL	Ground Level
GP	General Purpose
GPS	Global Positioning Systems
HAA	Heavy Anti-Aircraft
HE	High Explosive
HO	Home Office
HSE	Health and Safety Executive
IB	Incendiary Bomb
kg	Kilograms
km	Kilometres
LAA	Light Anti-Aircraft
LCC	London County Council
LE	Low Explosive
LSA	Land Service Ammunition
m	Metres
MoD	Ministry of Defence
mm	Millimetres
NEQ	Net Explosive Quantity
NFF	National Filling Factory
NGR	National Grid Reference
OD	Ordnance Datum
OS	Ordnance Survey
PM	Parachute Mine
PoW	Prisoner of War
RADAR	Radio Detection And Ranging
RAF	Royal Air Force
RN	Royal Navy
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SAA	Small Arms Ammunition
TA	Territorial Army
TNT	Trinitrotoluene
UK	United Kingdom
UN	United Nations
USAAF	United States Army Air Force
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V Weapons	*Vergeltungswaffen* – Vengeance Weapons
WD	War Department
WWI	World War One
WWII	World War Two

EXECUTIVE SUMMARY

Study Site

The Client has defined the Study Site as "The Foundry North & South, H2 Teesside" and it is centred on NGR 456208, 525535.

Risk Level

HIGH

Potential Threat Sources

The most probable UXO threat is posed by WWII-era German HE bombs, British AXO/LSA/SAA, IBs, and British AAA projectiles (which were used to defend against German bombing raids).

Risk Pathway

Given the types of UXO that might be present on-site, all types of aggressive intrusive engineering activities may generate a significant risk pathway.

Key Findings

During WWII, the Study Site was situated within *Redcar Municipal Borough,* which recorded three HE bomb strikes per 100ha, a "very low" level of bombing.

Luftwaffe aerial reconnaissance photography associated with the Study Site identified *Redcar Iron Works* (located partially on-site) as a primary bombing target.

ARP records associated with the Study Site were not available. Nonetheless, further research of historical records identified evidence of significant bombing within *Redcar* and the surrounding area. Notably, multiple HE bomb strikes were recorded impacting in the vicinity of *Redcar Iron Works* (located on-site and in the vicinity) in 1941/42, with at least seven known to have directly impacted the works. In addition, supplementary research identified numerous HE bomb strikes in the vicinity of the Study Site, the closest being on and around *Bran Sands Bombing Decoy* (located 200m south-west).

Official bomb damage mapping associated with the Study Site was not available. Nonetheless, further research of historical records identified bomb damage to the *iron furnaces, mill boilers* and a *gas cleaning plant* within the *Redcar Iron Works,* due to the aforementioned bomb strikes.

Extensive military activity has also been documented on-site previously. For example, numerous anti-invasion installations were built within the Site including four minefields, five pillboxes and AAA gun batteries. As a result, it is considered highly likely that munitions may have been stored, located and/or fired from this Study Site during WWII.

Pre-WWII mapping (1938) and post-WWII mapping (1953) shows that the Study Site was located in a developed industrial area during WWII; the Study Site itself primarily consisted of undeveloped land, alongside multiple structures and railway lines in the north-eastern sector associated with *Redcar Iron Works*. Therefore, it is likely that footfall within the Study Site would have varied throughout WWII, with high levels of footfall expected in all developed areas. Nevertheless, despite high levels of footfall, in any areas of potentially significant bomb damage, it is plausible that bomb damage debris may have concealed a UXB entry hole and caused it to go unnoticed. Additionally, as most of the Site was undeveloped during WWII, there is also a generally elevated likelihood that any UXBs impacting in those areas could have done so unnoticed.

The Site has undergone significant post-WWII development in some areas, specifically concerning the removal of structures associated with *Redcar Iron Works* and the subsequent development of structures and railway lines associated with *Teesside Works* throughout the Study Site. Consequently, it is considered likely that any UXO within post-war disturbed and developed ground would potentially have been discovered and removed. However, the potential for deep buried UXO to be present within any remaining areas of undisturbed ground is assessed to be extant.

EXECUTIVE SUMMARY (…continued)

Recommendations

Given that extensive WWII bombing was recorded potentially on-site and/or in the immediate vicinity of the Study Site, combined with the extensive military installations and minefields located on-site and the possibility that the proposed intrusive works will encounter previously undisturbed ground below ground level in areas of the Study Site, the following risk mitigation measures are recommended as a minimum in order to reduce risks ALARP during intrusive works in **all previously undisturbed ground** (i.e., that which has not previously been excavated, probed, drilled or otherwise intrusively disturbed since it was potentially contaminated with UXO).

Recommended Risk Mitigation Measures Overview

"Open" Intrusive Works

Engineering Methodology	UXO Emergency Response Plan	UXO Safety and Awareness Briefing	On-Call EOD Engineer	Non-Intrusive Magnetometer Survey	EODE Watching Brief	Intrusive Magnetometer Survey	UXO Risk Rating (Post-Mitigation)
Trial Pits	✔	✔	✘	✘	✔	✘	ALARP
Excavations	✔	✔	✘	✘	✔	✘	
Trenching	✔	✔	✘	✘	✔	✘	

"Blind" Intrusive Works

Engineering Methodology	UXO Emergency Response Plan	UXO Safety and Awareness Briefing	On-Call EOD Engineer	Non-Intrusive Magnetometer Survey	EODE Watching Brief	Intrusive Magnetometer Survey	UXO Risk Rating (Post-Mitigation)
Boreholes	✔	✔	✘	✘	✘	✔	ALARP
Window Sampling	✔	✔	✘	✘	✘	✔	
Piling	✔	✔	✘	✘	✘	✔	

A full and detailed guide to the recommended risk mitigation measures is presented at Section 5 of this report.

For further information, please contact *6 Alpha Associates*:

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ASSESSMENT METHODOLOGY

Approach

6 Alpha Associates (6 Alpha) is an independent, specialist risk management consultancy practice, which has assessed the prospective UXO risk at this Study Site by employing a process advocated by *CIRIA*. The *CIRIA* guide for managing UXO risks in the construction industry (C681) not only represents industry best practice but has also been endorsed by the *UK*'s *HSE*. *6 Alpha* were the lead technical author of the CIRIA C681 guide.

UXO hazards can be identified through the investigation of local and national archives associated with the Study Site, *MoD* archives, local historical sources, historical mapping as well as contemporary aerial photography (where it is available). The amalgamation of information is then assessed within a Semi-Quantitative Risk Assessment (as per industry best practice outlined in CIRIA C681) in order to form the basis of a proportional UXO risk mitigation strategy in circumstances where the SQRA evidences that further action is necessary in order to reduce the UXO risk at the Study Site.

The assessment of UXO risk is a measure of the probability of UXO encounter and initiation and the consequence of an inadvertent UXO initiation; the former being a function of the identified hazard and proposed development methodology and the latter being a function of the type of hazard and the proximity of personnel (and/or other 'sensitive receptors', such as equipment) to the hazard. UXO risk is thus calculated using the following formula:

Risk (R) = Probability (P) x Consequence (C)

If intolerable UXO risks are identified, the methods of mitigation we have recommended are considered reasonable and sufficiently robust to reduce them to ALARP. We advocate the adoption of the ALARP legal principle because it is a key factor in efficiently and effectively ameliorating UXO risks. It also provides a ready means for assessing the Client's tolerability of UXO risk. In essence, the principle states that if the cost of reducing a risk significantly outweighs the benefit, then the risk may be considered tolerable. This does not mean that there is never a requirement for UXO risk mitigation, but that any mitigation must demonstrate that it is beneficial. Any additional mitigation that delivers diminishing benefits and that consume disproportionate time, money and effort are considered *de minimis* and thus unnecessary. Because of this principle, UXO risks will rarely be reduced to zero (nor need they be).

Important Notes

Although this report is up to date and accurate at the time of writing, *6 Alpha's* UXO threat databases are continually being populated and updated as and when additional information becomes available. Nonetheless, *6 Alpha* have exercised all reasonable care, skill and due diligence in providing this service and producing this report.

The assessment levels are also based upon our professional opinion and have been supported by our interpretation of historical records and third-party data sources. Wherever possible, *6 Alpha* has sought to corroborate and to verify the accuracy of all data we have employed, but we are not accountable for any inherent errors that may be contained in third party data sets (e.g., *National Archive* or other library sources), and over which *6 Alpha* cannot exercise control.

STAGE ONE – STUDY SITE LOCATION AND DESCRIPTION

Study Site

The Client has defined the Study Site as "The Foundry North & South, H2 Teesside". The Study Site is centred at NGR 456208, 525535 as presented at *Figures 1* and *2,* respectively.

Location Description

The Study Site is situated north-west of the *Town of Redcar,* within *Teesside,* and totals an area of 44.1ha. Furthermore, the Study Site is bounded by:

- North: undeveloped land*;*
- East: undeveloped land and the former *Redcar Iron Works;*
- South: undeveloped land and the former *Redcar Iron Works;*
- West: undeveloped land and the former *Redcar Iron Works.*

Aerial Photography (2020) (*Figure 3*)

Current aerial photography corroborates the information above and shows that the Study Site is situated within a developed industrial and coastal area. The Study Site itself consists of disused structures associated with *Redcar Iron Works*, alongside small areas of hard standing and undeveloped land.

Proposed Works

The Client has described the following:

"We have designed GI's inline with Eurocode 7 for all the sites. Target depths are 10m into the bed rock."

"For foundry site it is a large energy and industrial complex being proposed. Majority of the structures will be piled to bed rock."

Ground Conditions – General Overview

It is important to establish the specific ground conditions in order to determine the maximum *German* UXB penetration depth as well as the potential for other types of munitions to be buried. It is also important to establish the provenance of made ground, where this is recorded as being part of the ground make-up, in order to accurately determine the ground levels at the time when UXO contamination may have occurred so as to accurately determine the average/maximum bomb penetration depths and subsequently to make appropriate recommendations aimed at reducing the risk to ALARP.

Ground Conditions – Site Specific		
BGS borehole log "NZ52NE56 – Redcar Stage II 3903A" (located in the Study Site's eastern sector), recorded the following strata:		
Depth bgl (m)	Strata	Description
0.00m to 4.30m	Fill	Sand to cobble sized slag
4.30m to 12.20m	Sand	Light brown fine and medium sand with gravel and occasional shell fragments.
12.30m to 15.10m	Clay	Stiff brown with little grey mottled silty clay with gravel
15.10m to 42.60m	Mudstone	Moderately weathered and moderately fractured red-brown mudstone with occasional bands of red-brown and green-grey weak silty mudstone.
42.60m to 45.10m	Mudstone	Slightly weathered moderately fractured brown slightly gypsiferous weak mudstone.
In addition, an analysis of *BGS* mapping associated with the Study Site suggests that the Site is likely to be underlain by a bedrock of "Redcar Mudstone Formation- Mudstone" in the south, "Penarth Group - Mudstone" in the centre and "Mercia Mudstone Group – Mudstone" in the north.		

STAGE TWO – REVIEW OF HISTORICAL DATASETS

Sources of Information Consulted

The following information sources have been employed to establish the nature and scope of the UXO threat at this Study Site:

1. *6 Alpha*'s *Azimuth* Database;
2. *Home Office* WWII Bomb Census maps;
3. WWII and post-WWII aerial photography;
4. Official Abandoned Bomb Register;
5. Information gathered from the *National Archives* at *Kew*;
6. Historic UXO information provided by *33 Engineer Regiment* (Explosive Ordnance Disposal) at *Carver Barracks, Wimbish*.

Potential Sources of UXO Contamination - Overview

In general, there are several activities that might have contaminated a site with UXO, but the three most common ways are: legacy munitions from military training/exercises; deliberate or accidental dumping (AXO) and ordnance resulting from war fighting activities (also known as the Explosive Remnants of War (ERW)).

During WWII, the *Luftwaffe* undertook bombing campaigns all over the *UK* and although the *Luftwaffe* had designated primary bombing targets across the *UK*, their high-altitude night bombing was not highly accurate. There was also a period of indiscriminate bombing of civilian and industrial areas alike in *British* cities in an attempt to cripple the morale of the *British* people. As a result, thousands of buildings were damaged across industrial and residential areas and civilian fatalities were common. Bombs were also jettisoned over opportunistic targets and more rural locations were also attacked in this manner.

As the threat of invasion lingered over *Britain* during WWII, defensive actions were undertaken. The *British* and *Allied Forces* requisitioned large areas of land for military training and bomb storage (including HE bombs, naval shells, artillery and tank projectiles, explosives, LSA and SAA). Thousands of tonnes of these munitions were used for the *Allied Forces* weapon testing and military training alone. It has been estimated that at least 20 per cent of the *UK*'s land has been used for military training at some point.

The most common type of UXO discovered today in the *UK* is the aerially delivered high explosive (HE) bomb, which are comparatively thick-skinned and were dropped from *Luftwaffe* aircraft. If the bomb did not detonate when it was dropped, the force of impact enabled the UXO to penetrate the ground, often leaving behind it a UXB entry hole. These entry holes were not always apparent, and some went unreported, leaving the bomb buried and unrecorded. *British* AXO/LSA/SAA is also commonly encountered in areas that were formerly occupied by military forces (such as RAF airfields, military camps and/or military training areas). More rarely, additional forms of *German* UXO are occasionally discovered including *inter alia* Incendiary Bombs (IBs), and Anti-personnel (AP) bomblets and fragments of *V1* and *V2* rockets.

"The best practice guide for dealing with your UXO risks on land" (CIRIA publication C681) suggests that approximately 10 per cent of all munitions deployed during WWII failed to function as designed. ERW are therefore, still commonly encountered, especially whist undertaking construction and civil engineering groundwork.

Furthermore, in exceptional circumstances, UXO is discovered unexpectedly and without apparent rational explanation. There are several ways this might occur:

- When *Luftwaffe* aircraft wished to swiftly escape e.g., from an aerial attack, they would jettison some or all of their bombs and flee. This is commonly referred to as *tip and run* and it has resulted in bombs being found in unexpected locations;
- Transportation of aggregate containing munitions to an area that was previously free of UXO, usually related to construction activities employing material dredged from a contaminated offshore borrow site;
- *British* decoy sites were also constructed to deliberately cause incorrect targeting. For obvious reasons, such sites were often built in remote and uninhabited areas – few historical records concerning these sites are available.

WWII Bombing of *Teesside*

Teesside was considered a highly important industrial area even before the mass mobilisation of *Britain's* industry at the outset of WWI and WWII. It encompassed *Middlesbrough, Billingham, Redcar* and other important manufacturing hubs. Much of the local industry was repurposed for the war effort, and so it became one of the major industrial areas to be targeted by the *Luftwaffe* in their attempts to cripple the *British* war effort.

The first bombs landed on *Middlesbrough* and the surrounding areas on the 25th May 1940 when a *Luftwaffe* bomber targeted the *South Steel Plant*. In total, over 200 buildings had been destroyed by the bombing of the *Middlesbrough* area by the end of the war. There were also a high number of casualties associated with the bombing in this period, as contemporary bombing by *Axis* aircraft over the *UK* was characterised by targeting civilian populations. Further bombing occurred across much of the area, with the town of *Redcar* attacked on numerous occasions.

WWII HE Bomb Density (*Figure 4*)

The Study Site was located within *Redcar Municipal Borough,* which recorded three HE bombs per 100 hectares, a "very low" level of bombing.

WWII Luftwaffe Bombing Targets (*Figure 5)*

Prior to WWII, the *Luftwaffe* conducted numerous aerial photographic reconnaissance missions over *Britain*, recording key military, industrial and commercial targets for attack, in the event of war. In addition, logistics infrastructure and public services, such as railways, canals, power stations, reservoirs, water and gas works were also considered viable bombing targets.

Luftwaffe aerial reconnaissance photography associated with the Study Site identified *Redcar Iron Works* (partially located on-site) as a primary bombing target.

WWII HE Bomb Strikes (*Figure 6*)

During WWII, ARP wardens compiled detailed logs of bomb strikes across their respective districts. ARP records associated with the Study Site were not available. Nonetheless, further research of historical records found evidence of significant bombing within *Redcar* and the surrounding area during WWII. Notably, multiple HE bomb strikes were recorded impacting in the vicinity of *Redcar Iron Works* (located partially on-site) in 1941/42, with at least seven known to have directly impacted the works. In addition, supplementary research identified numerous HE bomb strikes on and around *Bran Sands Bombing Decoy* (located 200m south-west at its closest point), *Warrenby Marshes* (located approximately 400m south), *South Gare* (approximately 850m north-west) and *West Coatham Grange Farm* (approximately 850m south-east). Furthermore, whilst IBs may have fallen within the Study Site, they fell in such large numbers that accurate record keeping was either non-existent or perfunctory. Nonetheless, supplementary research evidenced a "large number" of IBs impacted the beach near *Warrenby Marshes.*

In addition to IBs and HE bomb strikes, during the latter part of the war when aerial bombing had significantly declined, the main threat came from *V* type weapons. *V1* and *V2* rockets were thin-skinned, unmanned and inaccurate weapons. Despite this, there is no evidence to suggest that the Study Site (or its immediate vicinity) was subjected to rockets strikes during WWII.

The potential penetration depth of an UXB was dependent on a number of factors including but not restricted to those prior to striking the ground e.g. velocity and orientation of the UXB which in turn will be influenced on factors such as the release altitude from the aircraft and encounters with infrastructure during its fall; those encountered at the point of impact i.e. was the impact on concrete, grass, water etc. and finally, the below ground level conditions which were encountered such as infrastructure e.g. services, basements, foundations, and geology e.g. made ground, clay, sand, etc. Further, as the UXB penetrated the ground, it's velocity naturally slowed where, it either came to an abrupt stop e.g., against foundations or would continue for 10's of feet along a route of least resistance which often resulted in a curving of the trajectory back towards the surface. This is known as the "J Curve" effect and often resulted in a considerable horizontal off-set from the point of entry. This is often the reason why UXBs have been discovered against or under the foundations of buildings, which were present during WWII, or many meters from the point of impact.

WWII Bomb Damage

Official bomb damage mapping associated with the Study Site was not available. It is highly likely that bomb damage records associated with the industrial facilities were recorded privately and not released into the public domain as a matter of national security. Nonetheless, further research of historical records identified bomb damage to the *iron furnaces, mill boilers* and a *gas cleaning plant* within the *Redcar Iron Works* due to the aforementioned bomb strikes. Although the exact location of this damage could not be corroborated, it is likely to have been located in close proximity to the Study Site. Furthermore, an analysis of post-war mapping identified multiple *"ruins"* approximately 890m east-south-east of the Study Site boundary, all of which are likely indicative of bomb damage.

Abandoned Bombs

An examination of the official abandoned bomb records has identified the following abandoned bombs;

- One abandoned 50kg IBs situated at *Foreshore*, to the west of the *Redcar Iron Works* (located 190m south);
- Two abandoned 50kg IBs situated at *Warrenby Marshes* (located 480m south).

Records of WWII UXB Disposal Tasks

Civil defence records did not identify any UXB disposal tasks within *Redcar Municipal Borough* from 1940-45, within 1,000m of the Study Site. However, it is known that these records are incomplete, some having been destroyed by *Luftwaffe* action during WWII.

Nonetheless, further research of historical records identified one UXB encounter during WWII in the vicinity of the Study Site. Specifically, one UXB was removed from the *"blacksmiths shop"* within the *Redcar Iron Works,* possibly located on-site or in the immediate vicinity of the Study Site.

Military Activity (*Figure 7* & *8*)

There is evidence to suggest that areas of the Study Site were employed for various military purposes during WWII. For example, the area of the Site was seen as a potential amphibious invasion landing point in the early stages of WWII and so a number of defensive fortifications were installed on-site. Notably, 22 anti-invasion minefields were recorded as being laid on the coastline within 1,000m of the Study Site boundary, four of which were located on-site. These minefields were a part of a larger anti-invasion minefield-belt, which was deployed along a 20km front from *Hartlepool* to *Saltburn-by-Sea.* These minefields likely consisted primarily of what were known in WWII as *B-type C mines.* There is evidence to suggest that these minefields were cleared after WWII (as was then common practice), although an analysis of official *EOD* records neither corroborated such clearance nor provided evidence of the success rate of such clearance operations, and so it is possible (though unlikely) that some may remain shallow buried.

In addition, multiple other defensive installations were identified in the vicinity of the Study Site; including 27 anti-invasion pillboxes, of which five were located on-site; three *light anti-aircraft* batteries, of which one was located on-site; one *beach defence battery* 295m west-north-west; one *machine gun emplacement* 605m north-west, and one *spigot-mortar emplacement* 715m east.

Furthermore, to protect the area against aerial attacks, *Bran Sands Bombing Decoy* was constructed 200m south-west. It functioned as a series of controlled fires, which would be lit to simulate an urban area on fire, and also as a series of lights which were built to resemble a marshalling yard and furnace. This was done in order to divert *Luftwaffe* bombers into deploying their bombloads over the decoy area, instead of their real target. Further research indicates this decoy was bombed multiple times, and thus was at least partially successful in its aim.

Aside from defensive installations, a 20th century rifle range was located 400m north-east of the Study Site boundary, although the frequency of its use could not be corroborated. In addition, the Study Site was also located within a *WWII Armament Training Area,* which was an airspace used for military training and practice exercises, however this is unlikely to have generated a significant UXO contamination threat at the Site.

Given the large number of military installations and minefields on-site and/or in close proximity to the Study Site, it is considered highly likely that munitions may have been stored, located and/or fired from this Study Site during WWII. It was common for munitions to be buried at former military facilities and were often abandoned at the end of the war – the remnants of which are known as Abandoned Explosive Ordnance (AXO).

WWII Site Use

The CS mapping prior to WWII (1938) and OS mapping post-WWII (1953) shows that the Study Site was located in a developed industrial area during WWII; the Study Site itself primarily consisted of undeveloped land, alongside multiple structures and railway lines in the north-eastern sector associated with *Redcar Iron Works*. Therefore, it is likely that footfall within the Study Site would have varied throughout WWII, with high levels of footfall expected in all developed areas.

Generally, in developed areas with higher footfall, it is considered more likely that a local civilian, employee or any military personnel based at the Site would have observed and reported any UXB entry holes during WWII, which would have been dealt with at the time. Nevertheless, despite high levels of footfall, in any areas of potentially significant bomb damage, it is plausible that bomb damage debris may have concealed a UXB entry hole and caused it to go unnoticed. Additionally, as most of the Site was undeveloped during WWII, there is also a generally elevated likelihood that any UXBs impacting in those areas could have done so unnoticed.

Post-WWII UXO Encounters

An examination of the post-WWII BDO tasks associated with the Study Site has not identified any BDO operations within the Study Site itself, however the following tasks were undertaken in the area:

- The controlled demolition of one projectile at *South Gare, Redcar* on the 25th of June 2016 (located approximately 850m north-west).

Sources of UXO Contamination

Given the historic military activity documented at the Study Site, the most likely source of UXO contamination is *German* aerially delivered ordnance, which ranges from small IBs through to large HE bombs (the latter forms the principal threat), *British* AXO/LSA/SAA and AAA projectiles (which were used to defend the UK against *German* bombing raids) associated with the military activity on-site.

Post-WWII Study Site Development

Generally, the probability of encountering UXO in ground that has been disturbed since it may have been contaminated with UXO is considered to be remote (up to the depth below ground level previously disturbed by any intrusive works). Therefore, an understanding of the Study Site's previous development history is crucial when assessing the likelihood that UXO might be encountered at the Study Site.

Study Site Development History From an analysis of the CS and OS historical mapping associated with the Study Site, the following history can be deduced:	
Year	Analysis
1895 CS Map	The Study Site was located in a developing industrial and coastal area. The Study Site itself primarily consisted of undeveloped land, although a *tramway* and railway lines ran through the northern sector.
1915 CS Map	Significant changes were not recorded at the Study Site.
1938 CS Map	*Redcar Iron and Steel Works* had been developed and covered the north-eastern part of the Site. A large number of structures and railway lines were built as part of the works. Much of the southern sector of the Site remained undeveloped
1953 OS Map	Significant changes were not recorded at the Study Site.
1970-1973 OS Map	Further railway lines had been developed traversing the northern and central sectors of the Site.
1982-1985 OS Map	Structures associated with *Redcar Iron and Steel Works* was cleared. Multiple structures, railway lines and areas of hard standing associated with *Teesside Works, Redcar* had been developed throughout the entirety of the Study Site.
1992 OS Map	Significant changes were not recorded at the Study Site.
2000 Aerial Photography	Significant changes were not recorded at the Study Site.
2007 Aerial Photography	Several small structures associated with *Teesside Works, Redcar* had been demolished.
2020 OS Map	Further small structures associated with *Teesside Works, Redcar* had been demolished.

The Study Site history assessment is our best interpretation of the data available at the time of writing. Given that yearly revisions of neither CS and OS mapping, nor aerial photography, are available for analysis, there are gaps between the mapping revisions.

Consequently, it should not be assumed that any new structures and/or features that are labelled on a map revision were constructed, developed, installed or demolished in the exact year that the mapping illustrates the change. It is possible – and indeed likely – that the exact date of development occurred somewhere between the two closest mapping revisions. Specifically, this may be particularly relevant where there is a gap between pre and post-WWII mapping, as it may not be clear whether structures were present during WWII or if they were constructed in the post-WWII period.

STAGE THREE – DATA ANALYSIS

Variable	Result	Comment
Was the area considered to be a primary bombing target during WWII?	✔	*Redcar Iron Works* (located on-site) was identified as a primary bombing target.
Was the Study Site or the immediate area bombed during WWII?	✔	Further research identified multiple HE bomb strikes on and around *Redcar Iron Works* (located on-site and in the vicinity).
Did the Study Site or the immediate area experience bomb damage?	✔	Further research of historical records identified bomb damage to *Redcar Iron Works* due to the aforementioned bomb strikes.
Would munitions have been manufactured, stored and/or fired from the Study Site previously?	✔	Given the number of military installations and minefields on-site and in the vicinity, it is highly likely that munitions would have been located, stored and/or fired from the Study Site.
Was the ground undeveloped during WWII?	✔	The Study Site primarily consisted of undeveloped land, alongside structures and railway lines associated with *Redcar Iron Works* in the north-eastern sector.
Would the footfall have been high in the area?	✘	Within all developed areas, footfall would have been high, however in undeveloped areas, footfall is likely to have been low.
Would a UXB entry hole have been observed during WWII?	✘	In those areas of lower footfall, and/or those areas of potentially significant bomb damage, it is plausible that a UXB entry hole could have gone unnoticed.
Has UXO been encountered previously at the Study Site?	✘	There have been no documented UXO encounters on-site.
Have previous intrusive works removed the potential for UXO to be present?	✘	It is likely that any UXO within post-war disturbed and developed ground would potentially have been discovered and removed. The potential for a UXO encounter in areas of undisturbed ground remains extant.
Are proposed intrusive works likely to extend into previously undisturbed ground?	✔	Areas of the Study Site have remained undeveloped since WWII and therefore the proposed works may extend into previously undisturbed ground.
Is there potential for an unplanned encounter with UXO to occur during proposed intrusive works?	✔	Given that bombing was recorded potentially on-site/in the immediate vicinity of the Site, combined with the history of significant military activity on-site, it is considered possible for an unplanned encounter with UXO to occur.
Does the probability of a UXO encounter vary across the Study Site?	✔	The probability of encountering UXO within post-war disturbed and developed ground is considered to be remote. However, the probability of a UXO encounter within all previously undisturbed areas of the Study Site is extant.

N.B. The ✔ / ✘ symbology is intended to act only as a succinct visual indicator as to whether the data analysis has returned a positive (i.e., ✔) or negative (✘) answer to each question concerning the potential for UXO contamination at the Study Site.

STAGE FOUR – RISK ASSESSMENT

Threat Items

The most probable UXO threat items are *German* HE bombs, IBs, *British* AXO/LSA/SAA and *British* AAA projectiles. The consequences of initiating *German* HE bombs are generally more severe than initiating AXO/LSA/SAA, IBs or AAA projectiles, and thus they pose the greatest prospective risk to intrusive works.

Bomb Penetration Depth

Considering the ground conditions (highlighted in Stage 1), the average BPD for a 250kg *German* HE bomb is assessed to be approximately 6m bgl, with the maximum BPD considered to be approximately 14m bgl. Although it is possible that the *Luftwaffe* deployed larger bombs in the area, their deployment was infrequent, and to use such larger (or the largest) bombs for BPD calculations are not justifiable on either technical or risk management grounds.

WWII *German* bombs have a greater penetration depth when compared to IBs and AAA projectiles, which are unlikely to be encountered at depths greater than 1m bgl. However, due to the "J Curve" and the potential for structures to impede the penetration into the ground, HE bombs have been discovered at much shallower depths than the average.

Risk Pathway

Given the types of UXO that might be present on-site, all types of aggressive intrusive engineering activities (i.e., investigative groundworks and construction methodologies) may generate a significant risk pathway. Whilst not all UXO encountered aggressively will initiate upon contact, such a discovery could lead to serious impact on the project especially in terms of critical injury to personnel, damage to equipment and project delay.

Prospective Consequences

Consequences of UXO initiation include:

1. Fatally injure personnel;
2. Severe damage to plant and equipment;
3. Deliver blast and fragmentation damage to nearby buildings;
4. Rupture and damage underground utilities/services.

Consequences of UXO discovery include:

1. Delay to the project and blight;
2. Disruption to local community/infrastructure;
3. The expenditure of additional risk mitigation resources and EOD clearance;
4. Incurring additional time and cost.

UXO RISK CALCULATION

Site Activities

Although there is some variation in the probability of encountering and initiating items of UXO when conducting different types of intrusive activities, a number of ground intrusive methodologies have been described for analysis at this Study Site. The consequences of initiating UXO vary greatly, depending upon, *inter alia* the mass of HE in the UXO and how aggressively it might be encountered. For this reason, *6 Alpha* has conducted separate risk rating calculations for each intrusive methodology that might be employed.

Risk Rating Calculation

6 Alpha's Semi-Quantitative Risk Assessment assesses and rates the risks posed by the most probable threat items when conducting a number of different activities on the site. UXO risk is determined by calculating the probability of encountering and initiating UXO and the consequences of an inadvertent UXO detonation.

UXO Risk Calculation Table – All Areas				
Activity	**UXO Threat Items**	**Probability (SH+EM=P)**	**Consequence (D+PSR=C)**	**UXO Risk (PxC=R)**
Trial Pits	HE Bombs	2+2=4	3+3=6	4x6=24
	AAA Projectiles	2+2=4	3+1=4	4x4=16
	IBs	1+2=3	3+1=4	3x4=12
	AXO/LSA/SAA	2+2=4	3+2=5	4x5=20
Window Sampling	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	2+3=5	3+1=4	5x4=20
	IBs	1+3=4	3+1=4	4x4=16
	AXO/LSA/SAA	2+3=5	3+2=5	5x5=25
Boreholes	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	2+3=5	3+1=4	5x4=20
	IBs	1+3=4	3+1=4	4x4=16
	AXO/LSA/SAA	2+3=5	3+2=5	5x5=25
Excavations	HE Bombs	2+2=4	3+3=6	4x6=24
	AAA Projectiles	2+2=4	3+1=4	4x4=16
	IBs	1+2=3	3+1=4	3x4=12
	AXO/LSA/SAA	2+2=4	3+2=5	4x5=20
Trenching	HE Bombs	2+2=4	3+3=6	4x6=24
	AAA Projectiles	2+2=4	3+1=4	4x4=16
	IBs	1+2=3	3+1=4	3x4=12
	AXO/LSA/SAA	2+2=4	3+2=5	4x5=20
Piling	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	2+3=5	3+1=4	5x4=20
	IBs	1+3=4	3+1=4	4x4=16
	AXO/LSA/SAA	2+3=5	3+2=5	5x5=25

Abbreviations – Site History (SH), Engineering Methodology (EM), Probability (P), Depth (D), Consequence (C), Proximity to Sensitive Receptors (PSR) and Risk Rating (RR).

STAGE FIVE – RECOMMENDED RISK MITIGATION MEASURES

Do the ground conditions support a geophysical UXO survey?

Non-Intrusive Methods of Mitigation – Magnetometer results may be affected by ferro-magnetic contamination due to previous construction activities and made ground within the Study Site.

Intrusive Methods of Mitigation – Intrusive magnetometry may be effective on this Study Site, prior to boreholing and piling especially. However, any ferrous metal/red brick contamination in made ground/old foundations may affect the detection capability of the UXB survey equipment, as it passes through the contaminated layer especially. Nonetheless, beyond the contaminated strata such a survey should prove effective.

Mitigation Measures to Reduce Risk to 'ALARP'

Activity	Risk Mitigation Measures	Final Risk Rating
All Activities in All Areas	**1. Operational UXO Emergency Response Plan;** appropriate site management documentation should be held on-site to guide and plan for the actions which should be undertaken in the event of a suspected or real UXO discovery (this plan can be supplied by *6 Alpha*); **2. UXO Safety & Awareness Briefings;** the briefings are essential when there is a possibility of explosive ordnance encounter and are a vital part of the general safety requirement. All personnel working on the site should receive a briefing on the identification of a UXB, what actions they should take to keep people and equipment away from such a hazard and to alert site management. Information concerning the nature of the UXB threat should be held in the site office and displayed for general information on notice boards, both for reference and as a reminder for ground workers. The safety awareness briefing is an essential part of the *Health & Safety Plan* for the site and helps to evidence conformity with the principles laid down in the *CDM* regulations 2015 (this brief can be delivered directly, or in some cases remotely, by *6 Alpha*).	**ALARP**
Trial Pits, Excavations and Trenching into Previously Undisturbed Ground	**3. EOD Engineer in the Watching Brief Role;** Where "open" intrusive works into previously undisturbed ground are proposed an EOD Engineer should be present in the UXO Watching Brief role to monitor ongoing "open" intrusive works to identify any suspicious items that may be UXB or UXO related (this service can be provided by *6 Alpha*).	
Window Sampling, Piling and Boreholing into Previously Undisturbed Ground	**4. Intrusive UXO Survey;** Where 'blind' intrusive works into previously undisturbed ground are proposed, an intrusive UXO survey (employing down-hole magnetometer or MagCone techniques) is strongly recommended. Such a survey should extend to the *assessed average bomb penetration depth* or to the maximum depth of the works, whichever is encountered first, or until geology is encountered through which it is assessed a UXB would not penetrate, to identify for signs of sub-surface anomalies which may model as the target UXO in advance of said works. (This service can be provided by *6 Alpha*).	

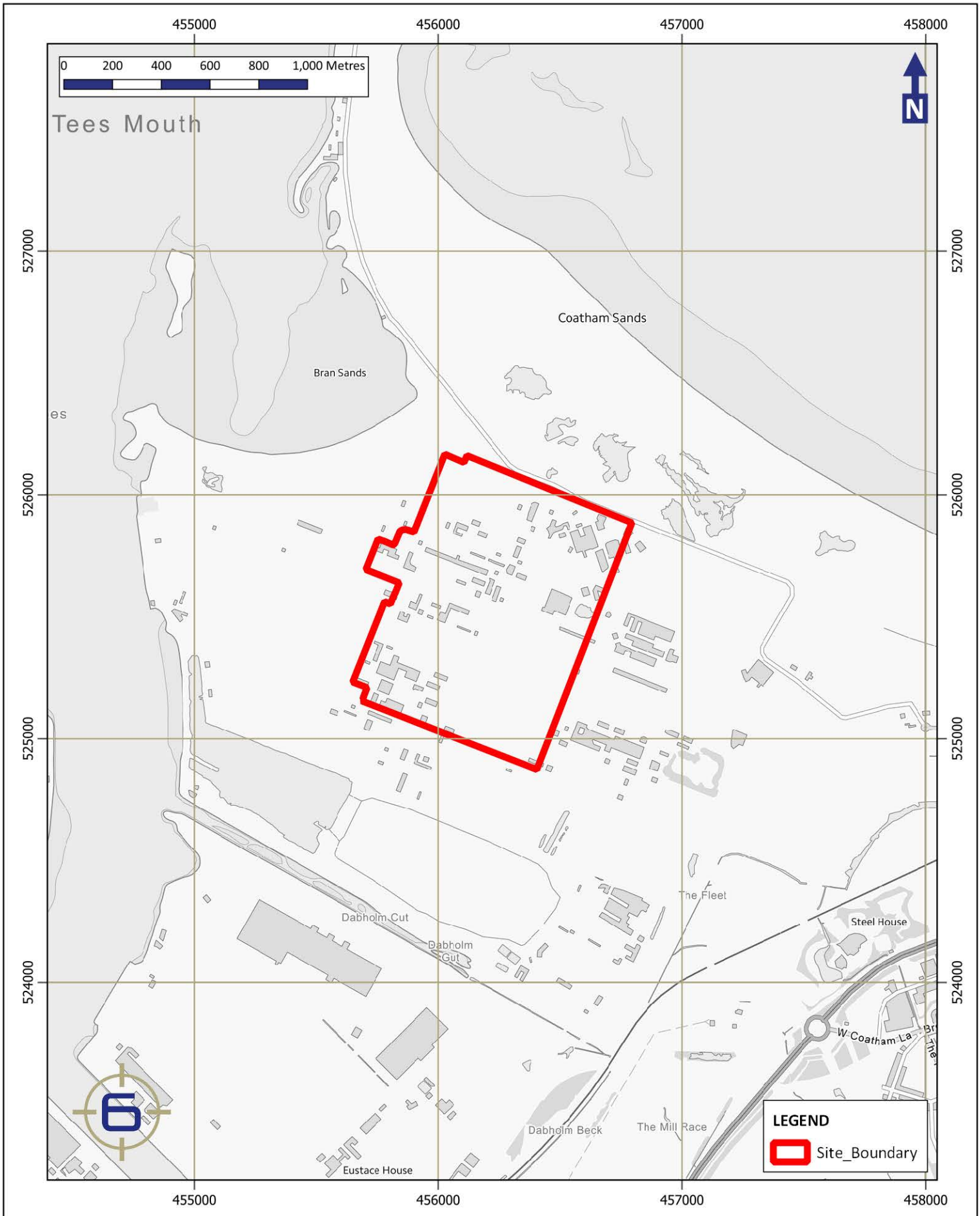
This assessment has been conducted partially based on the information provided by the Client, should the proposed works change then *6 Alpha* should be re-engaged to refine this risk assessment

Report Figures

Figure One - Study Site Location

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

Site Location

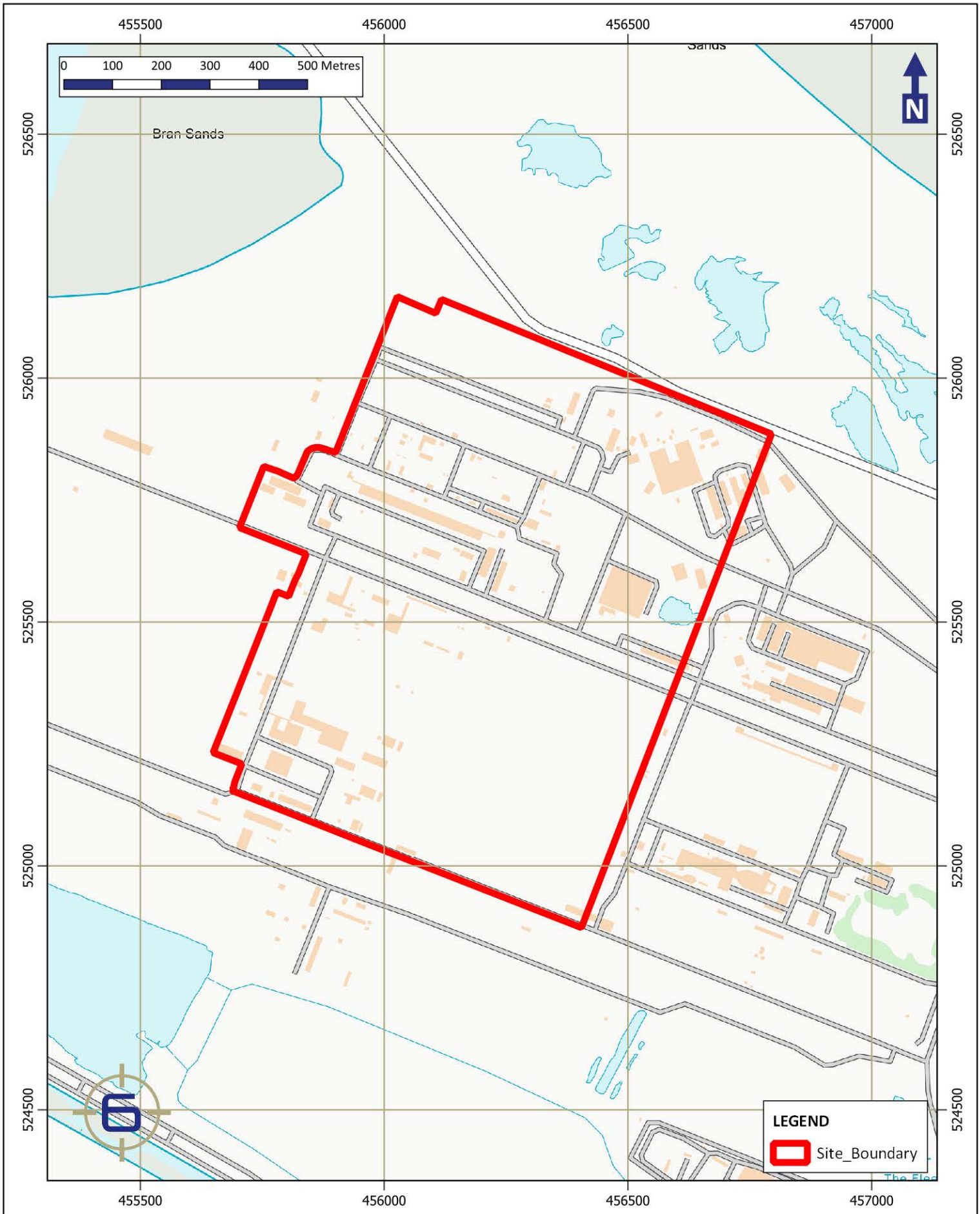


PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
10202_1	1	CC	LG	02/11/2022	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Figure Two - Study Site Boundary

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

Site Boundary



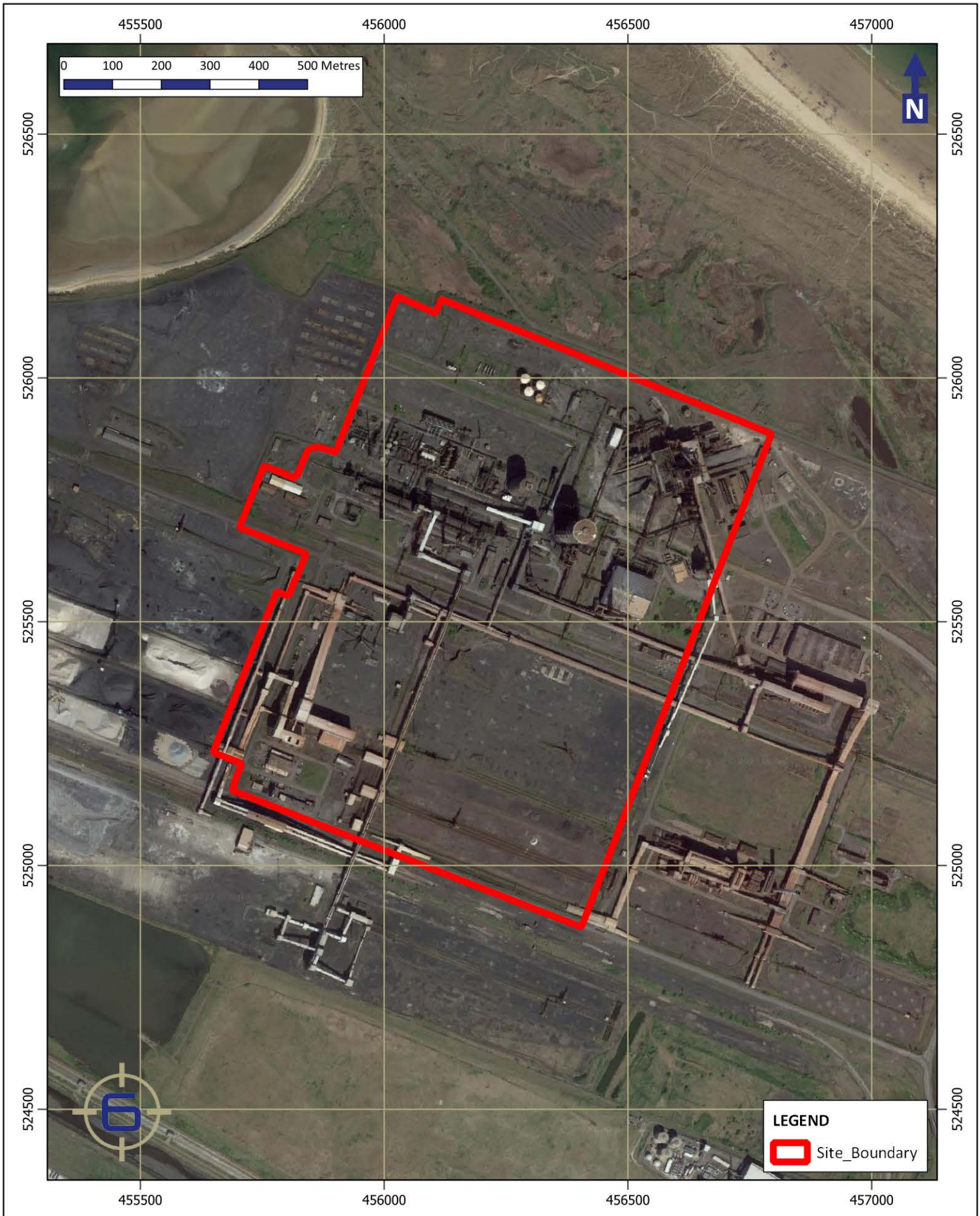
PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
10202_1	2	CC	LG	02/11/2022

Figure Three - Aerial Photography (2020)

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

Aerial Photography (2020)

British National Grid



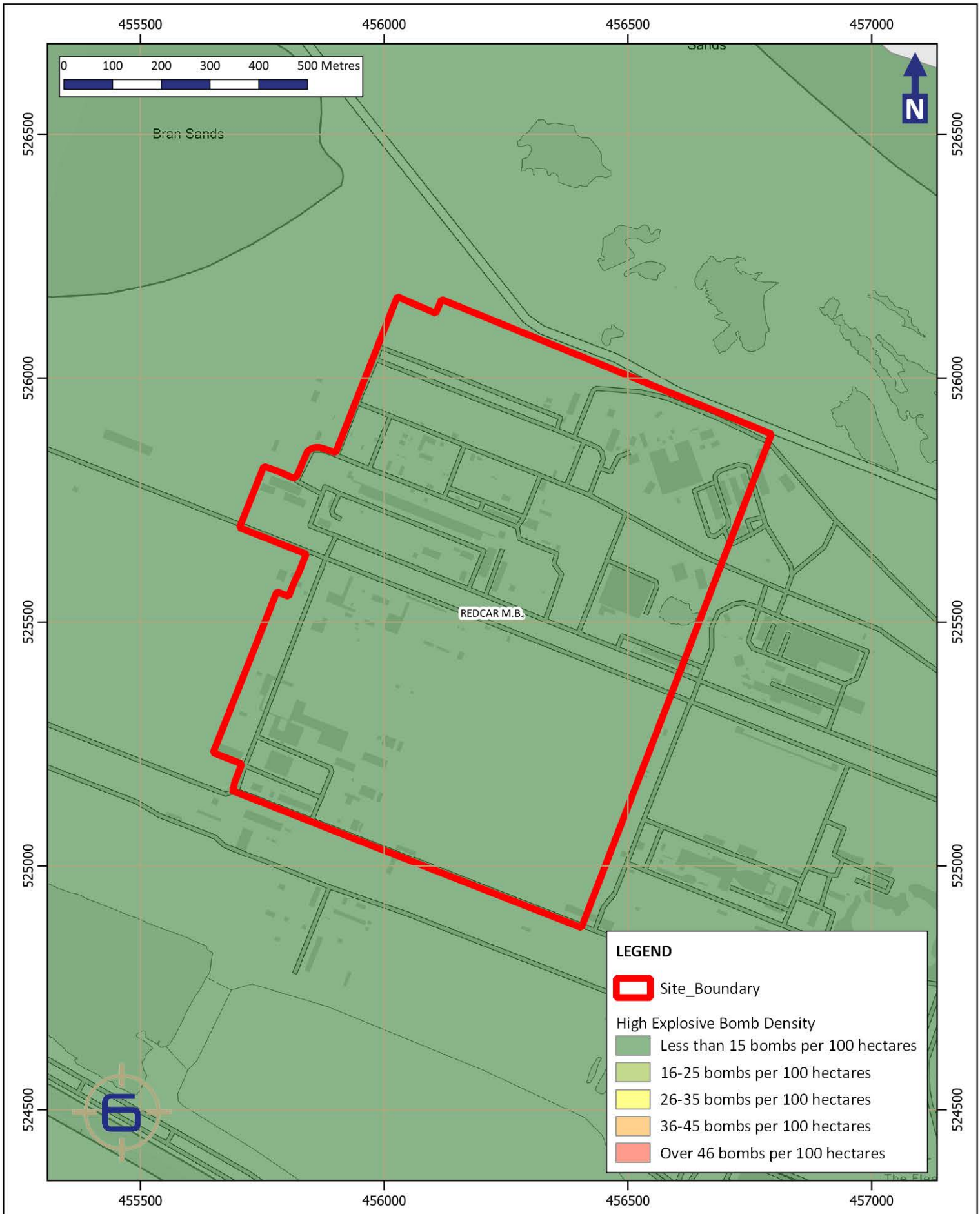
PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE		
10202_1	3	CC	LG	02/11/2022	Map data: Google	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.

Figure Four - WWII High Explosive Bomb Density

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

WWII High Explosive Bomb Density

British National Grid



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
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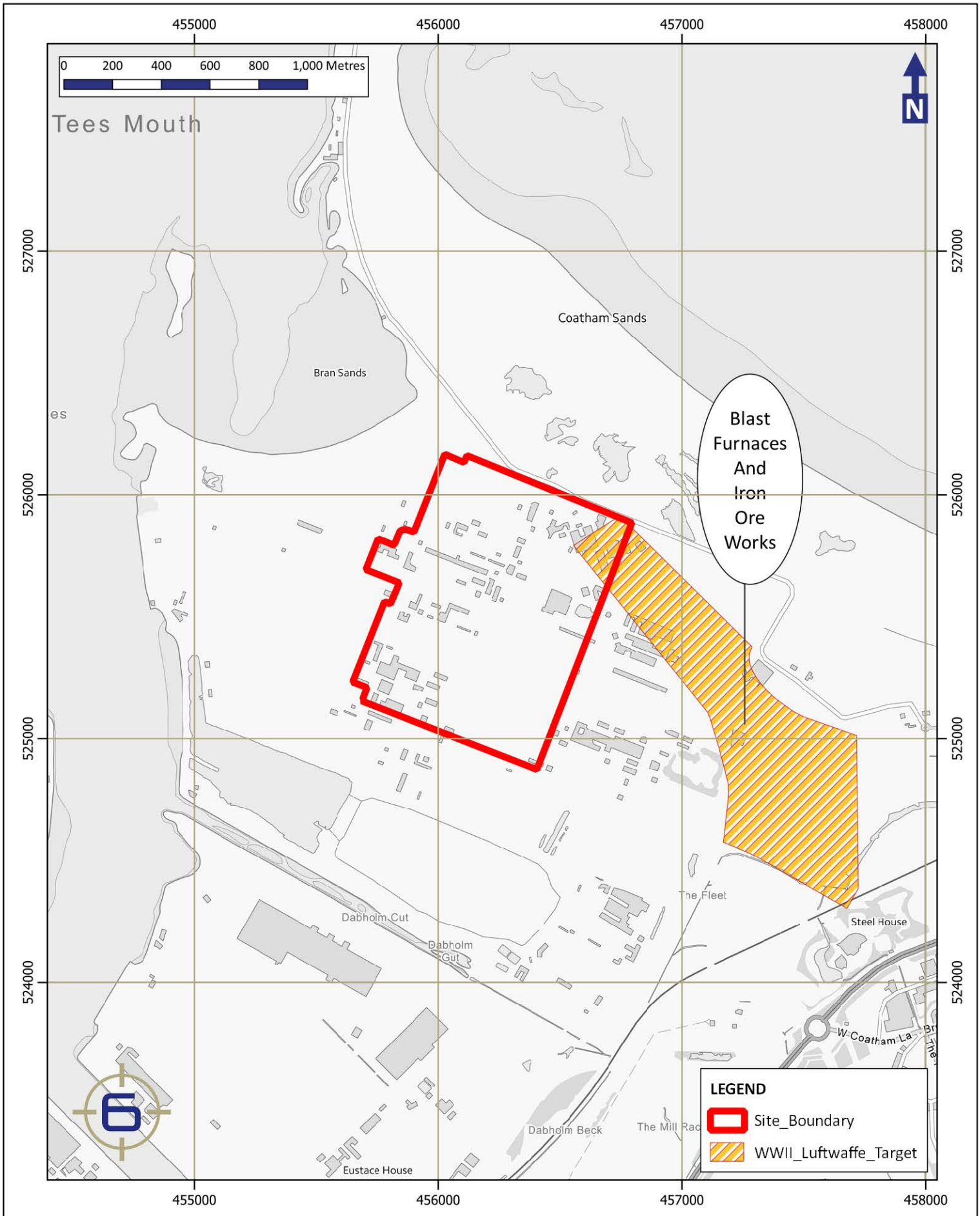
Figure Five - WWII Luftwaffe Bombing Targets

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

WWII Luftwaffe Bombing Targets

British National Grid



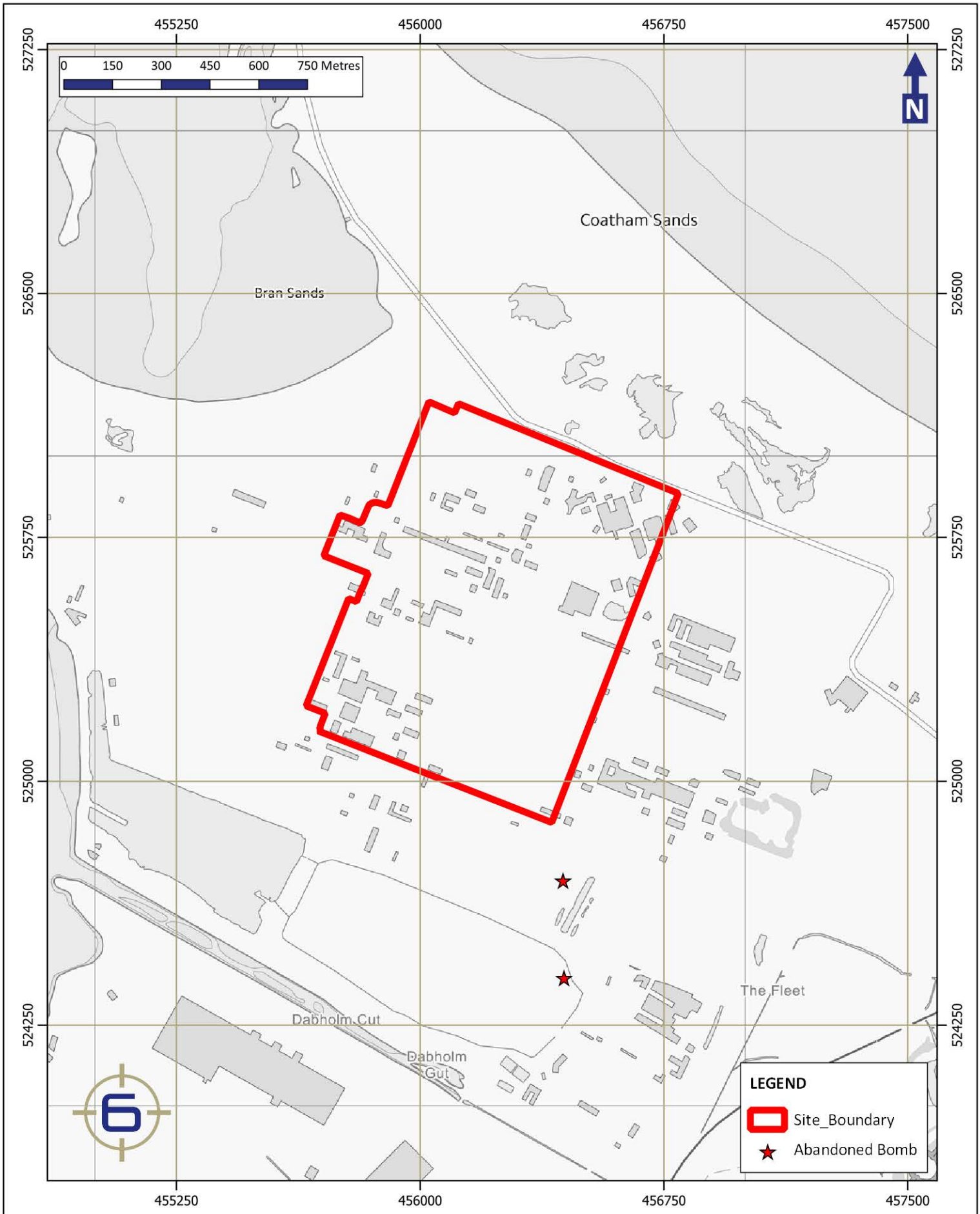
PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
10202_1	5	CC	LG	03/11/2022

Figure Six - WWII High Explosive Bomb Strikes

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

WWII Abandoned Bombs

British National Grid



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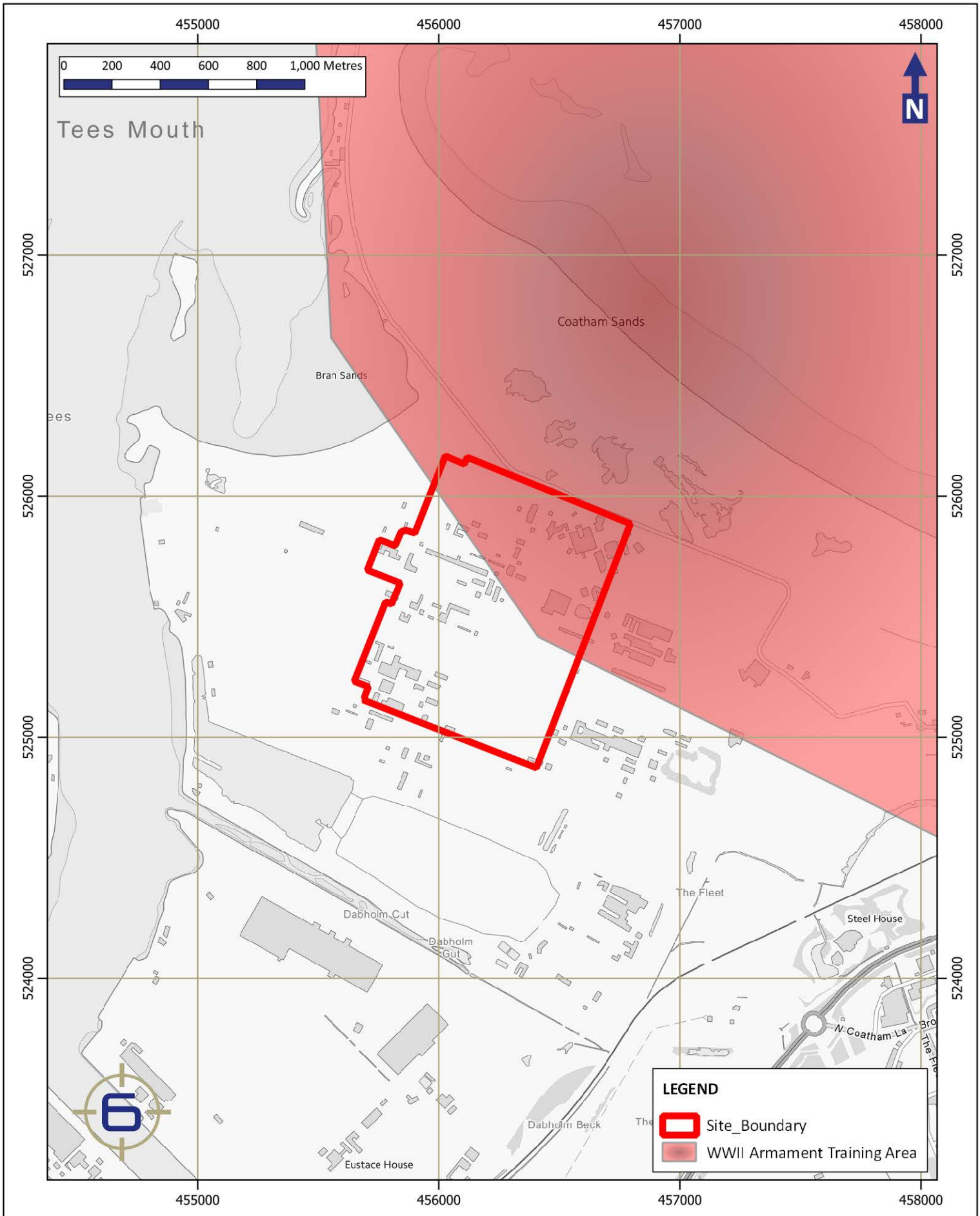
10202_1	6	CC	LG	03/11/2022	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Figure Seven - WWII Armament Training Area

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

Extent of WWII Armament Training Areas

British National Grid



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
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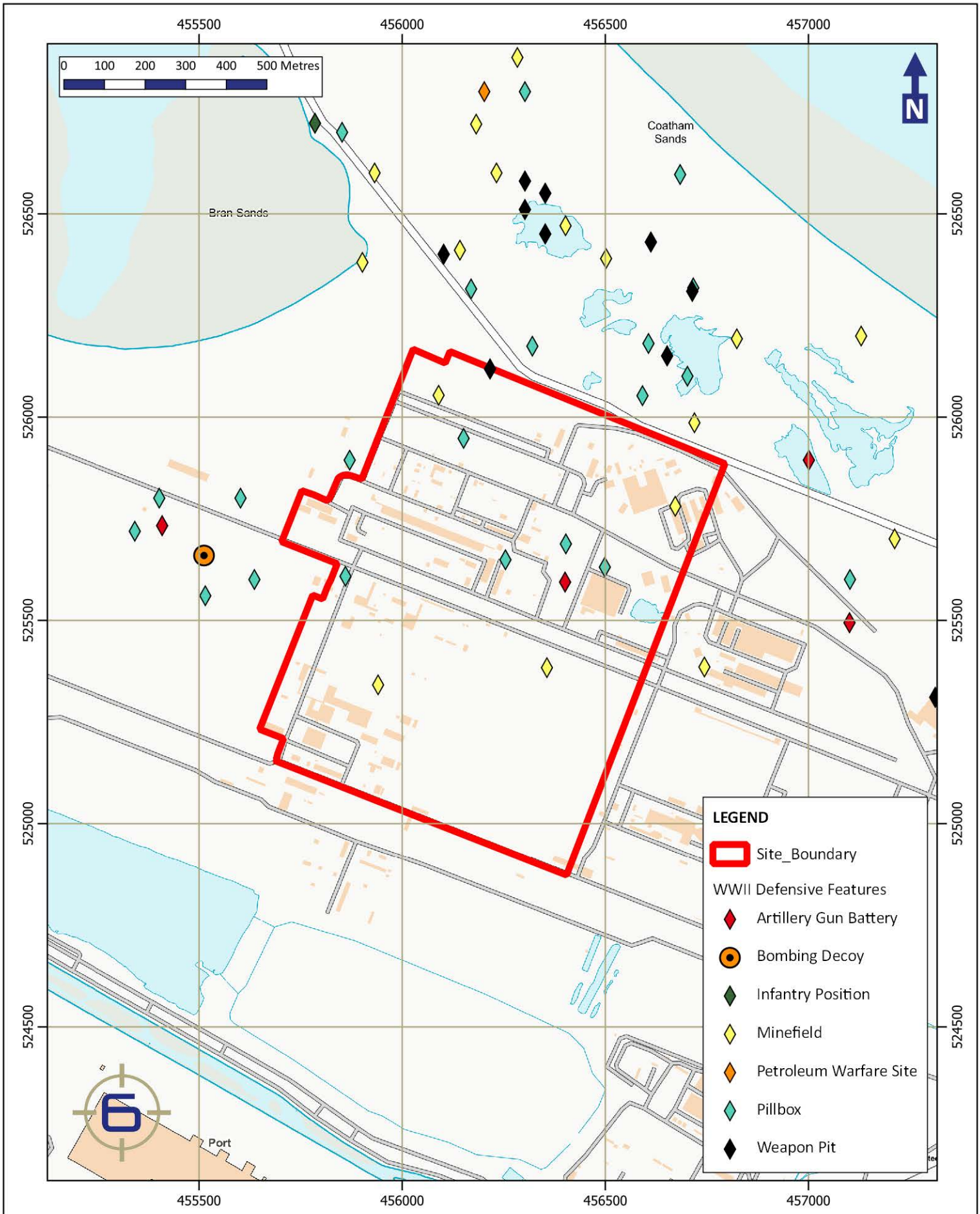
Figure Eight - WWII Defensive Features

THE FOUNDRY NORTH & SOUTH, H2 TEESSIDE

WWII Defensive Features

British National Grid



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
10202_1	8	LG	BW	10/11/2022

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H2Teesside Project

Environmental Statement

Volume III – Appendices

Appendix 10B: Contaminated Land Conceptual Site Model

Document Reference: 6.4.12

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended)

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)

Rev: 0

TABLE OF CONTENTS

TABLES

10B.0 CONTAMINATED LAND CONCEPTUAL SITE MODEL

10B.1 Introduction

10B.1.1 This appendix identifies possible risks, if any, arising from substances used or deposited at the Proposed Development Site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered.

10B.2 Assessment Framework

10B.2.1 Current legislation relating to contaminated land in the UK is contained within Part 2A of the Environmental Protection Act 1990 (Defra, 1990), which was inserted by Section 57 of the Environment Act 1995 (HM Government, 1995) and by Section 86 of the Water Act 2003 (HM Government, 2003) and elaborated within the Contaminated Land (England) Regulations 2006 [S.I. 2006/1380] (amended 2012 [S.I. 2012/263]) (HM Government, 2012).

10B.2.2 The "suitable for use" approach is adopted for the assessment of contaminated land. Remedial measures are only undertaken where unacceptable risks to human health or the environment are realised, taking into account the use (or proposed use) of the land in question and the environmental setting.

10B.2.3 Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in Part 2A of the Environmental Protection Act 1990 (Defra, 1990).

10B.2.4 The risk assessment process for the environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- source: Hazardous substance that has the potential to cause adverse impacts;
- pathway: Route whereby a hazardous substance may come into contact with the receptor. Examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- receptor: Target that may be affected by contamination. Examples include human occupants / users of Sites, water resources (surface waters or groundwater), or structures.

10B.2.5 For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

10B.2.6 The following sections detail the conceptual site model, which has been developed for the Proposed Development Site with the view to assessing the potential risks during construction and upon completion of the proposed new development.

10B.3 Potential Sources of Contamination

10B.3.1 This section highlights those former/current onsite and off-site activities that have been identified as potential sources of contamination. These activities may have in turn impacted on soil, soil leachate, and groundwater. A summary of the potential

sources of contamination is presented in Table 10B-1 based on the findings of the Summary Report (Environmental Statement (ES) Volume III, EN070009/APP/6.3).

Table 10B-1: Potential Sources of Contamination

SOURCE	DESCRIPTION	ASSOCIATED CONTAMINANTS OF POTENTIAL CONCERN
Main Site		
Made Ground associated with historical land use (onsite / offsite)	Former iron and steel works including coke making, steel making, casting and rolling and finishing, tramway, railway, sidings, tanks (ammonia liquor, tar), infilled ground, slag, substations, refuse tips, sand pit potential fill material, infilled tar pit.	Heavy metals and inorganics including sulphate, pH, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbons (PAH), Semi Volatile Organic Compounds (SVOCs), Volatile Organic Compounds (VOCs), Polychlorinated biphenyls (PCBs), phenols, coal tar, clinker, ash, alkalis, acids asbestos, and Asbestos Containing Materials (ACMs).
Made Ground associated with current land use (onsite / offsite)	Construction and demolition works, and bulk materials storage.	Heavy metals and inorganics including sulphate, pH, TPH, PAH, SVOCs, VOCs, phenols, coal tar, clinker, ash, alkalis, acids asbestos, and ACMs.
Bulk Soil Gases	Methane and carbon dioxide generated from Made Ground and natural deposits.	Methane, carbon dioxide, hydrogen sulfide and VOCs.
Connection Corridors		
Made Ground associated with historical land uses (on / offsite)	Unspecified Heaps, Tramways Sidings, Unspecified Tanks, Slag and Tar Macadam Works, Railway Sidings, Oxygen Works, Unspecified Warehouses, Corporation Yards, Unspecified Factories, Chimneys, Old Clay Pits, Cuttings, Brick Works, Electricity Substations, Salt Works, Power Station, Engine Shed, Fire Station, Mortuary, Disused Brine Wells, Oil Storage Depot, Cemetery, Smithy, Bedding Works, Rifle Ranges, Telephone Exchange, Electricity Switch House, Gas Handling Station, Tunnel, Oil Refinery, Oil Terminal, Oil Supply Terminal, Slag Wool Works, Dock, Transit Shed and Terminal.	Heavy metals and inorganics including sulphate, pH, Total Petroleum Hydrocarbons (TPH), Semi-volatile organic compounds (SVOCs), Volatile Organic Compounds (VOCs), asbestos and asbestos containing materials (ACMs).

SOURCE	DESCRIPTION	ASSOCIATED CONTAMINANTS OF POTENTIAL CONCERN
Waste and Landfill (onsite / offsite)	Active or recently closed landfill (under EA regulation) taking special waste, historical landfills and various licensed waste management facilities.	Heavy metals, Polycyclic Aromatic Hydrocarbons (PAH), TPH, SVOCs, VOCs, acids, alkalis, inorganics (e.g. sulphate), pH, asbestos, landfill gases, ACMs and contaminated leachate.
Made Ground associated with current land use (onsite / offsite)	Construction and demolition works, and bulk materials storage. (Areas in and around South Tees Development Corporation (STDC)).	Heavy metals and inorganics including sulphate, pH, TPH, PAH, SVOCs, VOCs, phenols, coal tar, clinker, ash, alkalis, acids asbestos, and ACMs.

10B.4 Potential Receptors

10B.4.1 Table 10B-2 lists the potential receptors at the Main Site and Connection Corridors.

Table 10B-2: Potential Receptors

POTENTIAL RECEPTOR	DESCRIPTION
Main Site	
Onsite Human Health	Construction Workers
Onsite Human Health	Future Site Users – Trespassers and Site Visitors
Onsite Human Health	Future Site Users – Workers / Maintenance
Offsite Human Health	Adjacent Site Users i.e. during excavation / remediation / earthworks
Onsite Controlled Waters (Superficial Aquifers)	Secondary A Aquifer (Tidal Flat Deposits (Sand and Silt) and Glaciolacustrine Deposits (Silt))
Onsite Controlled Waters (Superficial Aquifers)	Secondary Undifferentiated Aquifer (Till and Tidal Flat Deposits (Sand, Silt and Clay))
Onsite Controlled Waters (Superficial Aquifers)	Unproductive Aquifer (Glaciolacustrine Deposits (Clay))
Onsite Water Environment (Bedrock Aquifers)	Secondary B Aquifer (Mercia Mudstone Group and the Penarth Group)
Onsite Controlled Waters (Bedrock Aquifers)	Secondary Undifferentiated Aquifer (Redcar Mudstone Formation and Penarth Group)
Onsite / Offsite Controlled Waters (Surface Water)	Ponds (onsite and >250 m north)
Offsite Controlled Waters	River Tees and North Sea
Onsite / Offsite Flora	Plants, trees and soft landscaping
Offsite Fauna	Fish or microbial life in the Streams
Onsite Buildings and Infrastructure: Concrete	Future proposed services at the Site may be impacted by contamination in the ground. In particular, any existing concrete foundations if the groundwater has high sulphate levels.
Onsite Buildings and Infrastructure: Structures	Proposed structures may be impacted by accumulations of ground gases.
Onsite Buildings and Infrastructure: Services	Potable water supply pipes and other services.
Connection Corridors	
Onsite Human Health	Construction and Maintenance Workers (All Corridors)

POTENTIAL RECEPTOR	DESCRIPTION
Onsite Human Health	Future Site Users – Trespassers (All Corridors)
Onsite Human Health	Future Site Users – Workers / Maintenance (All Corridors)
Off-site Human Health	Adjacent Site Users i.e., during excavation/ remediation/ earthworks (All Corridors)
Onsite Water Environment: Superficial Aquifers	Secondary Undifferentiated Aquifer (Alluvium) (Hydrogen Connection Corridor, north of river Tees only)
Onsite Water Environment: Superficial Aquifer	Secondary Undifferentiated (Devensian Till) (Main Site, Water Connection Corridor, Electrical Connection Corridor, Hydrogen Pipeline Corridor, CO_2 Export Corridor, Natural Gas Connection Corridor)
Onsite Water Environment: Superficial Aquifer	Secondary A Aquifer (Blown Sand) (Possible presence in some corridors south of river Tees only)
Onsite Water Environment: Superficial Aquifer	Secondary A Aquifer (Tidal Flat Deposits (Sand and Silt)) (All Corridors)
Onsite Water Environment: Superficial Aquifer	Secondary A Aquifer (Tidal Flat Deposits (Sand, Silt and Clay)) (Oxygen and Nitrogen Corridor)
Onsite Water Environment: Superficial Aquifers	Secondary Undifferentiated Aquifer (Tidal Flat Deposits/Estuarine Deposits) (All Corridors)
Onsite Water Environment: Superficial Aquifers	Unproductive Aquifer (Glaciolacustrine Deposits) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Principal Aquifer (Sherwood Sandstone Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary B Aquifer (Mercia Mudstone Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary B Aquifer (Penarth Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary Undifferentiated (Penarth Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary Undifferentiated (Redcar Mudstone Formation) (All Corridors)
Offsite Water Environment: Surface Waters	River Tees and North Sea (All Corridors)
Onsite / Offsite Water Environment: Surface Waters	Various small water courses/bodies (e.g. Ponds, streams, reservoirs) (All Corridors)

POTENTIAL RECEPTOR	DESCRIPTION
Offsite Sensitive Land Uses (Environmentally designated sites)	Teesmouth and Cleveland Coast SSSI (within 1 km all Corridors, on site Hydrogen Pipeline Corridor)
Onsite / Offsite Ecosystems: Flora	Plants, Trees, and Soft Landscaping
Onsite / Offsite Ecosystems: Fauna	Livestock, Birds, Fish and Microbial Life in the Streams (All Corridors)
Onsite Buildings and Infrastructure: Concrete	Future proposed services at the site may be impacted by contamination in the ground. In particular any existing concrete foundations if the groundwater has high sulphate levels. (All Corridors)
Onsite Buildings and Infrastructure: Services	Potable water supply pipes and other services (All Corridors)

10B.5 Potential Pathways

10B.5.1 This section provides a summary of the potential pathways for the Main Site and Connection Corridors by which the identified sources may come into contact with receptors. A summary of the potential pathways is provided in Table 10B-3.

Table 10B-3: Potential Pathways

LOCATION	RECEPTOR	DESCRIPTION
Main Site		
Onsite	Human Health: People	Direct Pathway: Direct contact, dermal absorption or ingestion of soil.
Onsite	Human Health: People	Indirect Pathway: Inhalation of soil particulates derived from soils.
Onsite	Human Health: People	Indirect Pathway: Inhalation of soil vapour derived from soils
Onsite	Human Health: People	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion)
Onsite	Groundwater	Indirect Pathway: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow and/ or deep groundwater
Offsite	Groundwater	Indirect Pathway: Lateral migration of impacted shallow groundwater off-Site towards Surface Water Features (Ponds, river Tees and North Sea)

LOCATION	RECEPTOR	DESCRIPTION
Onsite	Groundwater	Indirect Pathway: Vertical migration of impacted shallow groundwater to the deeper Secondary B Aquifer.
Offsite	Groundwater	Indirect Pathway: Lateral migration of impacted deeper groundwater present in the Secondary A aquifer towards Surface Water Features (Ponds, river Tees and North Sea)
Onsite	Flora	Direct Pathway: Direct contact with contaminated soils
Onsite	Flora	Indirect Pathway: Leachate / Groundwater entering surface waters
Onsite	Flora	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata
Onsite	Buildings and Infrastructure: Concrete	Direct Pathway: Direct contact of buried concrete with contaminated soils (i.e., hydrocarbons) and aggressive ground conditions (pH and sulphate).
Onsite	Buildings and Infrastructure: Structures	Direct Pathway: Direct contact of services and supply pipes with contaminated soils.
Onsite	Buildings and Infrastructure: Services	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches
Connection Corridors		
On Site	Human Health / Fauna: People (Human Health) and Animals (Fauna)	Direct Pathway: Direct contact, dermal absorption or ingestion of soil
On Site	Human Health / Fauna: People (Human Health) and Animals (Fauna)	Indirect Pathway: Inhalation of soil particulates derived from soils
On Site	Human Health / Fauna: People (Human Health) and Animals (Fauna)	Indirect Pathway: Inhalation of soil vapour derived from soils
Off Site	Surface Water	Direct Pathway: Spillage/loss/run off from surface direct to receiving water
On Site	Groundwater	Indirect Pathway: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow and/ or deep groundwater

LOCATION	RECEPTOR	DESCRIPTION
On Site	Groundwater	Indirect Pathway: Vertical migration of impacted shallow groundwater to the deeper Principal aquifer
Off Site	Groundwater	Indirect Pathway: Lateral migration of impacted shallow groundwater Off Site towards surface water features
On Site	Flora	Direct Pathway: Direct contact with contaminated soils
On Site	Flora	Indirect Pathway: Uptake via root system
On Site	Flora	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata
On Site	Fauna	Leachate/groundwater entering surface waters
On Site	Buildings and Infrastructure: Concrete	Direct Pathway: Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate)
On Site	Buildings and Infrastructure: Supply Pipes	Direct Pathway: Direct contact of services and supply pipes with contaminated soils

10B.6 References

- Department for Environment Food and Rural Affairs (Defra) (1990). *Environmental Protection Act 1990: Part 2A - Contaminated Land Statutory Guidance (1990).*
- HM Government (1995). *The Environment Act 1995.*
- HM Government (2003). *The Water Act 2003.*
- HM Government (2012). *The Contaminated Land (England) (Amendment) Regulations 2012.*

H2Teesside Project

Environmental Statement

Volume III – Appendices

Appendix 10C: Contaminated Land Environmental Risk Assessment

Document Reference: 6.4.13

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended)

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)

Rev: 0

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TABLES

10C.0 CONTAMINATED LAND ENVIRONMENTAL RISK ASSESSMENT

10C.1 Risk Assessment Principles and Framework

10C.1.1 Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on Land Contamination Risk Management (EA, 2023).

10C.1.2 For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway. The potential contaminant linkages that have been identified for the Proposed Development Site are presented in Appendix 10B - Conceptual Site Model (ES Volume III, EN070009/APP/6.4).

10C.1.3 Assessments of risks associated with each of these contaminant linkages, following review of available information for the Proposed Development Site are discussed in the following sections.

10C.1.4 Using criteria broadly based on those presented in Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Council (NHBC) et al. 2008) the magnitude of the risk associated with potential contamination at the Proposed Development Site has been assessed. To do this an estimate is made of:

- the potential severity of the risk; and
- the likelihood of the risk occurring.

10C.1.5 The severity of the risk is classified according to the criteria in Table 10C-1.

Table 10C-1: Severity of Risk

SEVERITY	DESCRIPTION
High	• Acute risks to human health likely to result in “significant harm” (e.g. very high concentrations of contaminants/ground gases); • Catastrophic damage to buildings/property (e.g. by explosion, sites with high gassing potential, extensive volatile organic compound (VOC) contamination); • Major pollution of controlled waters (e.g. surface watercourses or Principal Aquifers / Source Protection Zones); and • Short term risk to a particular ecosystem.
Medium	• Chronic (long-term) risk to human health likely to result in “significant harm” (e.g. elevated concentration of contaminants/ground gases); • Pollution of sensitive controlled waters (e.g. surface watercourses or principal/secondary A aquifers); and • Significant effects on sensitive ecosystems or species.

SEVERITY	DESCRIPTION
Mild	• Pollution of non-sensitive waters (e.g. smaller surface watercourses or secondary B aquifers or unproductive strata); and • Significant damage to crops, buildings, structures or services (e.g. by explosion, sites with medium gassing potential, elevated concentrations of contaminants).
Minor	• Non-permanent human health effects (requirement for protective equipment during site works to mitigate health effects); • Damage to non-sensitive ecosystems or species; and • Minor (easily repairable) damage to buildings, structures or services (e.g. by explosion, sites with low gassing potential).

10C.1.6 The probability of the risk occurring is classified according to the criteria given in Table 10C-2.

Table 10C-2: Probability of Risk Occurring

PROBABILITY	EXPLANATION
High likelihood	Contaminant linkage may be present that appears very likely in the short term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low Likelihood	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur even in the long term are improbable.

10C.1.7 An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 10C-3.

Table 10C-3: Probability of Risk Occurring

		SEVERITY			
		SEVERE	MEDIUM	MILD	MINOR
PROBABILITY	HIGH LIKELIHOOD	Very High	High	Moderate	Moderate / Low
	LIKELY	High	Moderate	Moderate / Low	Low
	LOW LIKELIHOOD	Moderate	Moderate / Low	Low	Very Low
	UNLIKELY	Moderate / Low	Low	Very Low	Very Low

10C.2 Land Contamination Risk Management Assessment of Risk

10C.2.1 In October 2020 (updated July 2023), the UK government issued guidance on the evaluation and management of contaminated land; Land Contamination Risk Management (LCRM). Current contaminated land guidance LCRM (EA, 2023) categorises risk at Stage 1 Tier 1 as follows:

- acceptable; and
- unacceptable.

10C.2.2 However, no framework for assessing the risk has been published to accompany the guidance, so the CIEH & NHBC R&D Publication 66 assessment framework (2008) constitutes best practice in this regard. To align the risk rankings in Section 10.1 with the LCRM rankings and with the Part 2A definition, the following matrix has been utilised. This conversion is presented in Table 10C-4.

Table 10C-4: Probability of Risk Occurring.

	ACCEPTABLE	UNACCEPTABLE
Very Low		
Low		
Moderate/Low		
Moderate*		
High		
Very High		

*This risk category spans both acceptable and unacceptable. This is intentional as it is this risk band that tends to have the greatest level of uncertainty associated with it. Acceptability will be dependent on site-specific circumstances and level of confidence in the available evidence, determined by professional judgement.

10C.2.3 For a risk to be unacceptable, the contaminant linkage should be associated with at least a "medium" severity as defined in Table A4.3 in Annex 4 of R&D66 and the probability should (in the majority of cases) be at least "likely" as defined in Table A4.4 of R&D66.

10C.2.4 These risk categories represent the level of risk as it is currently understood from the information available at this time.

10C.3 Preliminary Risk Assessment

10C.3.1 An evaluation of the potential risks associated with the identified sources at the location of the Proposed Development to the various receptors is discussed and presented in Table 10C.5. The level of risk is determined based on the current condition of the Proposed Development Site, i.e. the effects of mitigation measures such as soil or groundwater treatment are not included but the level of risk takes into account the nature of the Proposed Development.

10C.3.2 The preliminary risk assessment is based on the information presented in Appendix 10A – Geology, Hydrogeology and Land Contamination Desk Based Summary Report (ES Volume III, EN070009/APP/6.4).

10C.3.3 Overall the assessment confirmed that the LCRM risks are deemed acceptable for all pollutant linkages identified given that suitable Proposed Development design and impact avoidance (embedded mitigation) will be implemented.

Table 10C-5: Preliminary Risk Assessment

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
Main Site							
Contaminants of Potential Concern relating to past and present land use onsite and offsite	Direct contact, dermal absorption or ingestion of soil	Construction Workers	Medium	Likely	Moderate	Acceptable	Previous ground investigation (GI) recorded exceedances of sulphate, metals, polyaromatic hydrocarbons (PAHs) and petroleum hydrocarbons. Asbestos was also encountered in previous GI. Therefore, the potential risk is *Moderate*. However, it is assumed the EPC Contractor(s) will comply with Construction Design and Management (CDM) 2015 regulations (Health and Safety Executive, 2015) mitigating the risk to Construction Workers. A confirmatory GI will be undertaken which will involve reviewing of data and updating the risk assessment rating. STDC will undertake remediation which will include a temporary surface layer until the construction includes a permanent surface layer.
		Future Site Users – Trespassers and Site Visitors	Medium	Low	Moderate / Low	Acceptable	Previous GI recorded exceedances of sulphate, metals, PAHs and petroleum hydrocarbons. Asbestos was also encountered in previous GI. However, it is expected that the Main Site when redeveloped will consist of mostly hardstanding and any areas of soft

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							landscaping will comprise a clean top layer of backfill, mitigating any potential risk allowing this linkage to be deemed *Acceptable*. A confirmatory GI will be undertaken which will involve reviewing of data and updating the risk assessment rating. STDC will undertake remediation which will include a temporary surface layer until the construction includes a permanent surface layer.
		Future Site Users – Works / Maintenance	Medium	Low	Moderate / Low	Acceptable	Previous GI recorded exceedances of sulphate, metals, PAHs and petroleum hydrocarbons. Asbestos was also encountered in previous GI. However, it is expected that the Main Site when redeveloped will consist of mostly hardstanding and any areas of soft landscaping will comprise a clean top layer of backfill, mitigating any potential risk allowing this linkage to be deemed acceptable. A confirmatory GI will be undertaken which will involve reviewing of data and updating the risk assessment rating. STDC will undertake remediation which will include a temporary surface layer until the construction includes a permanent surface layer.

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
	Inhalation of soil particulates derived from soils	Construction Workers	Medium	Likely	Moderate	Acceptable	Previous GI recorded exceedances of sulphate, metals, PAHs and petroleum hydrocarbons. Asbestos was also encountered in previous GI. Therefore, the potential risk is Moderate. However, the EPC Contractor(s) will comply with Construction Design and Management (CDM) 2015 regulations (Health and Safety Executive, 2015) mitigating the risk to Construction Workers. A confirmatory GI will be undertaken which will involve reviewing of data and updating the risk assessment rating. STDC will undertake remediation which will include a temporary surface layer until the construction includes a permanent surface layer.
		Future Site Users – Trespassers and Site Visitors	Medium	Low	Moderate / Low	Acceptable	Previous GI recorded exceedances of sulphate, metals, PAHs and petroleum hydrocarbons. Asbestos was also encountered in previous GI. However, it is expected that the Main Site when redeveloped will consist of mostly hardstanding and any areas of soft landscaping will comprise a clean top layer of backfill, mitigating any potential risk allowing this linkage to be deemed acceptable.
		Future Site Users – Works / Maintenance	Medium	Low	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							A confirmatory GI will be undertaken which will involve reviewing of data and updating the risk assessment rating. STDC will undertake remediation which will include a temporary surface layer until the construction includes a permanent surface layer.
	Inhalation of soil vapour derived from soils	Construction Workers	Medium	Likely	Moderate	Acceptable	There is potential for soil vapour generation from the known Made Ground and Tidal Flat Deposits on Site therefore a linkage exists where soils are exposed during excavation. Therefore, the potential risk is Moderate. However, the EPC Contractor(s) will comply with Construction Design and Management (CDM) 2015 regulations (Health and Safety Executive, 2015) mitigating the risk to Construction Workers. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Future Site Users – Trespassers and Site Visitors	Medium	Low	Moderate / Low	Acceptable	There is potential for soil vapour generation from the known Made Ground and Tidal Flat Deposits on Site therefore a linkage exists where soils are exposed at the surface e.g., in areas of soft landscaping. Risks can be mitigated by the replacement of soils in these areas with clean backfill as part of the redevelopment. In addition, migration of soil
		Future Site Users – Works / Maintenance	Medium	Low	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							vapour or ground gases (if present) via permeable strata into buildings may also occur. However, it is anticipated that the Main Site when redeveloped will consist mostly of hardstanding mitigating the risk. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Adjacent Site Users – during excavation / remediation / earthworks	Medium	Unlikely	Low	Acceptable	The likelihood of inhalation of soils vapour from workers and visitors at adjacent Sites is unlikely due to distance from Main Site and any potential vapours would dissipate. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Leaching of chemicals and vertical migration via permeable unsaturated strata to shall and / deep groundwater	Secondary A Aquifer (Tidal Flat Deposits)	Medium	Likely	Moderate	Acceptable	Previous GI encountered groundwater between 1.5m and 4.5m AOD. Previous GI identified exceedances of metals, total petroleum hydrocarbons, PAHs and inorganics. Information from Redcar & Cleveland Borough Council (RCBC) detailed data from discharge consents for Redcar Coke Ovens Effluent Treatment Plant situated in the west of Main Site, which reported Environmental
		Secondary Undifferentiated (Tidal Flat Deposits)	Medium	Likely	Moderate	Acceptable	
		Secondary B (Mercia Mudstone Group and Penarth Group)	Medium	Likely	Moderate	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
		Secondary Undifferentiated (Redcar Mudstone Formation)	Medium	Likely	Moderate	Acceptable	Quality Standards (EQS) exceedances most notably for benzo(a)pyrene and fluoranthene. Groundwater in the Glacial Till is not considered to be in hydraulic continuity with groundwater in the overlying Tidal Flat Deposits and the underlying bedrock and is considered to potentially form a confining aquifer between the Tidal Flat Deposits and the underlying bedrock aquifer. Data reviews also found to indicate that groundwater in the bedrock was unlikely to be in hydraulic continuity with the overlying Glacial Till. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Lateral Migration of impacted shallow groundwater offsite towards surface water features (Ponds, River Tees and North Sea)	Ponds (On Site and 250m North)	Medium	Low	Moderate / Low	Acceptable	It is assumed any current site drainage is expected to seep into underlying fill and within preferential pathways such as relict drains towards the North Sea and River Tees. Due to the appreciable distance (approximately 600 m North and 700 m East) of travel by ground or by watercourse there is likely to be some attenuation for most contaminants before drainage reaches the receiving water, as well as upon entering the River Tees or North Sea. Nevertheless, it is considered unsatisfactory for development to
		River Tees and North Sea	Medium	Low	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							release trapped contamination or to speed up the delivery of latent contamination to controlled waters. However, a drainage scheme will be embedded as part of the Proposed Development. An Indicative Surface Water Drainage Plan has been submitted with the DCO Application (EN070009/APP/2.12). Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Vertical migration of impacted shallow groundwater to the deeper Secondary B Aquifer.	Secondary B Aquifer (Mercia Mudstone Group and the Penarth Group)	Medium	Likely	Moderate	Acceptable	Previous GI identified exceedances of metals, total petroleum hydrocarbons, PAHs and inorganics. Groundwater in the Glacial Till is not considered to be in hydraulic continuity with groundwater in the overlying Tidal Flat Deposits and the underlying bedrock and is considered to potentially form a confining aquifer between the Tidal Flat Deposits and the underlying bedrock aquifer. Data reviews also found to indicate that groundwater in the bedrock was unlikely to be in hydraulic continuity with the overlying Glacial Till. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
	Lateral migration of impacted deeper groundwater present in the Secondary B aquifer towards Surface Water Features (Ponds, River Tees and North Sea)	Ponds (>250m)	Medium	Unlikely	Low	Acceptable	Due to the appreciable distance to the Ponds (<250 m) and River Tees (~800 m) and North Sea (~700 m) of travel there is likely to be some attenuation for most contaminants reaching the receiving water, as well as upon entering the River Tees or North Sea. Nevertheless, it is considered unsatisfactory for development to release trapped contamination or to speed up the delivery of latent contamination to controlled waters. However, likelihood of linkage to be present between deeper groundwater and local ponds is considered *unlikely*. Review of confirmatory GI data to confirm presence or absence of impacted groundwater in deeper aquifer, and update to conceptual site model and risk assessment will be undertaken.
		River Tees and North Sea	Medium	Low	Moderate / Low	Acceptable	
	Direct contact with contaminated soils	Plants, trees, and soft landscaping	Medium	Low	Moderate / Low	Acceptable	There are currently limited areas of soft landscaping on Main Site with the exception of grass verges along roadways and railway lines. This vegetation does not appear to be in any distress however, there is the potential to have direct contact with contaminative soils. Post development, direct contact or uptake by plant roots may occur in areas of soft landscaping (if proposed as part of

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							redevelopment), however risks can be mitigated by the replacement of soils in these areas with clean backfill as part of the redevelopment. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Leachate/ groundwater entering surface waters	Fish or microbial life in the River Tees and North Sea	Medium	Unlikely	Low	Acceptable	Lateral migration of impacted shallow groundwater to surface water (and therefore to flora and fauna within these waters) may occur. However, given the distance to surface waters, approximately 600 m from the Main Site, any potential contamination will likely attenuate. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Direct contact of buried concrete with contaminated soils (i.e., hydrocarbons) and aggressive ground conditions (Ph and sulphate)	Potable water supply pipes and other services.	Medium	Unlikely	Low	Acceptable	Given the industrial history of the Main Site, location of the aquifers, and presence of potable water supply pipes within Made Ground; any potential exceedances in soil and/or groundwater are unlikely to result in harm or damage to potable water supply pipes and services.

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
Bulk Gases	Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion)	Construction and maintenance workers	Medium	Low	Moderate / Low	Acceptable	Ground gas generation is possible from Made Ground and Tidal Flat Deposit known to be present on the Main Site. No identified unacceptable risk to human health or built receptors from the accumulation of ground gas was reported from previous investigations but it was recommended additional monitoring and assessment was undertaken to confirm risks. Not addressed within the existing remediation options appraisal report. Landfills known to be present in close proximity to the Main Site. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Trespassers and Site Visitors	Medium	Low	Moderate / Low	Acceptable	Based on historical land use and previous GI observations it is indicated that there is the potential for CoPC to be present in the Made Ground and superficial deposits recorded on the Main Site. There is the potential for any soil vapours or gases generated in Made Ground and superficial deposits at the Main Site to accumulate within future above / below ground structures associated with the
		Future Site Suers	Medium	Low	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							Proposed Development. Soil vapours may also be mobilised during construction activities including excavation of soils. Future buildings as part of Proposed Development, there is the potential for vapours to accumulate in enclosed or confined spaces. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Adjacent Site users i.e., during excavation/ remediation/ earthworks	Medium	Unlikely	Low	Acceptable	Although there is the potential for vapours and ground gases to migrate beneath neighbouring buildings through granular Made Ground, historical contaminants of potential concern (CoPC) are likely to have attenuated in the distance between site and off-site users and therefore it is unlikely that volumes of soil vapour/ ground gases significant enough to pose a risk to offsite receptors shall be mobilised. Soil vapours may be mobilised during construction activities including excavation of soils. Mobilisation of those soil vapours / ground gases released onsite, if any, is considered more likely to migrate upwards dispersing within the atmosphere. However, further investigation may be required to determine the soil vapour and ground gas risk.

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Migration of hazardous gases/vapours via permeable strata	Plants, trees, and soft landscaping	Medium	Low	Moderate / Low	Acceptable	South Gare and Coatham Dunes (immediately north of the Main Site) is classified as a Site of Special Scientific Interest. Given the potential Made Ground and fill materials associated with the former activities on Site and the presence of Phytotoxic contaminants cannot be discounted in certain areas of the Main Site. Ground gas generation is possible from Made Ground and Tidal Flat Deposits reported on the Main Site. Previous reports do not detail an unacceptable risk to receptors. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches	Proposed structures may be impacted by accumulations of ground gases.	Medium	Low	Moderate / Low	Acceptable	Previous GIs have detailed substantial thicknesses of Made Ground on Site and reported Tidal Flat Deposits to be present, both have potential for significant ground gas generation. Therefore, there is a risk of build-up within proposed structures and buildings. For future development, appropriate specification materials will be used in

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
							gas/damp protective membranes to mitigate any risks. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
Connection Corridors							
Made Ground (associated with historical land use) Contaminants of Potential Concern relating to past and present land use onsite and offsite	Direct contact, dermal absorption or ingestion of soil	Construction Workers and Maintenance Workers (All Corridors)	Medium	Low	Moderate / Low	Acceptable	Based on historical land use, there is potential for contaminants of potential concern (CoPC) to be present in the Made Ground on site. However, it is assumed the EPC Contractor(s) will comply with Construction Design and Management (CDM) 2015 regulations mitigating the risk to Construction Workers. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Future Site Users: Trespassers	Medium	Unlikely	Low	Acceptable	It is understood that there are no current site users and likely to be limited access by workers once the pipes are operational. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Future Site Users: Workers and maintenance	Medium	Unlikely	Low	Acceptable	
		Construction Workers and	Medium	Unlikely	Low	Acceptable	Based on historical onsite and adjacent land use, such as landfill, there is the potential for

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
Active or recently closed landfill (under EA regulation) taking special waste, historical landfills and various licensed waste management facilities	Inhalation of soil particulates derived from soils Inhalation of soil vapour derived from soils	Maintenance Workers					CoPC, to be present in the Made Ground on site. However, it is assumed the EPC Contractor(s) will comply with Construction Design and Management (CDM) 2015 regulations (Health and Safety Executive, 2015) mitigating the risk to Construction Workers. Furthermore, it is understood that there are no current site users and likely to be limited access by workers once the pipes are operational. The likelihood of exposure by future site users is considered low in outdoor areas given the proposed end use. Possibility of fugitive dust emissions offsite during earthworks but unlikely following construction. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Future Site Users: Trespassers	Medium	Unlikely	Low	Acceptable	
		Future Site Users: Workers and maintenance	Medium	Unlikely	Low	Acceptable	
		Adjacent Site Users	Medium	Unlikely	Low	Acceptable	
	Spillage/loss/run off from surface direct to receiving water	Surface Water Features: River Tees and North Sea	Medium	Unlikely	Low	Acceptable	Potential for migration of contaminants during construction especially near to watercourses due to run-off during stockpiling or when excavating materials from below the water table.
		Surface Water Features: Various small water	Medium	Likely	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
		courses/bodies (e.g. Ponds, streams, reservoirs)					However, it is assumed that mitigation will be implemented during construction and operation. The proximity of the River Tees and North Sea makes the likelihood of spillage/loss/run off unlikely. However, the various small water courses/bodies (e.g. Ponds, streams, reservoirs) on Site are deemed more likely to be impacted by potential spillage/loss/run-off but due to the isolated nature of the various small water courses/bodies, the severity is considered to be medium Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Leaching of chemical and vertical migration via permeable unsaturated strata to shallow and/ or deep groundwater	Superficial Aquifers: Secondary Unproductive Aquifer (Glaciolacustrine Deposits) (All Corridors)	Mild	Low	Low	Acceptable	Leaching of contaminants from unsaturated soils may occur in areas of soft landscaping into shallow groundwater. Areas of the Connection Corridors are underlain at shallow depth by Unproductive and Secondary Undifferentiated strata with low permeability that have negligible significance for water supply and/or river base flow.
		Superficial Aquifers:	Medium	Low	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
		Secondary A Aquifer (Blown Sand) (Possibly all Corridors)					The Secondary A Aquifer (Alluvium) only underlies a very small section of the Hydrogen Pipeline Corridor. The Secondary A Aquifer (Blown Sand & Tidal Flat deposits) are present in all corridors. With regards the underlying bedrock it is considered unlikely due to the significant thickness of cohesive strata separating the bedrock from the potential contaminant. The Principal Aquifer of the Sherwood Sandstone is anticipated to have lesser thicknesses of overbearing strata to the north of the River Tees and is therefore has a higher potential risk (*Moderate/Low*). Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Superficial Aquifers: Secondary A (Alluvium) (Hydrogen Pipeline Corridor Only)	Mild	Low	Low	Acceptable	
		Superficial Aquifers: Secondary Undifferentiated (Devensian Till) (All Corridors except Other Gases)	Mild	Low	Low	Acceptable	
		Superficial Aquifers: Secondary A (Tidal Flat Deposits) (All Corridors)	Mild	Low	Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
		Bedrock Aquifers: Principal Aquifer (Sherwood Sandstone) (All Corridors)	Medium	Low	Moderate / Low	Acceptable	
		Bedrock Aquifers: Secondary B (Mercia Mudstone Group) (All Corridors)	Mild	Low	Low	Acceptable	
		Bedrock Aquifers: Secondary B Aquifer (Penarth Group) (All Corridors)	Mild	Low	Low	Acceptable	
		Bedrock Aquifers: Secondary Undifferentiated (Redcar Mudstone Formation) (All Corridors)	Mild	Low	Low	Acceptable	
	Vertical migration of impacted shallow groundwater to	Bedrock Aquifers: Principal Aquifer (Sherwood Sandstone) (All Corridors, directly	Medium	Low	Moderate / Low	Acceptable	Where low permeability strata is present over the bedrock this should limit the potential for vertical migration of contaminants within shallower groundwater into this strata. It will be necessary to ensure the construction

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
	the deeper Principal aquifer	beneath Superficial at Hydrogen Pipeline Corridor)					works do not introduce new preferential pathways for contaminant migration. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Lateral migration of impacted shallow groundwater off site towards surface water features	Surface Water Features: River Tees and North Sea (Offsite all Corridors)	Medium	Unlikely	Low	Acceptable	Due to the proximity of the site to surface water receptors it is likely that contaminants in shallow groundwater could migrate into surface water. It will be necessary to ensure the construction works do not introduce new preferential pathways for contaminant migration. The Hydrogen Pipeline Corridor is within a SSSI, Ramsar Site and SPA and there is a potential for migration of contaminants in groundwater and / or surface water towards this area. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Surface Water Features: Various small water courses/bodies (e.g. Ponds, streams, reservoirs) (Onsite / Offsite all Corridors)	Medium	Low	Moderate / Low	Acceptable	
		Sensitive Land Uses: SSSI & SPA (Offsite all Corridors, Onsite Hydrogen Pipeline Corridor)	Medium	Low	Moderate / Low	Acceptable	

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
	Direct contact with contaminated soils Uptake via root system	Flora: Plants, trees, and soft landscaping	Minor	Likely	Low	Acceptable	Potential for direct contact by plants with soil contaminants although no specific signs of vegetative distress were observed during the site walkover. Landscaping following development to consider potential risks from contaminant. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Migration of hazardous gases/vapours via permeable strata	Future proposed services at the Site may be impacted by contamination in the ground	Mild	Likely	Very Low	Acceptable	Ground gas could be present associated with Made Ground and historical landfill or migration of contaminants. Ground gas could also be generated from the Tidal Flat Deposits. Potential for services to act as preferential pathways for gas or vapour migration. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
		Potable water supply pipes and other services.	Mild	Likely	Very Low	Acceptable	
	Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive	Future proposed services at the Site may be impacted by contamination in the ground	Mild	Unlikely	Very Low	Acceptable	The presence of sulphates can damage structural and load bearing concrete causing significant structural instability and damage. Suitable classification of the strata in which the future developments shall be found, will be undertaken to inform design options.

SOURCE	PATHWAY	RECEPTOR	POTENTIAL SEVERITY	LIKELIHOOD OF OCCURRENCE	POTENTIAL RISK	LCRM RISK	JUSTIFICATION
	ground conditions (pH and sulphate).						Currently, there is no known plan for structures for the Connection Corridors. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken.
	Direct contact of services and supply pipes with contaminated soils.	Potable water supply pipes and other services	Medium	Unlikely	Low	Acceptable	Given the industrial history of the Main Site, location of the aquifers, and presence of potable water supply pipes within Made Ground; any potential exceedances in soil and/or groundwater are unlikely to result in harm or damage to potable water supply pipes and services. Review of confirmatory GI data and update to conceptual site model and risk assessment will be undertaken to confirm aggressive ground conditions.

10C.4 References

- National House Building Council (NHBC), Environment Agency, Chartered Institute of Environmental Health (2008). *Guidance for the Safe Development of Housing on Land Affected by Contamination. The Construction Industry Research and Information Association publication Research & Development (R&D) Publication 66.*
- Environment Agency (EA) (2023). *Land Contamination Risk Management (LCRM).*
- Health and Safety Executive (2015). *The Construction (Design and Management) Regulations 2015.*

H2Teesside Project

Environmental Statement

Volume III – Appendices

Appendix 10D: Geotechnical Risk Register

Document Reference: 6.4.14

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended)

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)

Rev: 0

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TABLES

10D.0 GEOTECHNICAL RISK REGISTER

10D.1.1 A geotechnical risk register for the proposed works has been developed; identifying the ground hazards and risks associated with the current condition of the Proposed Development Site and typical construction risks relating to the proposed improvement options. The geotechnical risk register is a live document and will need to be updated as risks are identified in subsequent stages of the scheme.

10D.1.2 A number of geotechnical hazards have been identified for the site. In order to quantify the risks associated with the proposed works, a preliminary geotechnical risk assessment has been conducted. To do this, an estimate is made of:

- the potential severity of the risk (consequence); and
- the likelihood of the risk occurring.

10D.1.3 The likelihood and severity of the risk are classified according to the criteria in Table 10D-1.

10D.1.4 An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 10D-2.

10D.1.5 The geotechnical risks associated with the proposed works for the Proposed Development Site are summarised in Table 10D-3.

10D.1.6 Risks indexes are provided before mitigation measures are implemented and after.

10D.1.7 The Proposed Development Site will be subject to confirmatory ground investigation (GI). The mitigation measures outline will be secured through the Framework Construction Environmental Management Plan.

Table 10D-1: Scoring Rationale Describing Likelihood and Severity of Geohazards

LIKELIHOOD (L)		SEVERITY (S)	
Frequent	5 Likely regular occurrence in relevant period	Very High	5 Death or major loss; total systems failure
Probable	4 Likely to occur several times in relevant period	High	4 Major injury, major damage to property/infrastructure, or major environmental effect.
Occasional	3 Likely to occur in relevant period	Medium	3 Lost time, injury or illness; minor damage to property/ infrastructure or significant environmental effect.
Remote	2 Unlikely to occur in relevant period	Low	2 Minor first aid incident or requiring routine maintenance repair.
Improbable	1 Extremely unlikely to occur in relevant period	Very Low	1 Unlikely to have impact on works

Table 10D-2: Geohazard Risk Index Ranges

INDEX = LIKELIHOOD (L) X SEVERITY (S) (SEE ALSO CIRIA SP125)		
16 – 25	Very High Risk	Unacceptable. Re-examine activities to provide lower risk.
9 – 15	High Risk	Further mitigation measures required and/or alter method of work. Seek approval from all stakeholders if risk cannot be reduced.
6 – 8	Medium Risk	Tolerable only if further mitigation is not reasonably practical and there is need to continue activity with identified controls.
1 – 5	Low Risk	Broadly acceptable if all reasonably practicable control measures in place.

Table 10D-3: Geotechnical Risk Register

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
MAIN SITE									
Inadequate bearing resistance – shallow foundations	Thick various types of Made Ground, of variable, (sometimes very loose and loose) density and chemical composition underlain by low strength, potentially highly compressible Tidal Flat Deposits and Glacio- lacustrine Deposits.	5	4	20	Collapse - Structural failure of buildings supported on shallow pad or spread foundations. Injury to site workers, development users.	Confirmatory Ground Investigation (GI) (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground conditions proved on site. If necessary, adopt piled foundations to transfer structure loads to soils or bedrock of adequate strength.	1	4	4
Excessive total and / or differential ground displacement (settlement and / or heave)	Thick various types of Made Ground, of variable, (sometimes very loose, loose to very dense) density and chemical composition underlain by low strength,	3	4	12	Excessive total and / or differential settlement. Structural damage caused by excessive ground displacement. Serviceability problems leading to structural	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground conditions proved on site. If necessary, adopt piled foundations to transfer structure loads to soils or	1	4	4

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	potentially highly compressible Tidal Flat Deposits and Glacio-lacustrine Deposits.				damage / long term maintenance.	bedrock of adequate strength.			
Excessive ground displacement (vertical and / or lateral heave) and difficult foundation construction	Physical expansion of material resulting from chemical changes in slag-dominant material.	3	4	12	Unexpected axial tensile actions imposed on buried shallow foundations, slabs and utilities leading to serviceability problems and possibly, structural damage / integrity problems. Unexpected transverse compressive actions imposed on buried pile foundations.	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground conditions proved on site. If necessary, adopt piled foundations to transfer structure loads to soils or bedrock of adequate strength. If necessary, consider use of sleeved piles to accommodate lateral expansion and / or heave.	1	4	4
Collapse settlement	Infiltration of surface water. Inundation of poorly compacted Made	3	4	12	Collapse - Structural failure. Excessive total and / or differential settlement.	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	4	4

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	Ground due to a permanent rise in groundwater levels.					Adequate design for the groundwater and ground conditions proved on site. Excavate process and recompact made ground to minimise collapse risk. If necessary, adopt piled foundations to transfer structure loads to soils or bedrock of adequate strength.			
Unexploded ordnance (UXO)	UXO undiscovered ordinance following WWI and / or WWII.	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Adequate assessment and design. Provision of detailed report for site from specialist UXO data provider. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints. The UXO procedure is secured via the Framework CEMP (EN070009/APP/5.12).	1	5	5

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Difficult construction conditions –buried relict infrastructure – General	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, very dense material, relict buried foundations, walls, ground slabs, tunnels and possibly pile foundations from former infrastructure.	5	3	15	Structural damage (cracking / spalling) to driven concrete or steel piles or loss of plan position and verticality tolerances. Unable to construct shallow foundations, ground slabs, road / hardstanding areas for utilities as planned. Possible redesign, construction delay, increase in cost.	Confirmatory GI including geophysics (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the viability of undertaking targeted excavation and replacement of obstructions and processing and re-use of the materials in the works. Advanced probing / clearance works at proposed pile foundation positions. Remediation works undertaken by STDC to remove obstructions within 2.5m of ground level and/or mapping of any deeper features not demolished.	1	3	3
Difficult foundation construction – pile foundations	Soft, variable, compressible and / or saturated soils	4	4	16	Ground squeezing leading to ‘necking’ of pile shafts formed using	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	4	4

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
					continuous flight auger (CFA) techniques.	Adequate design for the ground conditions proved on site. Appropriate techniques selection, which may include balancing of pore water pressures at pile toes during construction if required. Consider adopting cased rotary bored piled foundations. Use of trained and experienced rig operators.			
Difficult foundation construction – pile foundations	Natural obstructions within the glacial drift soils present below the Main Site.	3	2	6	If piling required, unable to achieve pile design toe levels. Construction results in damage to piles if required, or piles which do meet specified out of plan and / or verticality tolerances. Construction delay; increase in cost and possible redesign.	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground conditions proved on site. Appropriate pile technique selection if required. Carry out advanced magnetometer probing at any required pile positions if necessary. Consider use of cased rotary bored or Overburden Drilling Excentric	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						(ODEX) piling techniques as alternative to contiguous flight auger (CFA) or driven precast concrete segmental piles if necessary.			
Difficult construction conditions – buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to existing buried infrastructure / services.	4	5	20	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider. Litigation resulting from damage caused to third party infrastructure.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities. Use best practice for diversion of utilities if required. At the main site, it is anticipated that STDC shall remove all known relict utilities during their proposed remediation.	1	2	2
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline	5	3	15	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection.	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design.	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	pH in soil or groundwater.				Sulphate attack on buried concrete resulting in a reduction in concrete strength. Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	Consideration to the provision of permanent sleeving to protect any piles installed through the most aggressive material (Slag dominant material). Consideration to the provision of Additional Protective Measures (APM) to provide additional protection against sulfate attack. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and polyethylene (PE) barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.			
Contamination of controlled waters – groundwater	Piled foundations may create source – pathway – receptor between contaminated	3	5	15	Release of leachable contaminants into underlying aquifers: Superficial – Secondary 'A' Aquifers (Blown Sand,	Confirmatory GI and groundwater quality testing and monitoring (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	5	5

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	groundwater and the underlying superficial and bedrock aquifers.				Tidal Flat Deposits (sand and silt). Bedrock - Secondary 'B' Aquifer (Mercia Mudstone Group & Penarth Group) and the Secondary Aquifer (undifferentiated) Redcar Mudstone Formation. Construction delays; increase in cost. Fines and / or enforcement action from Regulator. Reputational damage.	Adequate design for the ground conditions proved on site. Consultation with the EA and Redcar and Cleveland Borough Council (as part of the production of the Final CEMP(s)). Preparation of a Foundation Works Risk Assessment (prepared as part of the Final CEMP(s)). If piling required, consider adopting cased rotary bored piled foundations to remove potential pathway between Made Ground and underlying aquifers.			
Material re-use – unacceptable excavated soils	Material excavated to form development platforms not suitable for re-use as bulk earthwork fill. Soft spots or areas exposed at	5	3	15	Disposal off site or in landscape / development screening mounds. Excavate soft spots / soft areas and replace with well compacted acceptable material.	Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Assessment of earthworks volumes required / minimise surplus and create earthwork balance.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	development platform sub-formations. Material excavated during bulk earthworks undertaken on site is contaminated.					Cost / risk allowance for waste disposal of contaminated soils as a last resort including non-hazardous and hazardous waste to be allowed for in the Construction Risk Register. Development of a Remediation Design Strategy and implementation of Materials Management Plan (MMP) allowing risk-based re-use of contaminated soils, Final CEMP(s), Asbestos Management Plan (AMP) and Verification Report on completion of the works.			
Groundwater Flooding	High groundwater table.	3	4	12	The flooding of the development. A high groundwater table may also lead to inundation of excavations.	Groundwater monitoring for a 12-month programme to determine the groundwater levels during the dry and wet seasons, undertaken as part of the Confirmatory GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	4	4

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Drainage if required.			
Frost susceptible soils	Silty materials present in Made Ground	3	3	9	Shrinking and swelling of the surface materials and potential for differential settlement.	The California Bearing Ratio (CBR) values and frost susceptibility of the sub-grade soils and groundwater conditions will need to be further assessed by means of intrusive ground investigations and laboratory testing (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	3	6
CO_2 Export CORRIDOR									
Unexploded ordnance	UXO dropped during WWII [Mapping shows a historical Luftwaffe Target adjacent to the northern boundary (approximately 50 m), therefore there may be a possibility of UXO	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Provision of detailed report for site from specialist UXO data provider. Adequate assessment and design. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints.	1	5	5

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	being present at the corridor.]					The UXO procedure is secured via the Framework CEMP (EN070009/APP/5.12).			
Difficult construction conditions – relict buried infrastructure	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, relict buried foundations, walls, ground slabs, tunnels and possibly pile foundations associated with demolished former buildings.	5	3	15	Not possible to construct in-ground sections to depth or vertical alignment as planned. Construction delay; increase in cost and possible redesign.	Development specific GI targeted at suspected relict buried foundations, walls, slabs and tunnels etc (identified from historical land use review) including non-intrusive geophysical surveys along proposed in-ground services corridor (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design, including identification of in-ground constraints from the review of historical land use carried out as part of the Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)). Assess feasibility of re-routing sections to avoid problems.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						If re-routing is not practical, carry out advanced works ahead of main construction including probing and / or limited earthworks to remove identified relict buried structures by undertaking targeted excavation and replacement of obstructions. Include cost / risk allowance for impeded construction progress in the Construction Risk Register.			
Difficult construction conditions – tidal groundwater control	Shallow groundwater inflows [from wet, coarse soils].	4	3	12	Groundwater inflows into excavations, side slope instability, slumping or ravelling of slopes dug below ground, liquefaction or pumping of silts and / or sands under loading from earth moving plant. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for ground and groundwater conditions proved on site. Temporary groundwater control measures could be required, such as sump pumping, well pointing, vacuum extraction systems, and provision of temporary sheet pile cut off.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Include cost / risk allowance for slow construction progress in the Construction Risk Register.			
Dewatering	Prolonged pumping of groundwater induces ground settlement and damages adjacent third-party infrastructure.	3	3	9	Construction delay; increase in cost and possible redesign. Litigation resulting from damage caused to third party infrastructure.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground and groundwater conditions proved on site. If dewatering is required, assess feasibility of relocating pumping to avoid settlement sensitive infrastructure. Design / implement a programme of geotechnical monitoring during construction if necessary with appropriate controls / actions. Liaison with third party infrastructure owner (and technical advisors) during design and construction if required.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Contamination of controlled waters	Surface water runoff into controlled waters. Contaminated groundwater generated / released during construction.	3	2	6	Adverse impact on water quality, with resultant impact on wildlife. Construction delay; increase in cost and possible redesign. Fines and / or enforcement action from Regulator. Regulatory damage.	GI and groundwater quality testing and monitoring (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Include measures for preventing adverse impacts on controlled waters as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Development and adherence to the Final CEMP(s). Obtain appropriate discharge permit to allow discharge to existing sewerage network, system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility.	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and then tankered offsite and would be subject to treatment prior to discharge.			
Difficult construction conditions – buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to existing buried infrastructure / services.	4	3	12	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider. Litigation resulting from damage caused to third party infrastructure.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Use best practice for diversion of utilities if required. Use of existing above / below ground service conduits where possible.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline pH in soil or groundwater.	3	3	9	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection. Sulphate attack on buried concrete resulting in a reduction in concrete strength. Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the provision of APM to provide additional protection against sulfate attack if BRE SD1 assessment indicates Design Sulfate Class DS-5 conditions are present. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.	1	3	3
Material re-use	Material excavated may be contaminated and / or unacceptable for re-use as bulk	4	2	8	Disposal offsite.	Soils may be unlikely to be acceptable for re-use unless remediated to risk-based criteria.	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	backfill above buried service utilities.					Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Contamination assessment of all chemical data. Develop risk-based materials re-use criteria as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Cost / risk allowance for waste disposal of contaminated soils as a last resort to be allowed for in the Construction Risk Register. Materials discarded as Waste may be contaminated with hazardous materials. Development of a Remediation Design Strategy and implementation of an MMP, AMP, Final CEMP(s) and Verification Report on completion of the works.			
NATURAL GAS CONNECTION CORRIDOR									

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Unexploded Ordnance	UXO dropped during WWII. [Mapping shows an area to the north of Corridor was a historical Luftwaffe Target (approximately 400 m N)]	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Provision of detailed report for site from specialist UXO data provider. Adequate assessment and design. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints. The protocol for UXO is secured through the Framework CEMP (EN070009/APP/5.12).	1	5	5
Difficult construction conditions – relict buried infrastructure	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, relict buried foundations, walls, ground slabs, tunnels and possibly pile foundations	5	3	15	Not possible to construct in-ground sections to depth or vertical alignment as planned. Construction delay; increase in cost and possible redesign.	Development specific GI targeted at suspected relict buried foundations, walls, slabs and tunnels etc (identified from historical land use review) including non-intrusive geophysical surveys along proposed in-ground services corridor (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	associated with demolished former buildings.					Adequate design, including identification of in-ground constraints from the review of historical land use carried out as part of the Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)). Assess feasibility of re-routing sections to avoid problems. If re-routing is not practical, carry out advanced works ahead of main construction including probing and / or limited earthworks to remove identified relict buried structures by undertaking targeted excavation and replacement of obstructions. Examine potential for utilising the existing intake and associated abstraction licence from the former Redcar Steelworks to supply water to the Proposed Development.			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Include cost / risk allowance for slow construction progress in the Construction Risk Register.			
Difficult construction conditions – tidal groundwater control	Shallow groundwater inflows [from wet, coarse soils].	4	3	12	Groundwater inflows into excavations, side slope instability, slumping or ravelling of slopes dug below ground, liquefaction or pumping of silts and / or sands under loading from earth moving plant. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for ground and groundwater conditions proved on site. Temporary groundwater control measures could be required, such as sump pumping, well pointing, vacuum extraction systems, and provision of temporary sheet pile cut off. Include cost / risk allowance for slow construction progress in the Construction Risk Register.	1	3	3
Dewatering	Prolonged pumping of groundwater induces ground settlement and damages adjacent	3	3	9	Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	third-party infrastructure.				Litigation resulting from damage caused to third party infrastructure.	Adequate design for the ground and groundwater conditions proved on site. If dewatering is required, assess feasibility of relocating pumping to avoid settlement sensitive infrastructure. Design / implement a programme of geotechnical monitoring during construction, if necessary, with appropriate controls / actions. Liaison with third party infrastructure owner (and technical advisors) during design and construction if required.			
Contamination of controlled waters	Surface water runoff into controlled waters. Contaminated groundwater generated / released during construction.	3	2	6	Adverse impact on water quality, with resultant impact on wildlife. Construction delay; increase in cost and possible redesign.	GI and groundwater quality testing and monitoring (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Include measures for preventing adverse impacts on controlled waters as part of the remediation	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
					Fines and / or enforcement action from Regulator. Regulatory damage.	strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Development and adherence to the Final CEMP(s). Obtain appropriate discharge permit to allow discharge to existing sewerage network, system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility. Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and then tankered offsite and would be subject to treatment prior to discharge.			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Difficult construction conditions – buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to existing buried infrastructure / services.	4	3	12	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider. Litigation resulting from damage caused to third party infrastructure.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Use best practice for diversion of utilities if required. Use of existing above / below ground service conduits where possible.	1	3	3
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline pH in soil or groundwater.	3	3	9	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection. Sulphate attack on buried concrete resulting in a reduction in concrete strength.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the provision of APM to provide additional protection against sulfate attack if BRE SD1 assessment indicates	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
					Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	Design Sulfate Class DS-5 conditions are present. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.			
Material re-use	Material excavated may be contaminated and / or unacceptable for re-use as bulk backfill above buried service utilities.	4	2	8	Disposal offsite.	Soils may be unlikely to be acceptable for re-use unless remediated to risk – based criteria. Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Contamination assessment of all chemical data. Develop risk-based materials re-use criteria as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Cost / risk allowance for waste disposal of contaminated soils as a last resort to be allowed for in the Construction Risk Register. Material discarded as Waste may be contaminated with hazardous materials. Development of a Remediation Design Strategy and implementation of an MMP, AMP, Final CEMP(s) and Verification Report on completion of the works.			
WATER CONNECTION CORRIDOR									
Unexploded Ordnance	UXO undiscovered ordinance following WWI and/or WWII. [Mapping shows an area to the west of Corridor was a historical Luftwaffe	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Provision of detailed report for site from specialist UXO data provider. Adequate assessment and design. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints.	1	5	5

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	Target (approximately 300 m W)]					The protocol for UXO is secured via the Framework CEMP (EN070009/APP/5.12).			
Difficult construction conditions – relict buried infrastructure	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, relict buried foundations, walls, ground slabs, tunnels and possibly pile foundations associated with demolished former buildings.	5	3	15	Not possible to construct in-ground sections to depth or vertical alignment as planned. Construction delay; increase in cost and possible redesign.	Development specific GI targeted at suspected relict buried foundations, walls, slabs and tunnels etc (identified from historical land use review) including non-intrusive geophysical surveys along proposed in-ground services corridor (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design, including identification of in-ground constraints from the review of historical land use carried out as part of the Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)). Assess feasibility of re-routing sections to avoid problems.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						If re-routing is not practical, carry out advanced works ahead of main construction including probing and / or limited earthworks to remove identified relict buried structures by undertaking targeted excavation and replacement of obstructions. Examine potential for utilising the existing intake and associated abstraction licence from the former Redcar Steelworks to supply water to the Proposed Development. Include cost / risk allowance for slow construction progress in the Construction Risk Register.			
Difficult construction conditions - buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to existing buried	4	3	12	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities (pursuant to a Requirement	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	infrastructure / services.				Litigation resulting from damage caused to third party infrastructure.	of the Draft DCO (EN070009/APP/4.1). Use best practice for diversion of utilities if required. Use of existing above / below ground service conduits where possible.			
Difficult construction conditions – tidal groundwater control	Shallow groundwater inflows [from wet, coarse soils].	4	3	12	Groundwater inflows into excavations, side slope instability, slumping or ravelling of slopes dug below ground, liquefaction or pumping of silts and / or sands under loading from earth moving plant. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for ground and groundwater conditions proved on site. Temporary groundwater control measures could be required, such as sump pumping, well pointing, vacuum extraction systems, and provision of temporary sheet pile cut off. Include cost / risk allowance for slow construction progress in the Construction Risk Register.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Dewatering	Prolonged pumping of groundwater induces ground settlement and damages adjacent third-party infrastructure.	3	3	9	Construction delay; increase in cost and possible redesign. Litigation resulting from damage caused to third party infrastructure.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground and groundwater conditions proved on site. If dewatering is required, assess feasibility of relocating pumping to avoid settlement sensitive infrastructure. Design / implement a programme of geotechnical monitoring during construction if necessary with appropriate controls / actions. Liaison with third party infrastructure owner (and technical advisors) during design and construction if required.	1	3	3
Contamination of controlled waters	Surface water runoff into controlled waters.	3	2	6	Adverse impact on water quality, with resultant impact on wildlife.	GI and groundwater quality testing and monitoring (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	Contaminated groundwater generated / released during construction.				Construction delay; increase in cost and possible redesign. Fines and / or enforcement action from Regulator. Regulatory damage.	Include measures to mitigate risk to controlled waters as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Development and adherence to the Final CEMP(s). Obtain appropriate discharge permit to allow discharge to existing sewerage network, system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility. Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and then tankered offsite and would be			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						subject to treatment prior to discharge.			
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline pH in soil or groundwater.	3	3	9	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection. Sulphate attack on buried concrete resulting in a reduction in concrete strength. Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the provision of APM to provide additional protection against sulfate attack if BRE SD1 assessment indicates Design Sulfate Class DS-5 conditions are present. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Material re-use	Material excavated may be contaminated and / or unacceptable for re-use as bulk backfill above buried service utilities.	4	2	8	Disposal offsite.	Soils may be unlikely to be acceptable for re-use unless remediated to risk-based criteria. Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Contamination assessment of all chemical data. Develop risk-based materials re-use criteria as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Cost / risk allowance for waste disposal of contaminated soils to be allowed for in the Construction Risk Register. Waste may be contaminated with hazardous materials. Development of a Remediation Design Strategy and implementation of an MMP. AMP,	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Final CEMP(s) and Verification Report on completion of the works.			
ELECTRICAL CONNECTION CORRIDOR									
Unexploded Ordnance	UXO undiscovered ordinance following WWI and/or WWII.	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Provision of detailed report for site from specialist UXO data provider. Adequate assessment and design. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints. The protocol for UXO is secured via the Framework CEMP (EN070009/APP/5.12).	1	5	5
Difficult construction conditions – relict buried infrastructure	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, relict buried foundations, walls, ground slabs, tunnels	5	3	15	Not possible to construct in-ground sections to depth or vertical alignment as planned. Construction delay; increase in cost and possible redesign.	Development specific GI targeted at suspected relict buried foundations, walls, slabs and tunnels etc (identified from historical land use review) including non-intrusive geophysical surveys along proposed in-ground services corridor (pursuant to a	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	and possibly pile foundations associated with demolished former buildings.					Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design, including identification of in-ground constraints from the review of historical land use carried out as part of the Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)). Assess feasibility of re-routing sections to avoid problems. If re-routing is not practical, carry out advanced works ahead of main construction including probing and / or limited earthworks to remove identified relict buried structures by undertaking targeted excavation and replacement of obstructions. Examine potential for utilising the existing intake and associated abstraction licence from the former SSI Redcar Steelworks to supply			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						water to the Proposed Development. Include cost / risk allowance for slow construction progress in the Construction Risk Register.			
Difficult construction conditions – tidal groundwater control	Shallow groundwater inflows [from wet, coarse soils].	4	3	12	Groundwater inflows into excavations, side slope instability, slumping or ravelling of slopes dug below ground, liquefaction or pumping of silts and / or sands under loading from earth moving plant. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for ground and groundwater conditions proved on site. Temporary groundwater control measures could be required, such as sump pumping, well pointing, vacuum extraction systems, and provision of temporary sheet pile cut off. Include cost / risk allowance for slow construction progress in the Construction Risk Register.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Dewatering	Prolonged pumping of groundwater induces ground settlement and damages adjacent third-party infrastructure.	3	3	9	Construction delay; increase in cost and possible redesign. Litigation resulting from damage caused to third party infrastructure.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground and groundwater conditions proved on site. If dewatering is required, assess feasibility of relocating pumping to avoid settlement sensitive infrastructure. Design / implement a programme of geotechnical monitoring during construction if necessary with appropriate controls / actions. Liaison with third party infrastructure owner (and technical advisors) during design and construction if required.	1	3	3
Contamination of controlled waters	Surface water runoff into controlled waters.	3	2	6	Adverse impact on water quality, with resultant impact on wildlife.	GI and groundwater quality testing and monitoring (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	Contaminated groundwater generated / released during construction.				Construction delay; increase in cost and possible redesign. Fines and / or enforcement action from Regulator. Regulatory damage.	Development and adherence to the Final CEMP(s). Include measures to mitigate risks to controlled waters as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Obtain appropriate discharge permit to allow discharge to existing sewerage network, system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility. Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and then tankered offsite and would be			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						subject to treatment prior to discharge.			
Difficult construction conditions – buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to existing buried infrastructure / services.	4	3	12	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider. Litigation resulting from damage caused to third party infrastructure.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Use best practice for diversion of utilities if required. Use of existing above / below ground service conduits where possible.	1	3	3
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline pH in soil or groundwater.	3	3	9	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection. Sulphate attack on buried concrete resulting in a	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the provision of APM to provide additional protection against sulfate attack if	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
					reduction in concrete strength. Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	BRE SD1 assessment indicates Design Sulfate Class DS-5 conditions are present. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.			
Material re-use	Material excavated may be contaminated and / or unacceptable for re-use as bulk backfill above buried service utilities.	4	2	8	Disposal offsite.	Soils may be unlikely to be acceptable for re-use unless remediated to risk-based criteria. Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Contamination assessment of all chemical data. Develop risk-based materials re-use criteria as part of the remediation strategy (pursuant	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						to a Requirement of the Draft DCO (EN070009/APP/4.1). Cost / risk allowance for waste disposal of contaminated soils to be allowed for in the Construction Risk Register. Waste may be contaminated with hazardous materials. Development of a Remediation Design Strategy and implementation of MMP, AMP, Final CEMP(s) and Verification Report on completion of the works.			
HYDROGEN PIPELINE CORRIDOR									
High Groundwater Flood Risk Areas	High risk of groundwater flooding in areas close to pipeline crossing route area north of River Tees.	3	4	12	Risk of uplift to the pipeline or erosion of backfill to pipeline.	Adequate assessment and design.	1	4	4

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Unexploded Ordnance	UXO undiscovered ordinance following WWI and/or WWII. [North of River Tees – The majority of the Corridor is within an area of Moderate risk. South River Tees – small portion of Trunk Road to the south, being within an area of Moderate risk. Refer to Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)) for Decoy Sites, Strategic Targets and Luftwaffe Targets]	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Provision of detailed report for site from specialist UXO data provider. Adequate assessment and design. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints. The protocol for UXO is secured via the Framework CEMP (EN070009/APP/5.12).	1	5	5

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Difficult construction conditions – peat / alluvium	Presence of peat / alluvium locally in or below utilities excavations. [Figure 10-2: Superficial Geology (ES Volume II, EN070009/APP/6.3) shows an elongate area of peat present across the route south-east of Reservoirs near Saltholme].	3	2	6	Compressible formation susceptible to ground displacements (heave / settlement) during and after construction. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground conditions proved on site. Removal of soft spots and replacement with suitable compacted engineered fill material. Include cost / risk allowance for slow construction progress in the Construction Risk Register.	1	2	2
Difficult construction conditions – relict buried infrastructure	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, relict buried foundations, walls, ground slabs, tunnels and possibly pile	5	3	15	Not possible to construct in-ground sections to depth or vertical alignment as planned. Construction delay; increase in cost and possible redesign.	Development specific GI targeted at suspected relict buried foundations, walls, slabs and tunnels etc (identified from historical land use review) including non-intrusive geophysical surveys along proposed in-ground services corridor (pursuant to a	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	foundations associated with demolished former buildings.					Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design, including identification of in-ground constraints from the review of historical land use carried out as part of the Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)). Assess feasibility of re-routing sections to avoid problems. If re-routing is not practical, carry out advanced works ahead of main construction including probing and / or limited earthworks to remove identified relict buried structures by undertaking targeted excavation and replacement of obstructions. Examine potential for utilising the existing intake and associated abstraction licence from the former SSI Redcar Steelworks to supply			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						water to the Proposed Development. Include cost / risk allowance for slow construction progress in the Construction Risk Register.			
Difficult construction conditions – tidal groundwater control	Shallow groundwater inflows [from wet, coarse soils].	4	3	12	Groundwater inflows into excavations, side slope instability, slumping or ravelling of slopes dug below ground, liquefaction or pumping of silts and / or sands under loading from earth moving plant. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for ground and groundwater conditions proved on site. Temporary groundwater control measures could be required, such as sump pumping, well pointing, vacuum extraction systems, and provision of temporary sheet pile cut off. Include cost / risk allowance for slow construction progress in the Construction Risk Register.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Dewatering	Prolonged pumping of groundwater induces ground settlement and damages adjacent third-party infrastructure.	3	3	9	Construction delay; increase in cost and possible redesign. Litigation resulting from damage caused to third party infrastructure.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground and groundwater conditions proved on site. If dewatering is required, assess feasibility of relocating pumping to avoid settlement sensitive infrastructure. Design / implement a programme of geotechnical monitoring during construction if necessary with appropriate controls / actions. Liaison with third party infrastructure owner (and technical advisors) during design and construction if required.	1	3	3
Contamination of controlled waters	Surface water runoff into controlled waters.	3	2	6	Adverse impact on water quality, with resultant impact on wildlife.	GI and groundwater quality testing and monitoring (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1).	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	Contaminated groundwater generated / released during construction.				Construction delay; increase in cost and possible redesign. Fines and / or enforcement action from Regulator. Regulatory damage.	Include measures to mitigate risks to controlled waters as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Development and adherence to the Final CEMP(s). Obtain appropriate discharge permit to allow discharge to existing sewerage network, system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility. Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and then tankered offsite and would be			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						subject to treatment prior to discharge.			
Difficult construction conditions – buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to existing buried infrastructure / services.	4	3	12	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider. Litigation resulting from damage caused to third party infrastructure.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Use best practice for diversion of utilities if required. Use of existing above / below ground service conduits where possible.	1	3	3
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline pH in soil or	3	3	9	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the provision of APM to provide additional protection against sulfate attack if	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	groundwater.				Sulphate attack on buried concrete resulting in a reduction in concrete strength. Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	BRE SD1 assessment indicates Design Sulfate Class DS-5 conditions are present. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.			
Material re-use	Material excavated may be contaminated and / or unacceptable for re-use as bulk backfill above buried service utilities.	4	2	8	Disposal offsite.	Soils may be unlikely to be acceptable for re-use unless remediated to risk-based criteria. Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Contamination assessment of all chemical data. Develop risk-based materials re-use criteria as part of the remediation strategy (pursuant	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						to a Requirement of the Draft DCO (EN070009/APP/4.1). Cost / risk allowance for waste disposal of contaminated soils to be allowed for in the Construction Risk Register. Waste may be contaminated with hazardous materials. Development of a Remediation Design Strategy and implementation of an MMP, AMP, Final CEMP(s) and Verification Report on completion of the works.			
OTHER GASES CONNECTION CORRIDOR									
Unexploded Ordnance	UXO undiscovered ordinance following WWI and/or WWII.	3	5	15	Explosion, injury or fatality (site personnel and / or the public). Damage to on site and third-party infrastructure. Construction delay; increase in cost and possible redesign.	Provision of detailed report for site from specialist UXO data provider. Adequate assessment and design. Specialist UXO clearance surveys undertaken as part of all future below ground works. If necessary, re-route sections to avoid known UXO constraints.	1	5	5

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						The protocol for UXO is secured via the Framework CEMP (EN070009/APP/5.12).			
Difficult construction conditions – relict buried infrastructure	Obstructions in the Made Ground including gravel, cobble and boulder sized pieces of slag, relict buried foundations, walls, ground slabs, tunnels and possibly pile foundations associated with demolished former buildings.	5	3	15	Not possible to construct in-ground sections to depth or vertical alignment as planned. Construction delay; increase in cost and possible redesign.	Development specific GI targeted at suspected relict buried foundations, walls, slabs and tunnels etc (identified from historical land use review) including non-intrusive geophysical surveys along proposed in-ground services corridor (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design, including identification of in-ground constraints from the review of historical land use carried out as part of the Summary Report (Appendix 10A (ES Volume III, EN070009/APP/6.4)). Assess feasibility of re-routing sections to avoid problems.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						If re-routing is not practical, carry out advanced works ahead of main construction including probing and / or limited earthworks to remove identified relict buried structures by undertaking targeted excavation and replacement of obstructions. Examine potential for utilising the existing intake and associated abstraction licence from the former SSI Redcar Steelworks to supply water to the Proposed Development. Include cost / risk allowance for slow construction progress in the Construction Risk Register.			
Difficult construction conditions - buried utilities	Disused redundant and / or live buried services associated with past land use. New construction causes damage to	4	3	12	Severing / damaging utility. Settlement of utility / services. Restricted maintenance access to utility provider.	Adequate service survey / drawings to confirm status of utility. Non-intrusive geophysical survey and / or intrusive trial excavations to confirm presence and status of utilities (pursuant to a Requirement	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	existing buried infrastructure / services.				Litigation resulting from damage caused to third party infrastructure.	of the Draft DCO (EN070009/APP/4.1). Use best practice for diversion of utilities if required. Use of existing above / below ground service conduits where possible.			
Difficult construction conditions – tidal groundwater control	Shallow groundwater inflows [from wet, coarse soils].	4	3	12	Groundwater inflows into excavations, side slope instability, slumping or ravelling of slopes dug below ground, liquefaction or pumping of silts and / or sands under loading from earth moving plant. Construction delay; increase in cost and possible redesign.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for ground and groundwater conditions proved on site. Temporary groundwater control measures could be required, such as sump pumping, well pointing, vacuum extraction systems, and provision of temporary sheet pile cut off. Include cost / risk allowance for slow construction progress in the Construction Risk Register.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Dewatering	Prolonged pumping of groundwater induces ground settlement and damages adjacent third-party infrastructure.	3	3	9	Construction delay; increase in cost and possible redesign. Litigation resulting from damage caused to third party infrastructure.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design for the ground and groundwater conditions proved on site. If dewatering is required, assess feasibility of relocating pumping to avoid settlement sensitive infrastructure. Design / implement a programme of geotechnical monitoring during construction if necessary with appropriate controls / actions. Liaison with third party infrastructure owner (and technical advisors) during design and construction if required.	1	3	3
Contamination of controlled waters	Surface water runoff into controlled waters.	3	2	6	Adverse impact on water quality, with resultant impact on wildlife.	GI and groundwater quality testing and monitoring (pursuant to a	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
	Contaminated groundwater generated / released during construction.				Construction delay; increase in cost and possible redesign. Fines and / or enforcement action from Regulator. Regulatory damage.	Requirement of the Draft DCO (EN070009/APP/4.1). Development and adherence to the Final CEMP(s). Include measures to mitigate risks to controlled waters as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Obtain appropriate discharge permit to allow discharge to existing sewerage network, system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility. Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and			

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						then tankered offsite and would be subject to treatment prior to discharge.			
Aggressive ground conditions	Aggressive elevated concentrations of sulphate and chloride and acidic or alkaline pH in soil or groundwater.	3	3	9	Corrosion of buried steel leading to a loss in strength and / or excessive structural deflection. Sulphate attack on buried concrete resulting in a reduction in concrete strength. Serviceability problems leading to long term maintenance liability. Corrosion of polyethylene (PE) and polyvinyl chloride (PVC) plastic pipes.	Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Adequate design. Consideration to the provision of APM to provide additional protection against sulfate attack if BRE SD1 assessment indicates Design Sulfate Class DS-5 conditions are present. Utilities to be installed within clean inert pipe bedding material. Consider the use of wrapped steel, wrapped ductile iron, copper and PE barrier pipe with an aluminium barrier layer (PE-Al-PE) for services and water supplies in contaminated soils.	1	3	3

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
Material re-use	Material excavated may be contaminated and / or unacceptable for re-use as bulk backfill above buried service utilities.	4	2	8	Disposal offsite.	Soils may be unlikely to be acceptable for re-use unless remediated to risk based criteria. Development specific GI (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Contamination assessment of all chemical data. Develop risk-based materials re-use criteria as part of the remediation strategy (pursuant to a Requirement of the Draft DCO (EN070009/APP/4.1). Cost / risk allowance for waste disposal of contaminated soils to be allowed for in the Construction Risk Register. Waste may be contaminated with hazardous materials. Development of a Remediation Design Strategy and implementation of MMP, AMP,	1	2	2

IDENTIFIED GEOTECHNICAL HAZARD / RISK	CAUSE	RISK BEFORE MITIGATION			CONSEQUENCE	MITIGATION MEASURES	RISK AFTER MITIGATION		
		L	S	R (L X S)			L	S	R (L X S)
						Final CEMP(s) and Verification Report on completion of the works.			

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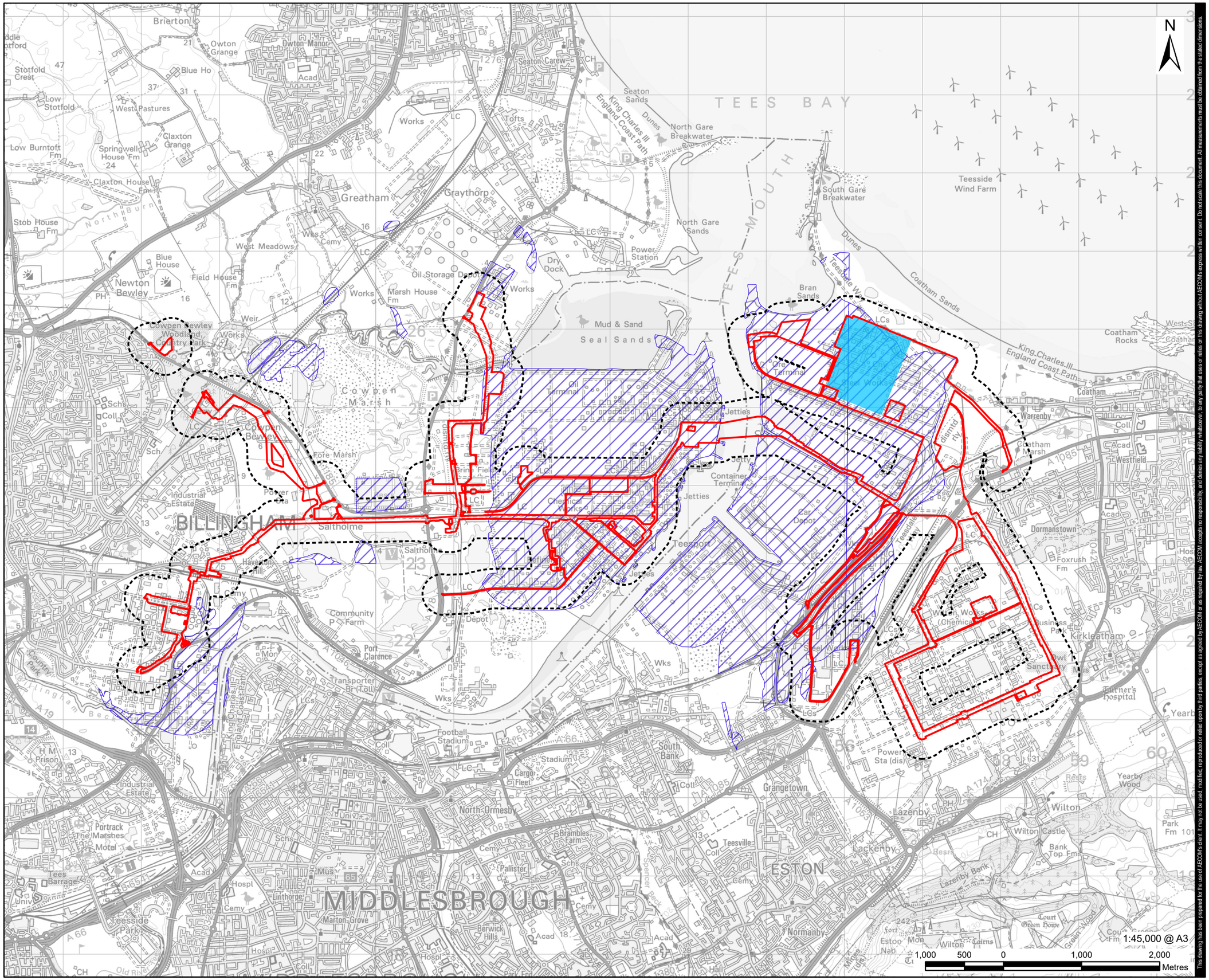

AECOM

PROJECT

H2Teesside DCO

APPLICANT

H2 Teesside Limited

CONSULTANT

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

NOTES

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Main Site

FIGURE NUMBER

Figure 10-1a

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15

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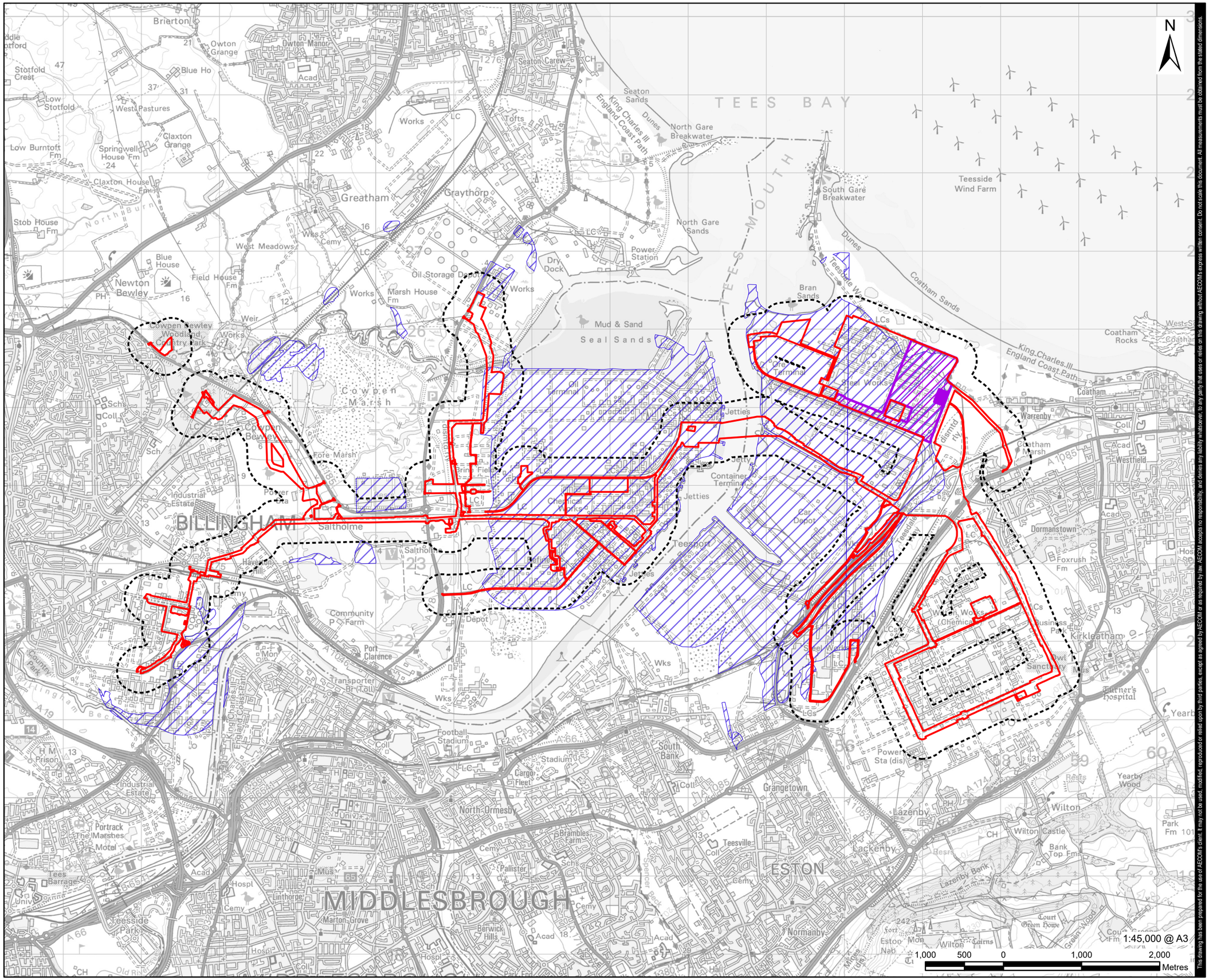

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1,000 500 0 1,000 2,000 Metres

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PROJECT

H2Teesside DCO

APPLICANT

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CONSULTANT

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Carbon Dioxide Export Pipeline & High-Pressure Compression Station

- Carbon Dioxide - Export Pipeline
- Carbon Dioxide - Above Ground Installation

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Carbon Dioxide Export Pipeline and High-Pressure Compression Station

FIGURE NUMBER

Figure 10-1b

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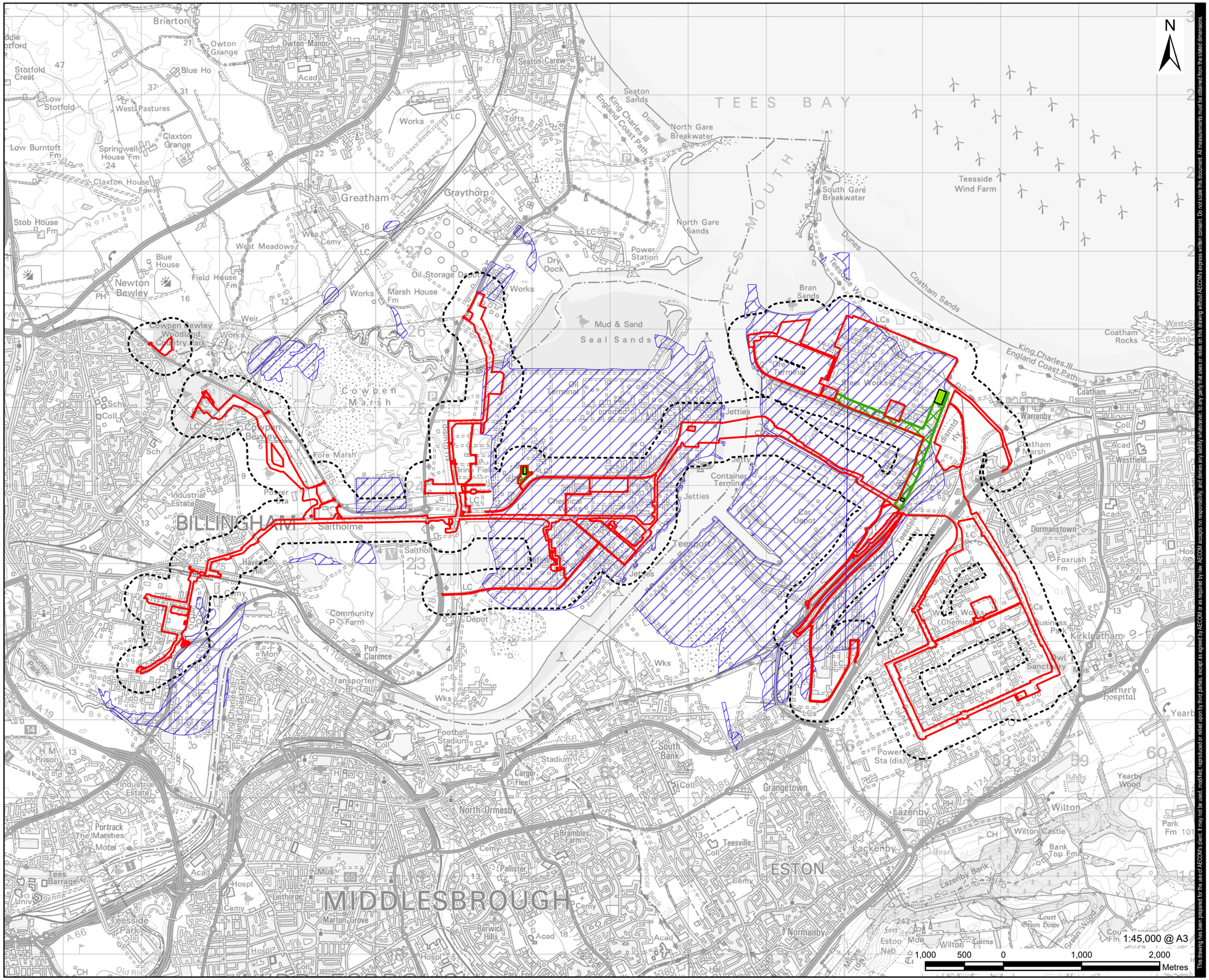

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Natural Gas Connection Works

- Natural Gas Connection - Underground High Pressure Gas Pipeline
- Natural Gas Connection - Above Ground Installation

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Natural Gas Connection Works

FIGURE NUMBER

Figure 10-1c

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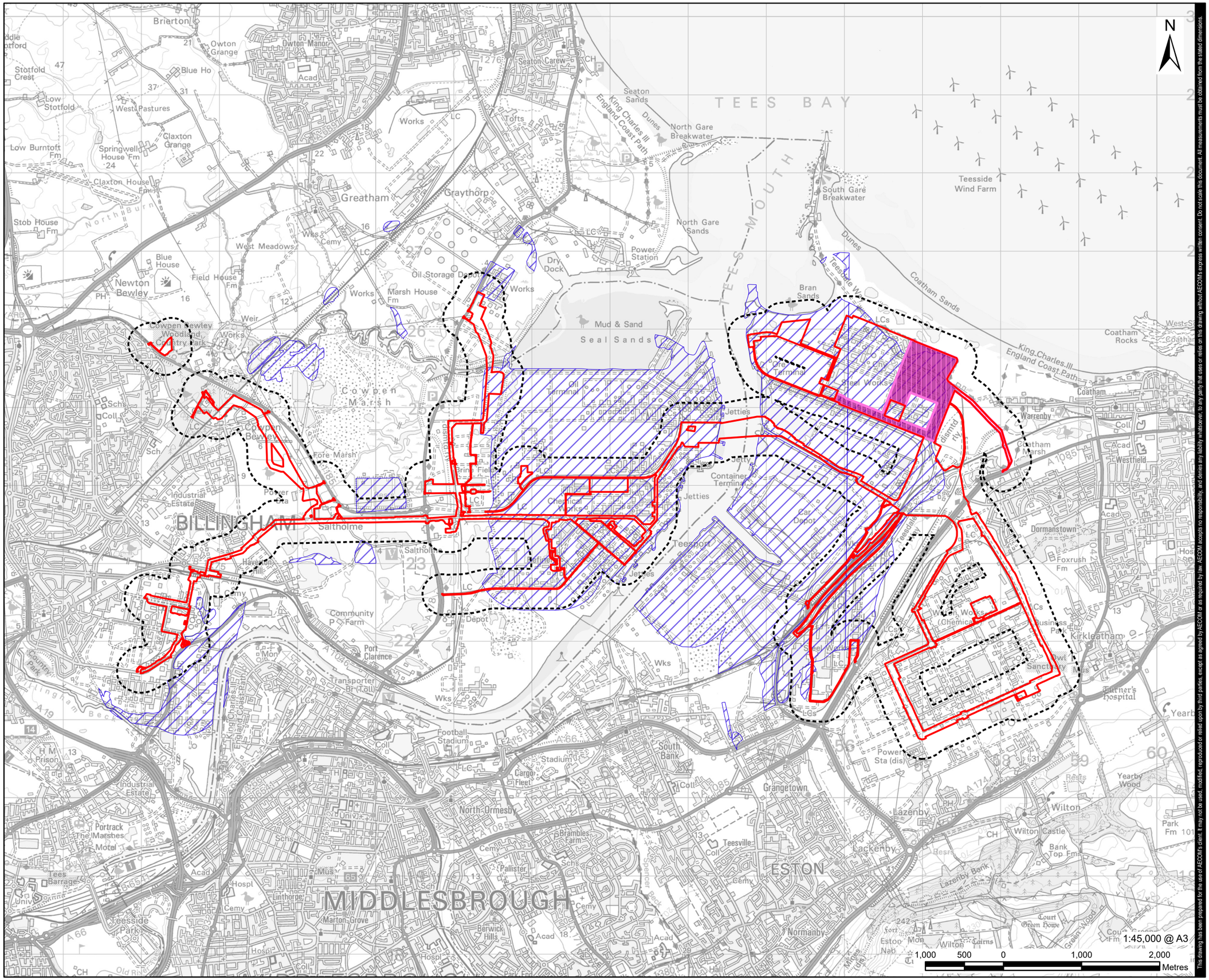

AECOM

PROJECT

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Water Supply Connection Works

- Water Supply Connection Works
- Wastewater Disposal Works

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Water and Wastewater Connection Works

FIGURE NUMBER

Figure 10-1d

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15

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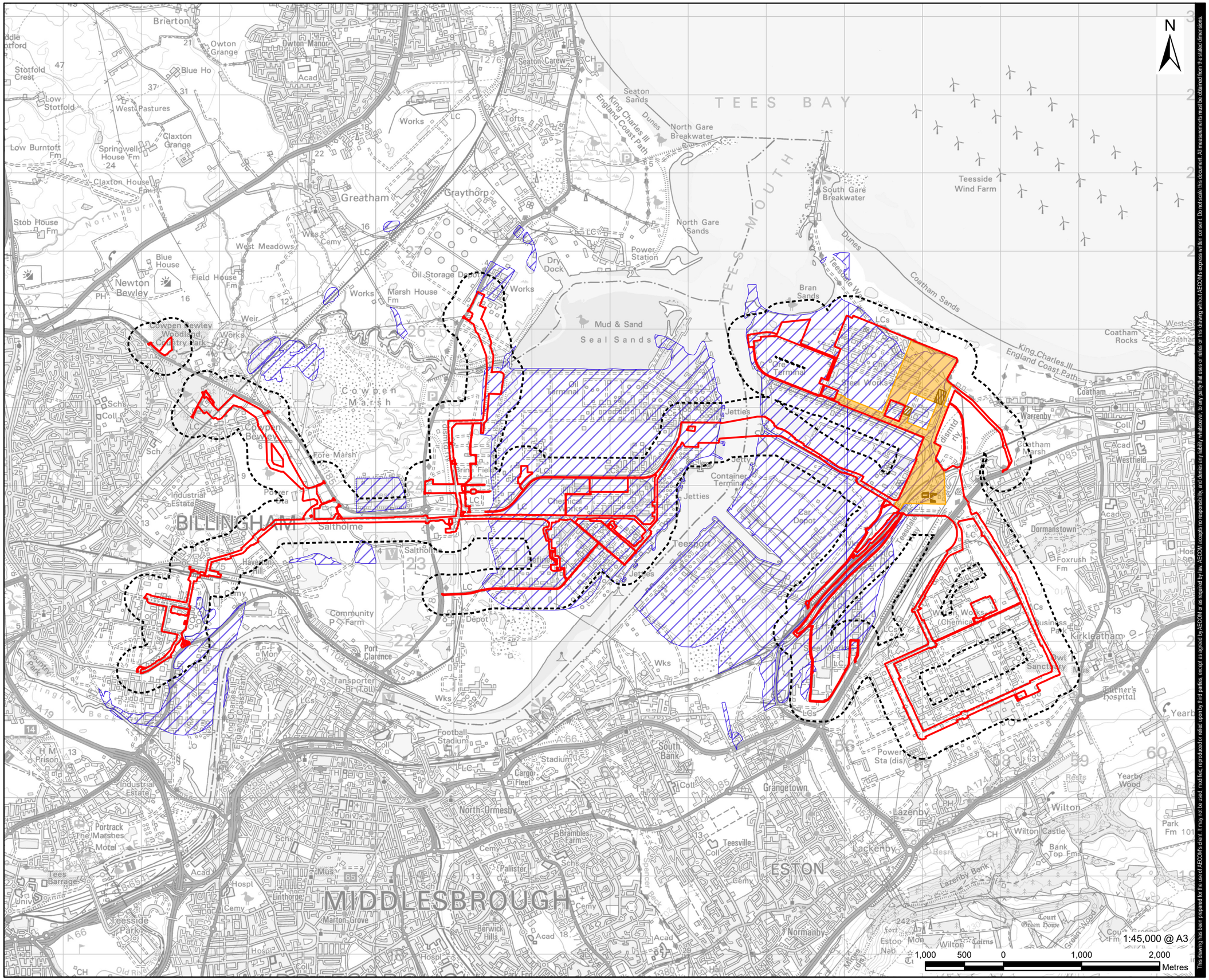

AECOM

PROJECT

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Electrical Connection Works

- Electrical Connection Works
- Above Ground Installation Connecting Work No. 3A to Pellet-Sinter Substation
- Above Ground Installation Connecting Work No. 3A to Tod Point Substation
- Above Ground Installation Connecting Work No. 3A to a New Substation

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Electrical Connection Works

FIGURE NUMBER

Figure 10-1e

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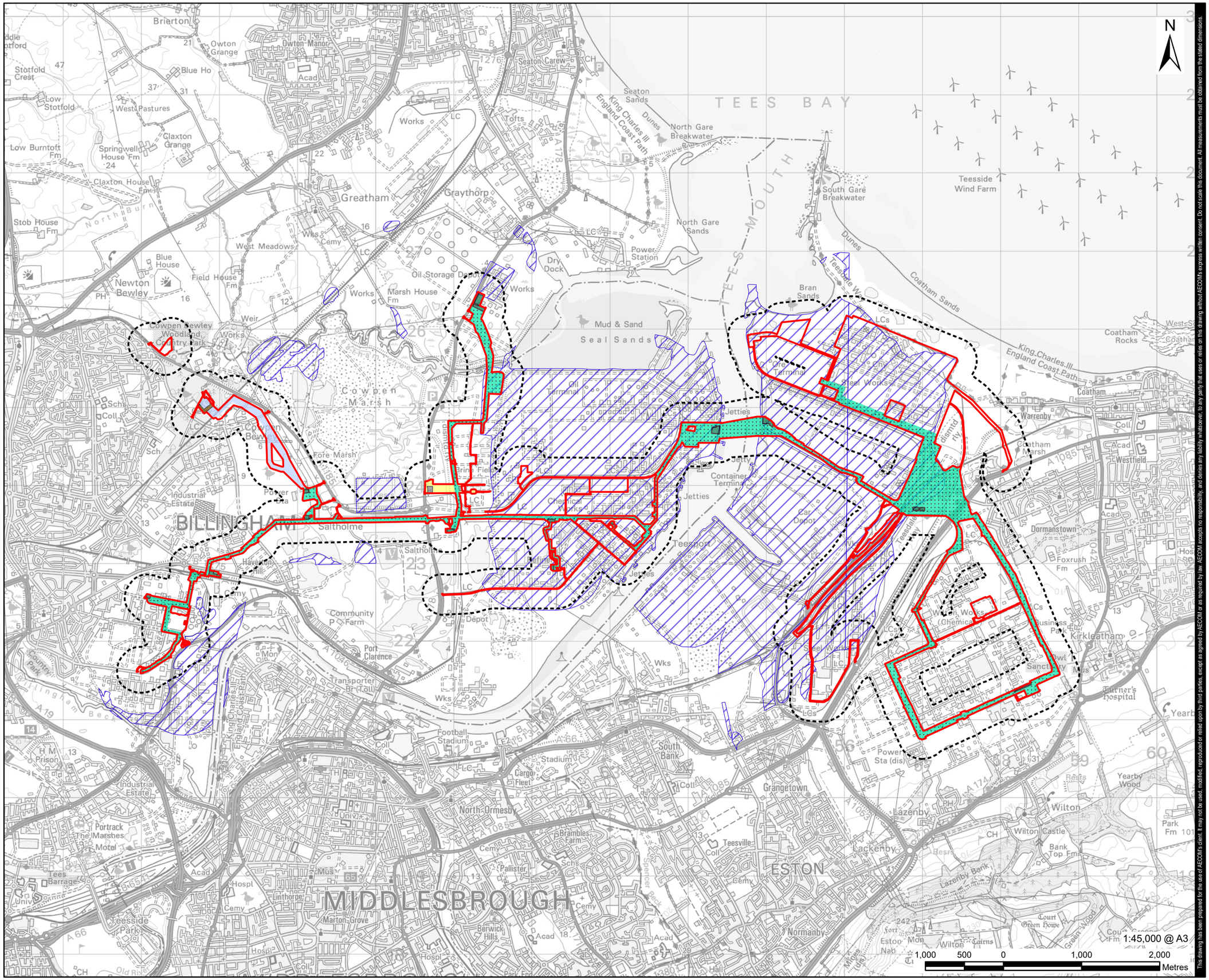

AECOM

PROJECT

H2Teesside DCO

APPLICANT

H2 Teesside Limited

CONSULTANT

AECOM Limited
100 Embankment,
Cathedral Approach,
Manchester, M3 7FB
www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Hydrogen Distribution Network

- Overground and Underground Pipelines
- Overground and Underground Pipelines to connect to Work No. 6B.2
- Overground and Underground Pipelines to connect to Work No. 6B.3
- Above Ground Installations
- Above Ground Installation at Cowpen Bewley
- Above Ground Installation at Saltholme Brinefields

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Hydrogen Distribution Network

FIGURE NUMBER

Figure 10-1f

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15

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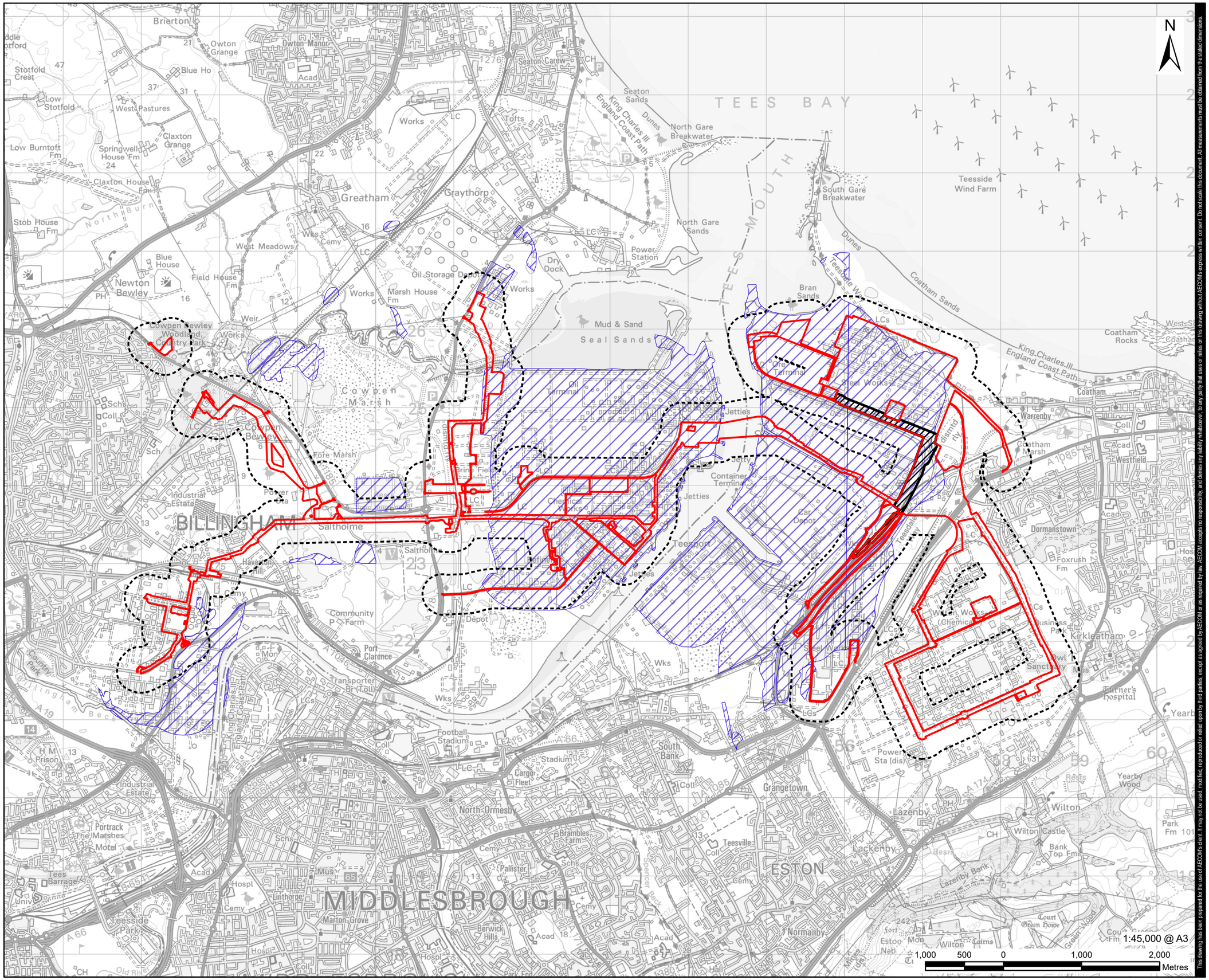

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APPLICANT

H2 Teesside Limited

CONSULTANT

AECOM Limited
100 Embankment,
Cathedral Approach,
Manchester, M3 7FB
www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Oxygen and Nitrogen Gas Connections

Artificial Geology (BGS 50k)

- Made Ground (Undivided)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Artificial Geology - Oxygen and Nitrogen Gas Connections

FIGURE NUMBER

Figure 10-1g

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2023-12-01

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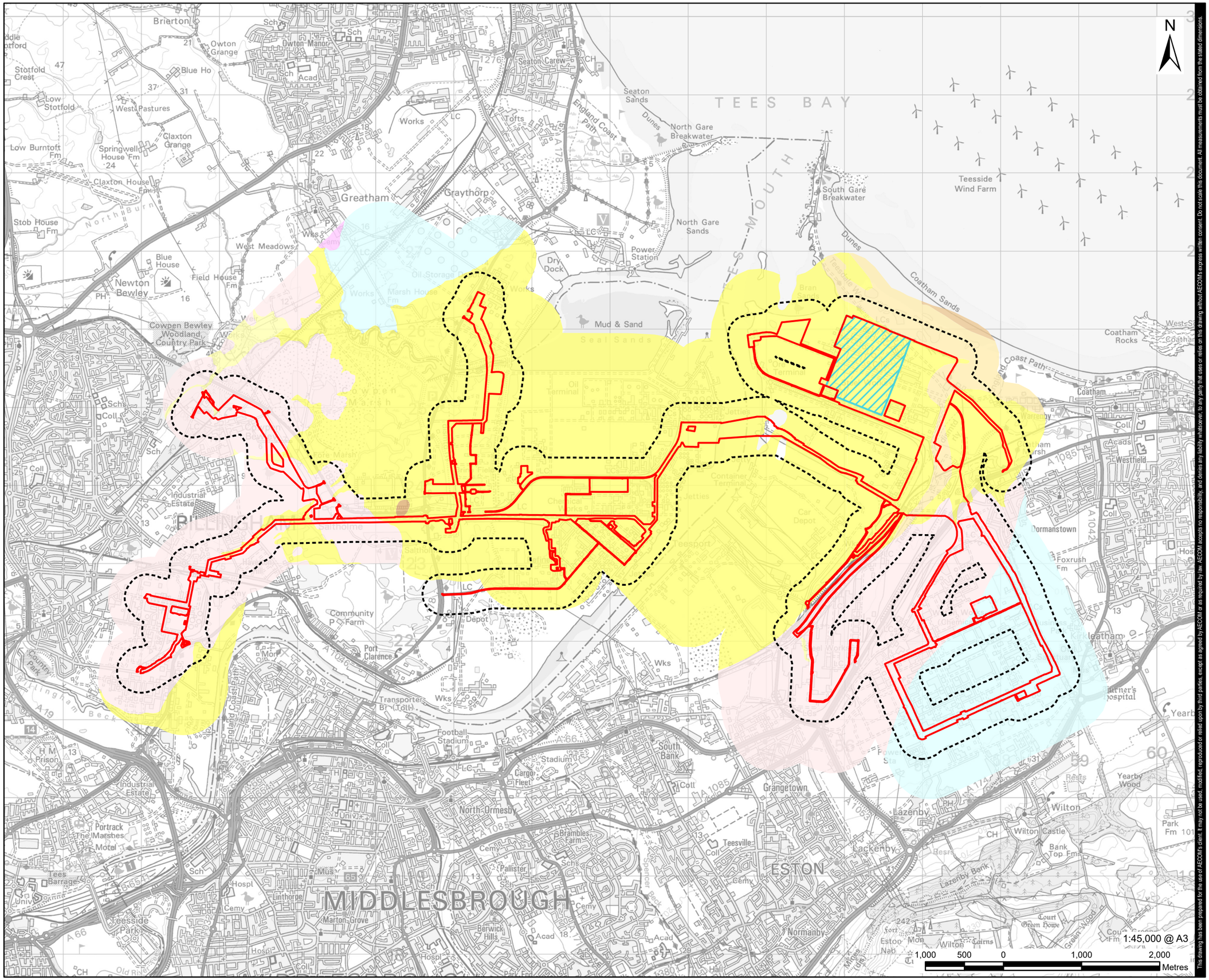

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APPLICANT

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LEGEND

- Proposed Development Site Boundary
- Proposed Development Site Boundary - 250 m Buffer
- Main Site

Superficial Geology (BGS 50k)

- Alluvium
- Beach And Tidal Flat Deposits (Undifferentiated)
- Blown Sand
- Glaciofluvial Deposits, Devensian
- Glaciolacustrine Deposits, Devensian
- Peat
- Tidal Flat Deposits
- Till, Devensian

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Superficial Geology

FIGURE NUMBER

Figure 10-2

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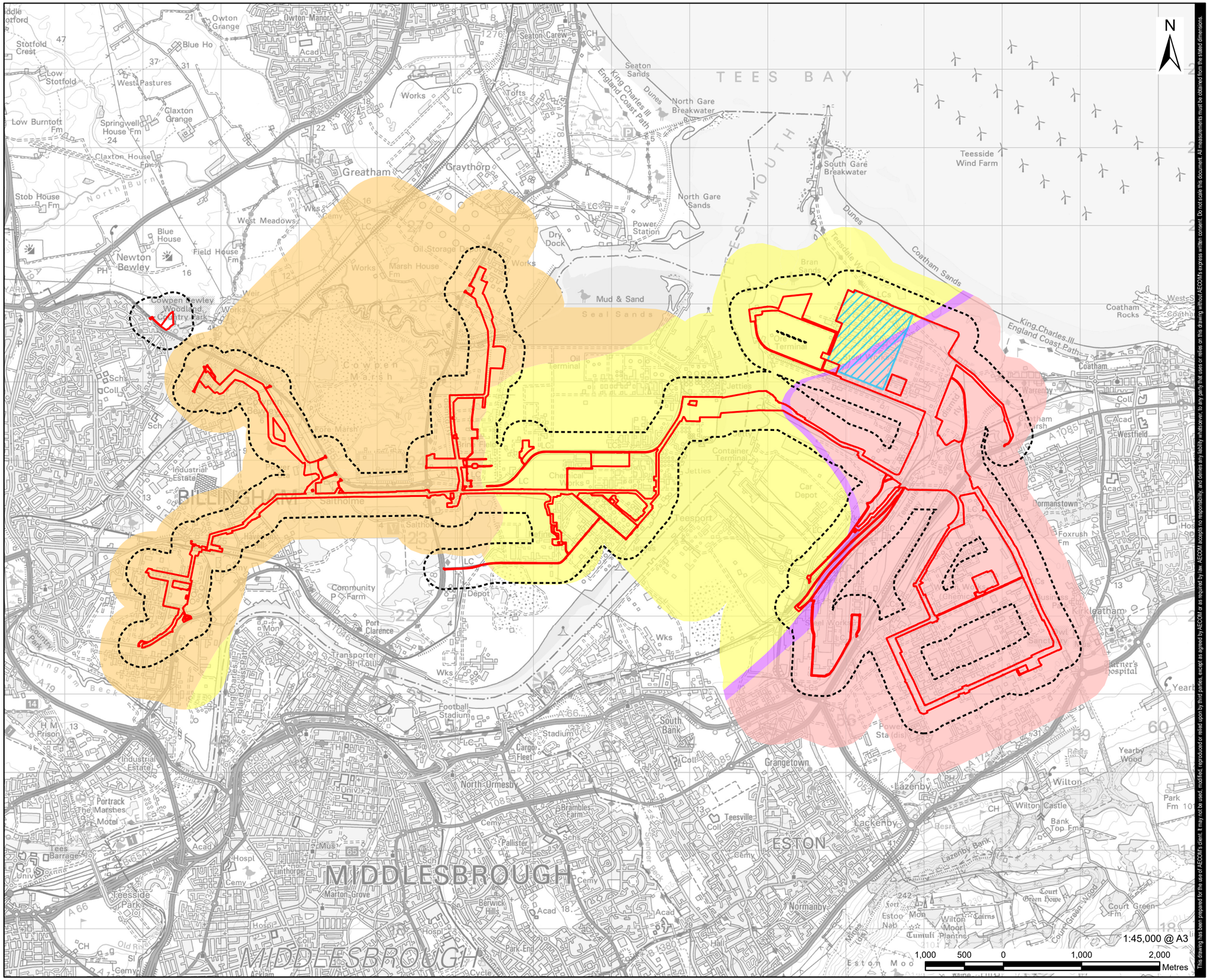

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Main Site

FIGURE NUMBER

Figure 10-3a

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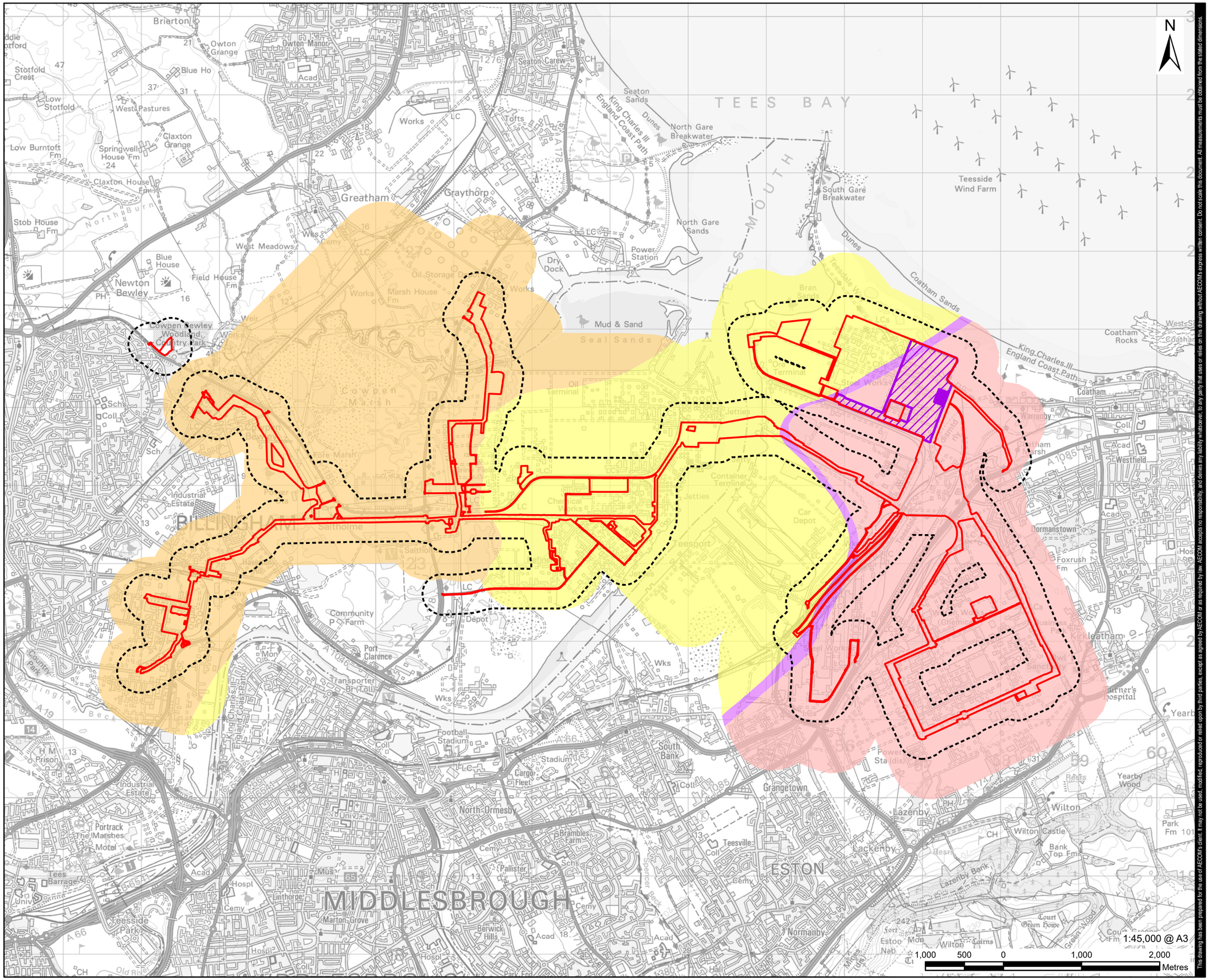

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APPLICANT

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Cathedral Approach,
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www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Carbon Dioxide Export Pipeline & High-Pressure Compression Station

- Carbon Dioxide - Export Pipeline
- Carbon Dioxide - Above Ground Installation

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Carbon Dioxide Export Pipeline and High-Pressure Compression Station

FIGURE NUMBER

Figure 10-3b

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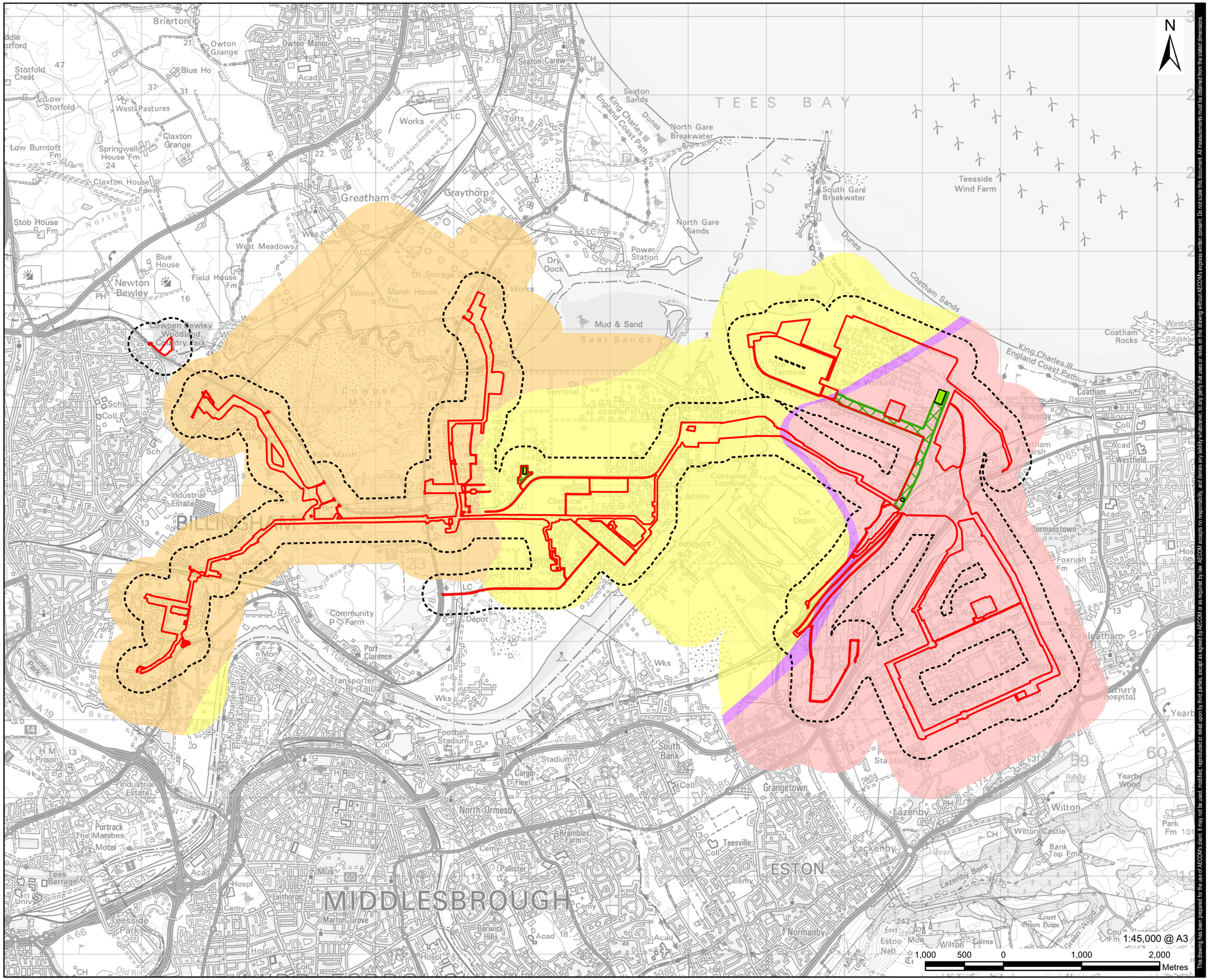

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PROJECT

H2Teesside DCO

APPLICANT

H2 Teesside Limited

CONSULTANT

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100 Embankment,
Cathedral Approach,
Manchester, M3 7FB
www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Natural Gas Connection Works

- Natural Gas Connection - Underground High Pressure Gas Pipeline
- Natural Gas Connection - Above Ground Installation

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Natural Gas Connection Works

FIGURE NUMBER

Figure 10-3c

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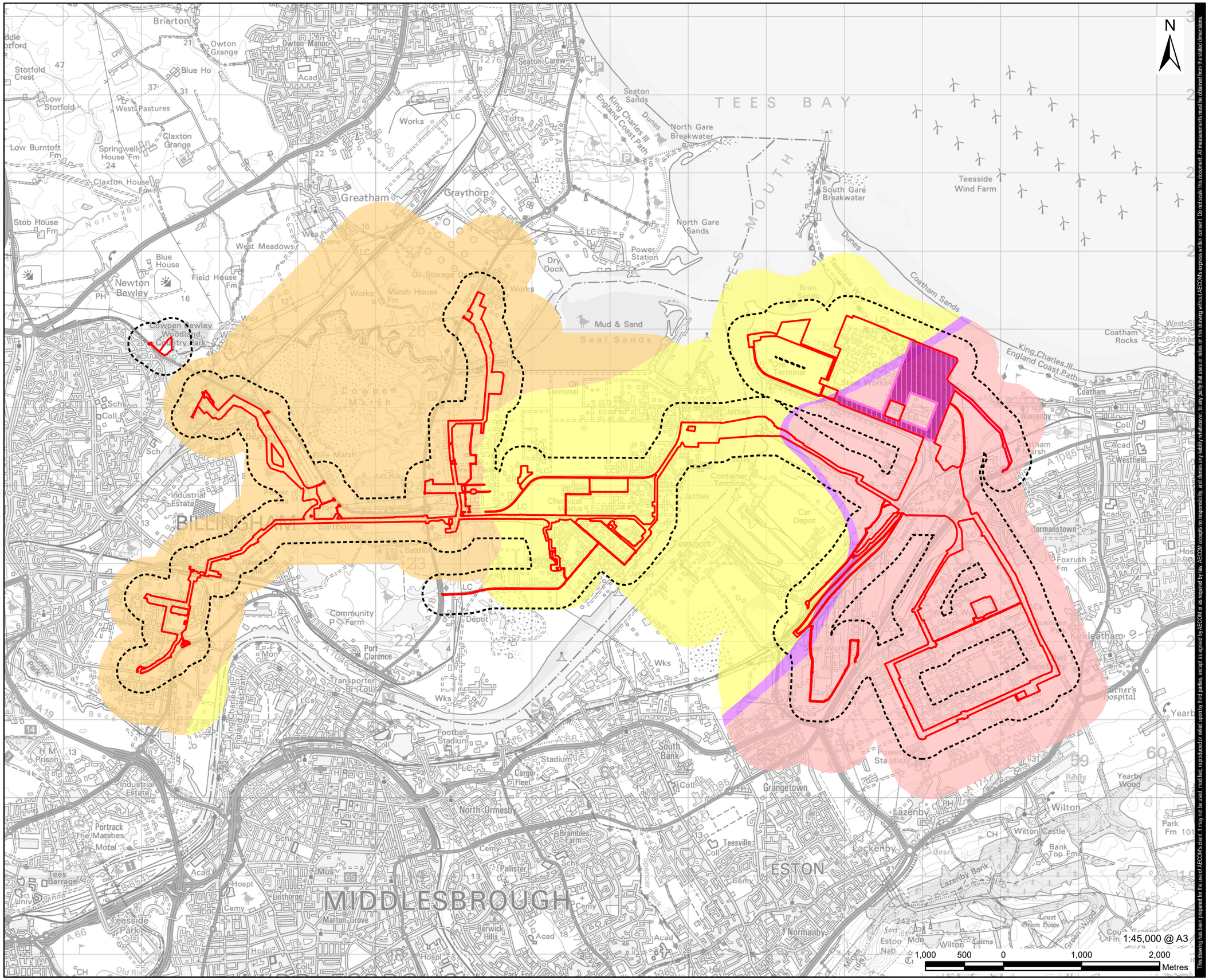

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PROJECT

H2Teesside DCO

APPLICANT

H2 Teesside Limited

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100 Embankment,
Cathedral Approach,
Manchester, M3 7FB
www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Water Supply Connection Works

- Water Supply Connection Works
- Wastewater Disposal Works

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Water and Wastewater Connection Works

FIGURE NUMBER

Figure 10-3d

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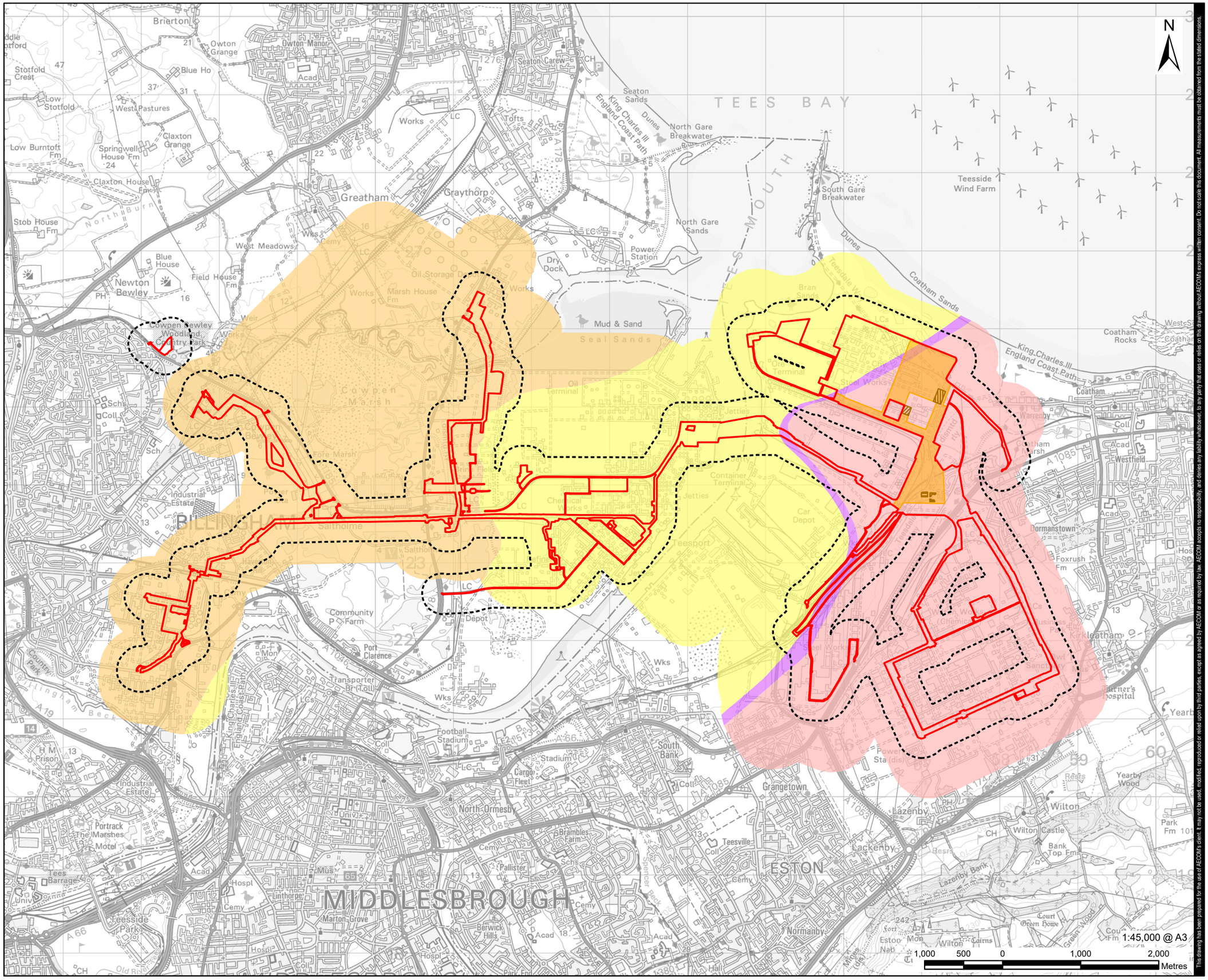

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www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Electrical Connection Works

- Electrical Connection Works
- Above Ground Installation Connecting Work No. 3A to Pellet-Sinter Substation
- Above Ground Installation Connecting Work No. 3A to Tod Point Substation
- Above Ground Installation Connecting Work No. 3A to a New Substation

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Electrical Connection Works

FIGURE NUMBER

Figure 10-3e

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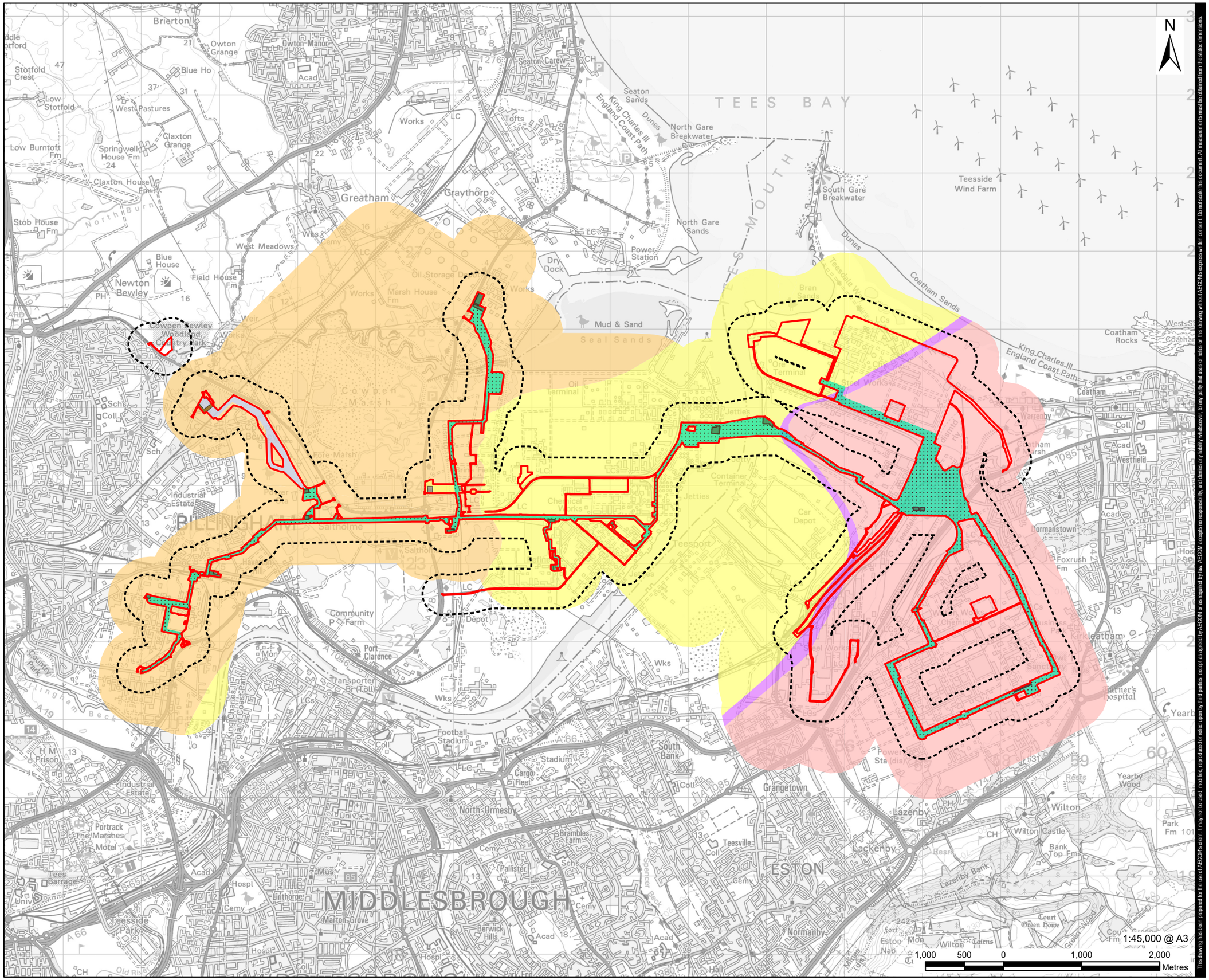

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PROJECT

H2Teesside DCO

APPLICANT

H2 Teesside Limited

CONSULTANT

AECOM Limited
100 Embankment,
Cathedral Approach,
Manchester, M3 7FB
www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Hydrogen Distribution Network

- Overground and Underground Pipelines
- Overground and Underground Pipelines to connect to Work No. 6B.2
- Overground and Underground Pipelines to connect to Work No. 6B.3
- Above Ground Installations
- Above Ground Installation at Cowpen Bewley
- Above Ground Installation at Saltholme Brinefields

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

Groundsure search area is based on the Red Line Boundary available at the time of the data purchase (March 2023).

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Hydrogen Distribution Network

FIGURE NUMBER

Figure 10-3f

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15

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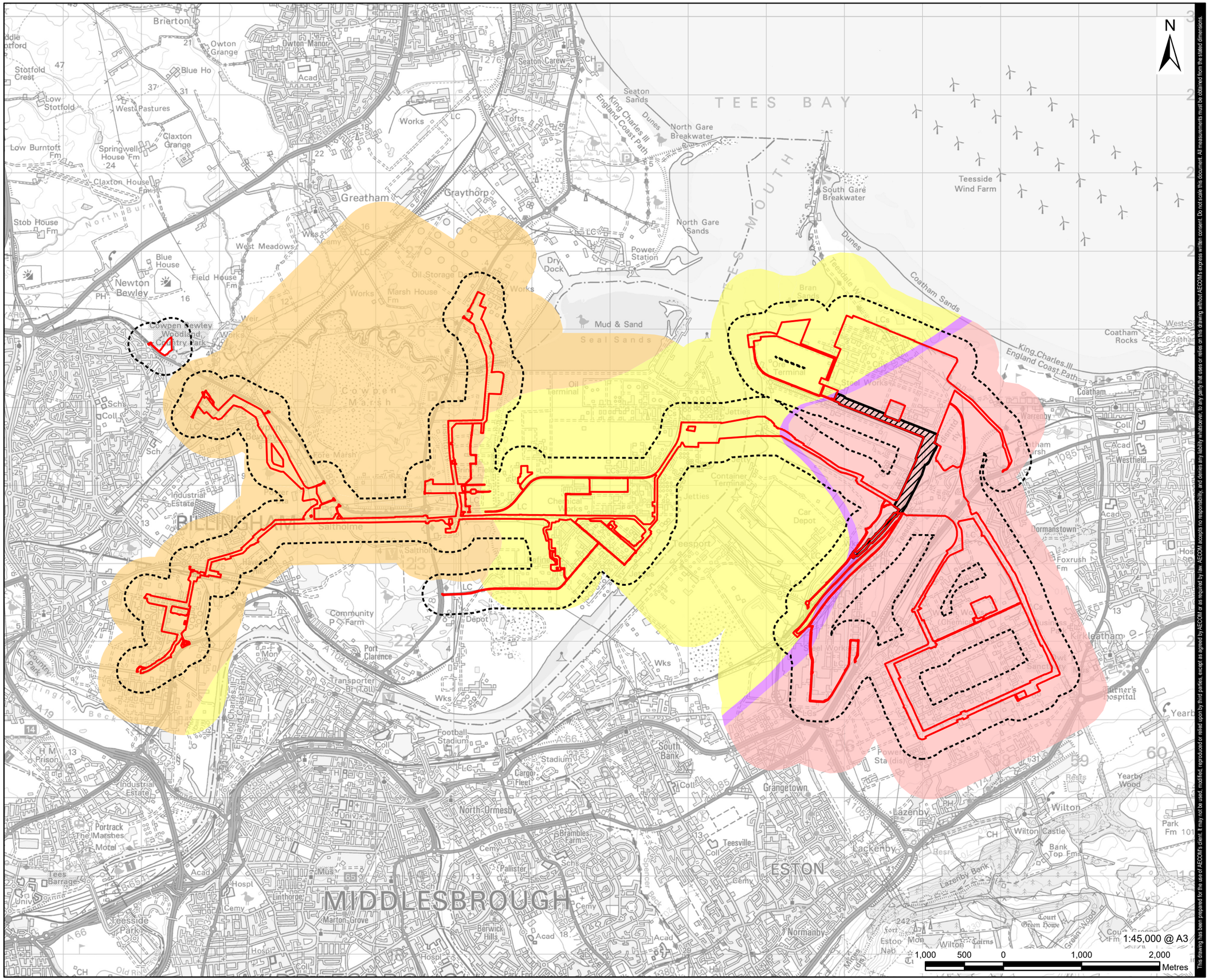

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APPLICANT

H2 Teesside Limited

CONSULTANT

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Cathedral Approach,
Manchester, M3 7FB
www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Oxygen and Nitrogen Gas Connections

Bedrock Geology (BGS 50k)

- Mercia Mudstone Group – Mudstone
- Penarth Group – Mudstone
- Redcar Mudstone Formation – Mudstone
- Sherwood Sandstone Group - Sandstone

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Geology - Oxygen and Nitrogen Gas Connections

FIGURE NUMBER

Figure 10-3g

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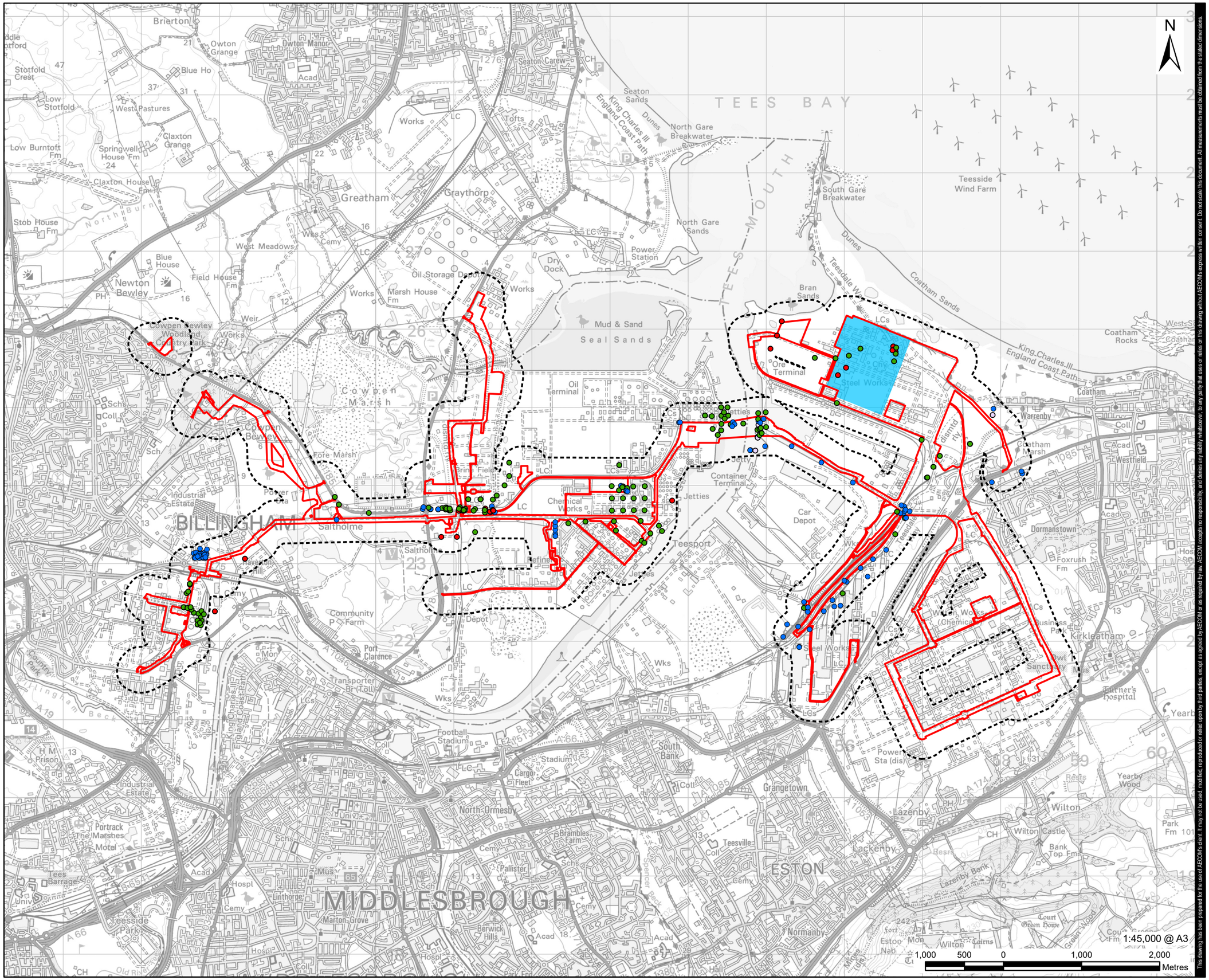

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

BGS Borehole (Depth m)

- 0 - 10m
- 10 - 30m
- 30m +
- Other

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

BGS Boreholes

FIGURE NUMBER

Figure 10-4

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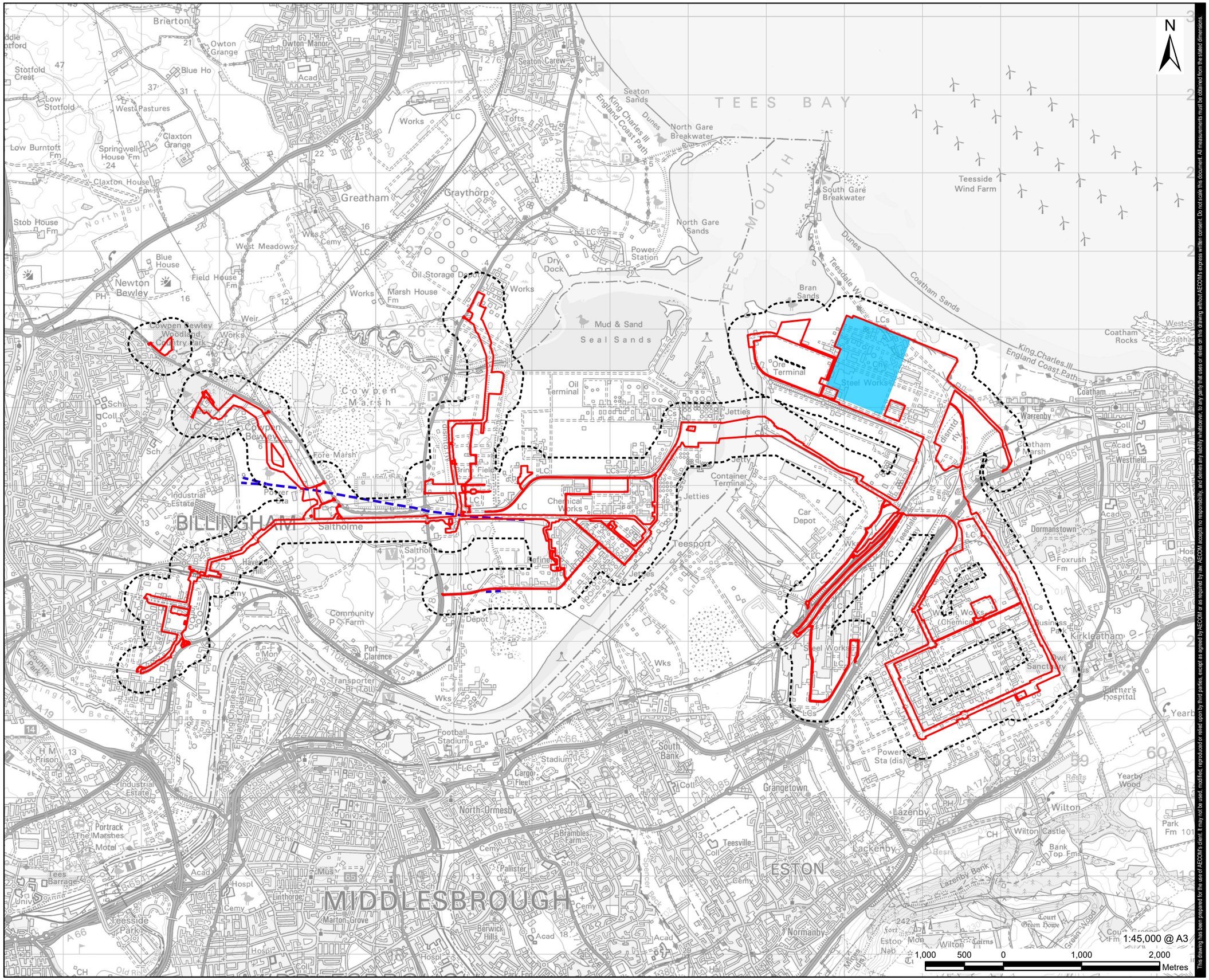

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Bedrock Faults and Linear Features

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Faults and Linear Features

FIGURE NUMBER

Figure 10-5

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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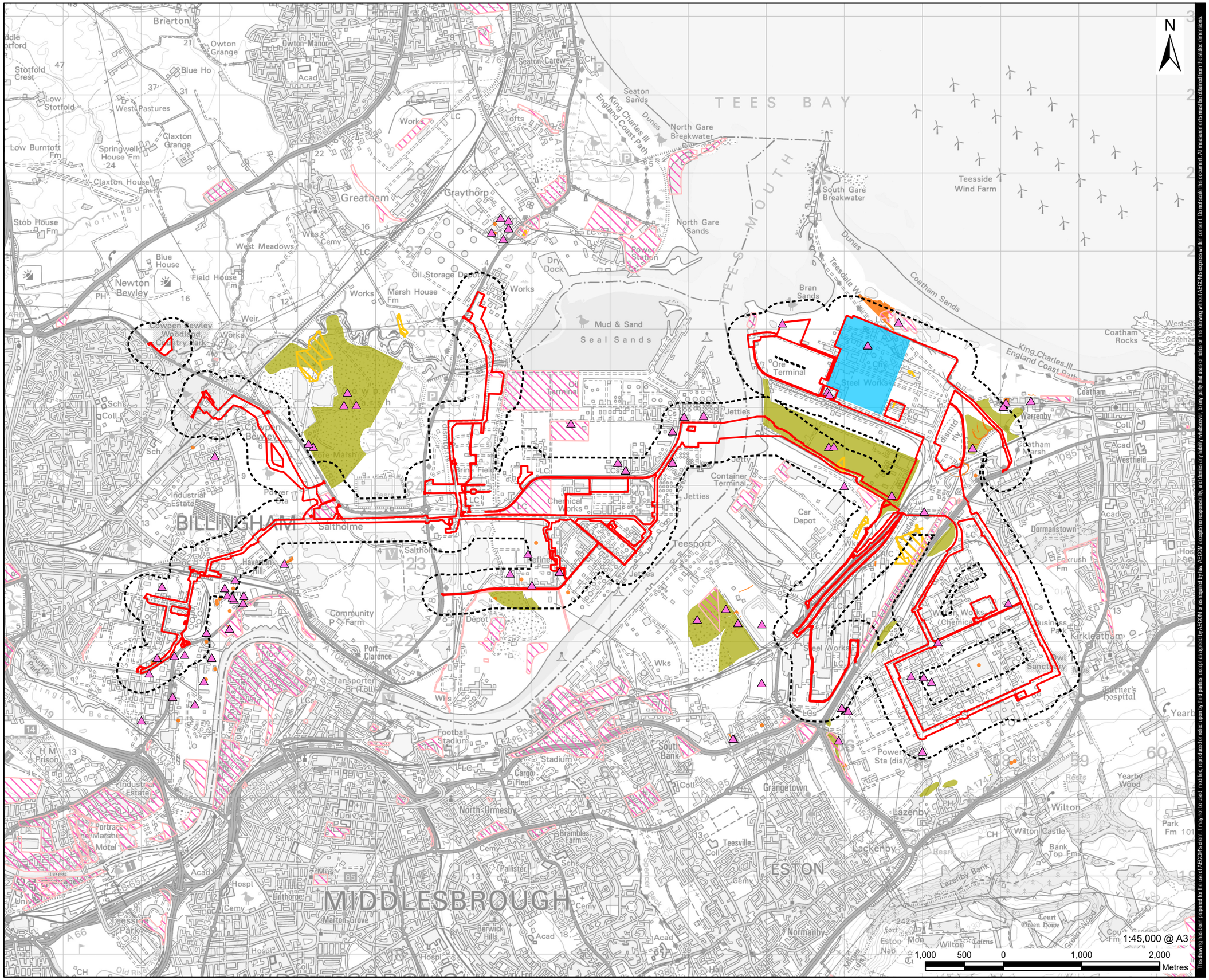

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Licensed Waste Site
- Historic Landfill Site
- Historical Waste Site
- Active or Recent Landfill
- Historical Landfill (Local Authority Mapping)

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Waste and Landfills

FIGURE NUMBER

Figure 10-6

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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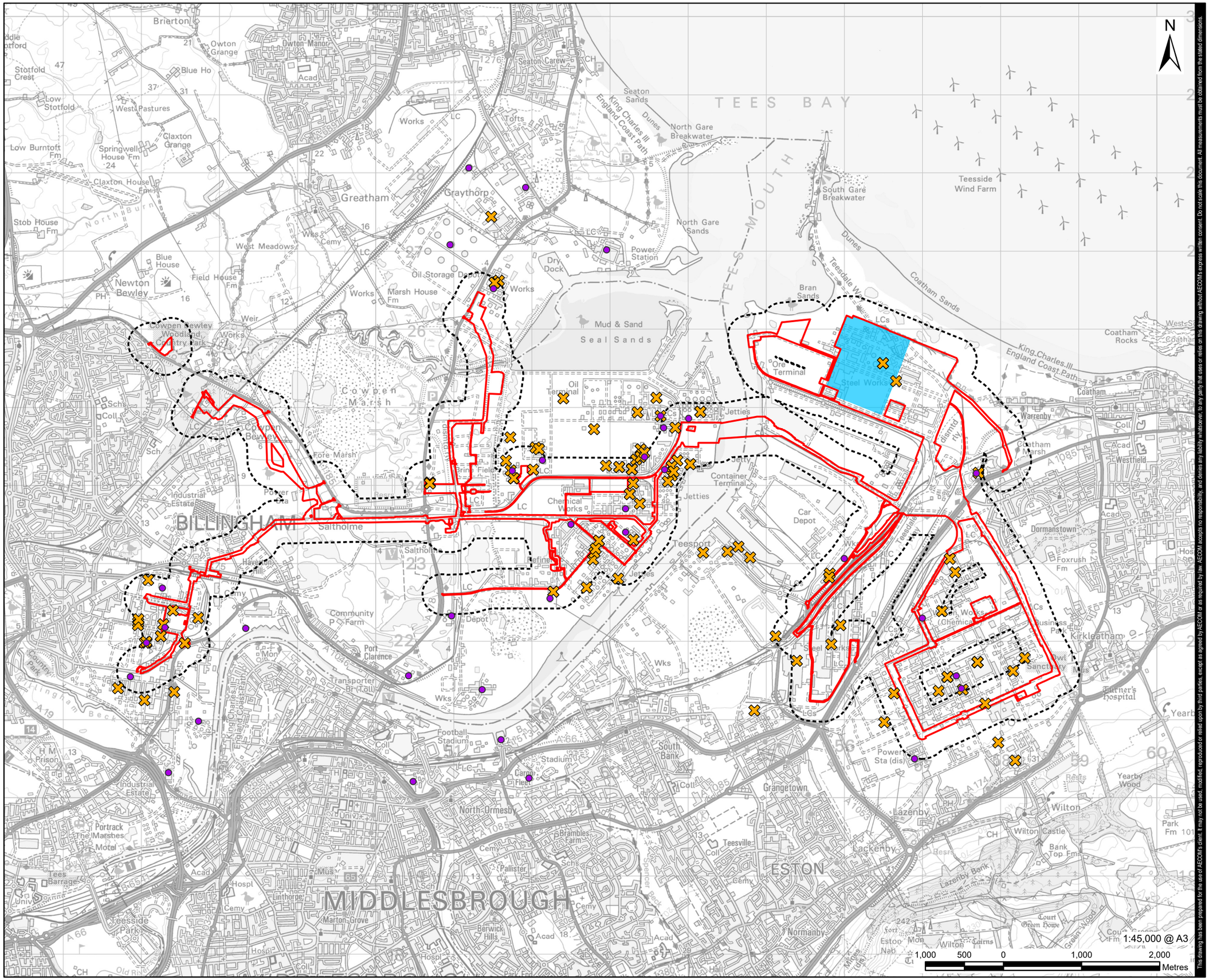

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PROJECT

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APPLICANT

H2 Teesside Limited

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Hazardous Substance Storage
- COMAH Site

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Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Hazardous Sites

FIGURE NUMBER

Figure 10-7

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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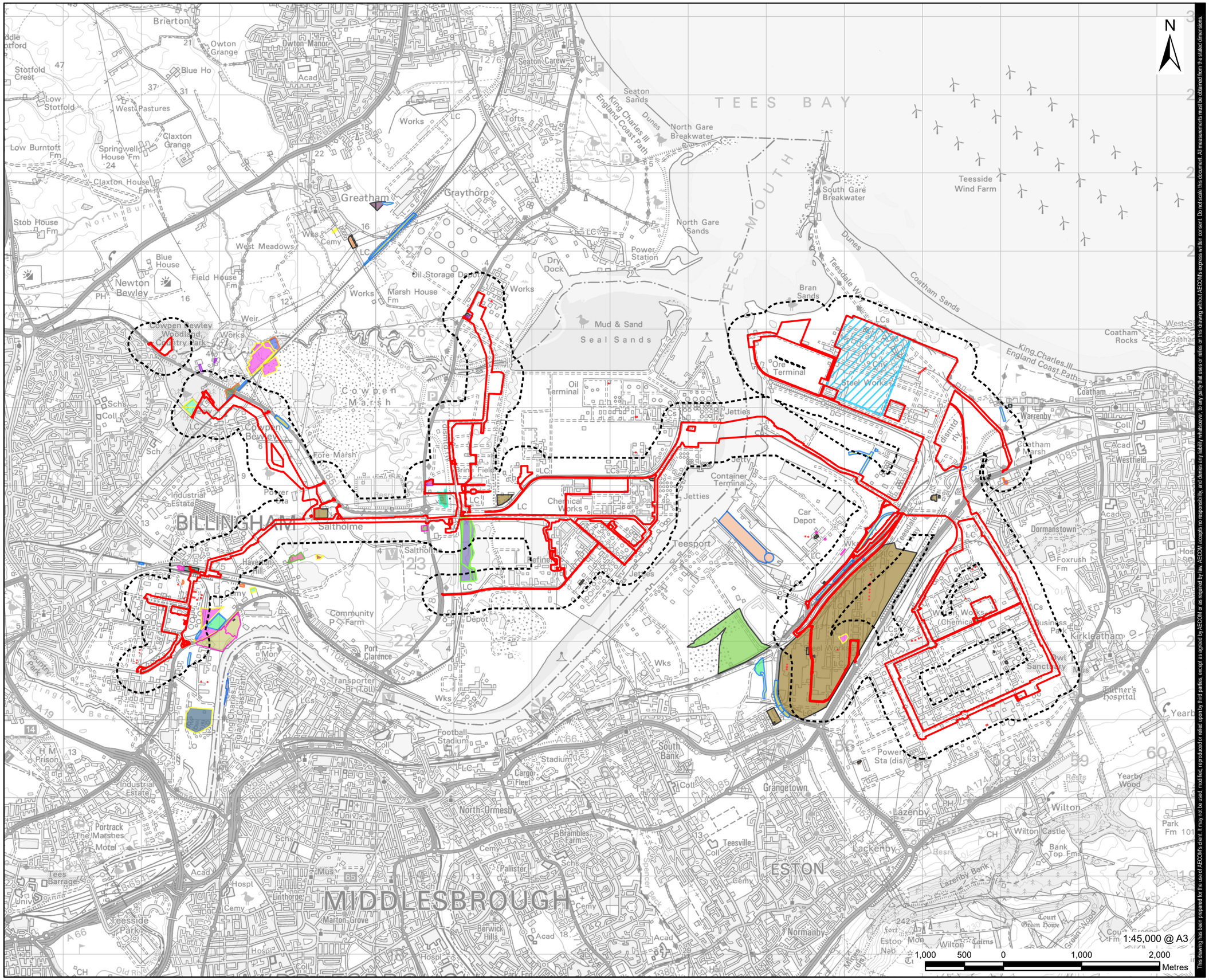

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APPLICANT

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CONSULTANT

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Airport
- Bank Works
- Barracks
- Bedding Works
- Brick Work
- Brick and Tile Works
- Brick and Tile Yard
- Brine Reservoirs
- Brine Well
- Cement Works
- Cemetery
- Chemical Works
- Chimneys
- Clay Pit
- Cooling Pond
- Cooling Tanks
- Corporation Yard
- Cuttings
- Disused Brine Wells
- Disused Rifle Range
- Disused Salt Works
- Dock Yard
- Electric Substation
- Electricity Switch House
- Engine House
- Engine Shed
- Engineering Works
- Filter Beds
- Fire Station
- Gas Handling Station

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Historical Industrial Land Uses (Polygons)

FIGURE NUMBER

Figure 10-8a

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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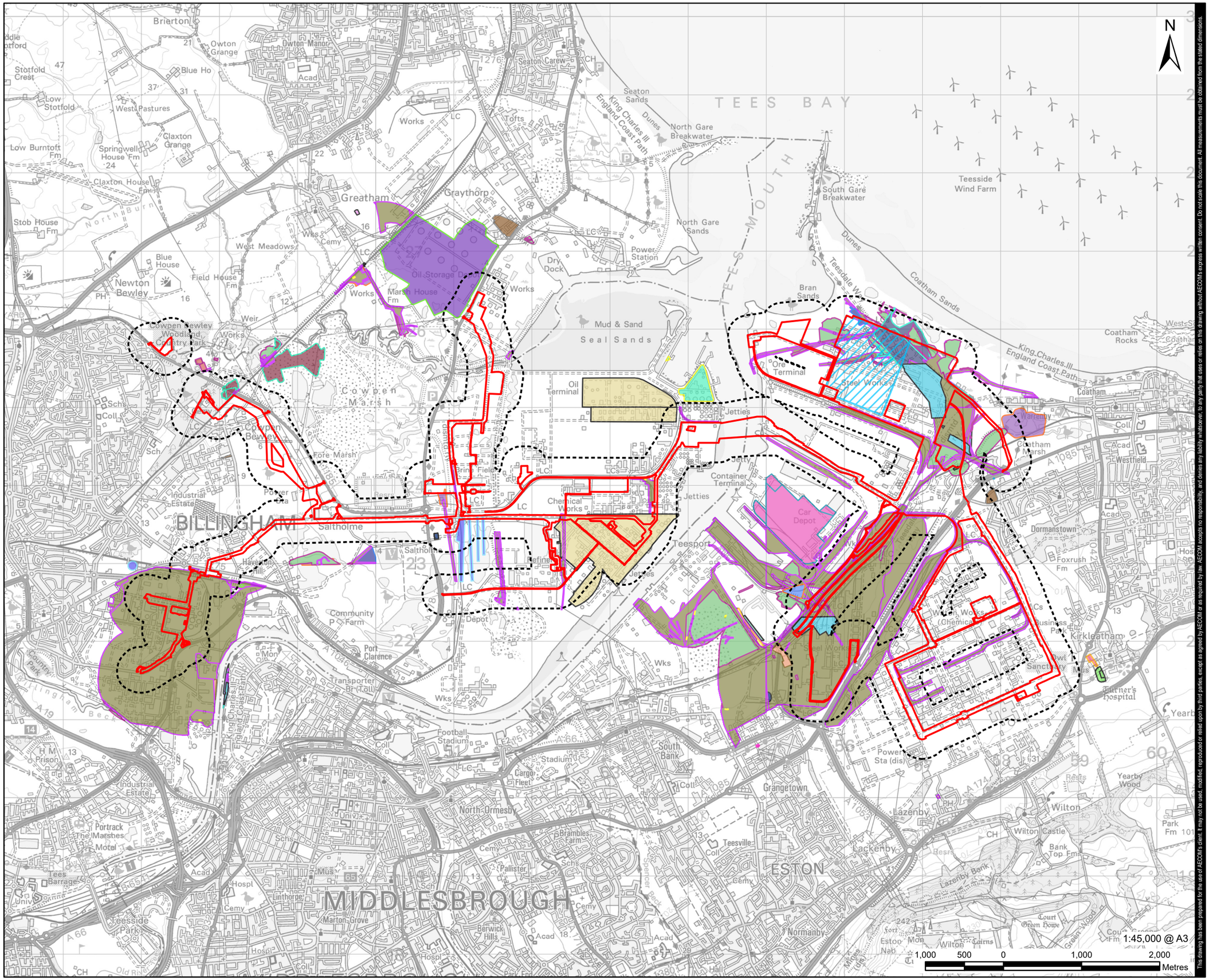

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Gravel Heap
- Hospital
- Industrial Estate
- Iron Workings
- Iron and Steel Works
- Mortuary
- Nursery
- Oil Refinery
- Oil Storage Depot
- Oil Supply Terminal
- Oil Terminal
- Old Clay Pits
- Oxygen Works
- Phosphate Manure Works
- Police Station
- Power Station
- Pump House
- Pumping Station
- Railway Buildings
- Railway Engine Shed
- Railway Sidings
- Railway Station
- Refinery
- Refuse Heaps
- Rifle Ranges
- Salt works
- Sand Pit
- Sawmill
- Settling Beds
- Settling Pond

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Historical Industrial Land Uses (Polygons)

FIGURE NUMBER

Figure 10-8b

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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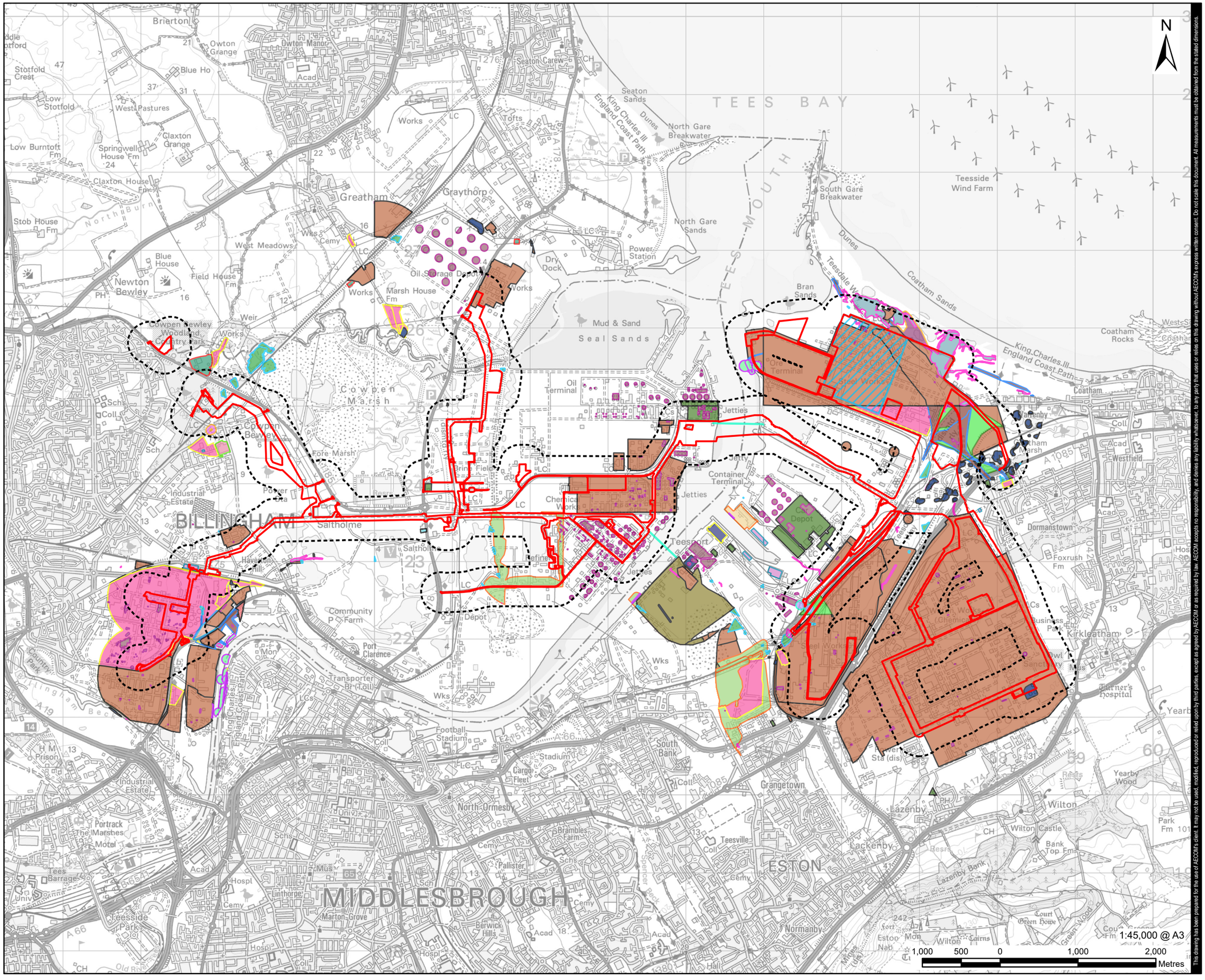

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Sewage Works
- Ship Building Works
- Ship Building Yard
- Slag Brick Works
- Slag Reduction Works
- Slag Wool Works
- Slag Works
- Slag and Tar Macadam Works
- Smithy
- Steel Works
- Telephone Exchange
- Terminal
- Tramway Sidings
- Transit Shed
- Tunnel
- Unspecified Commercial/Industrial
- Unspecified Depot
- Unspecified Disused Works
- Unspecified Factory
- Unspecified Foundry
- Unspecified Ground Workings
- Unspecified Heaps
- Unspecified Mill
- Unspecified Pits
- Unspecified Tanks
- Unspecified Warehouses
- Unspecified Wharf
- Uspecified Workings
- Wire Mills

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Historical Industrial Land Uses (Polygons)

FIGURE NUMBER

Figure 10-8c

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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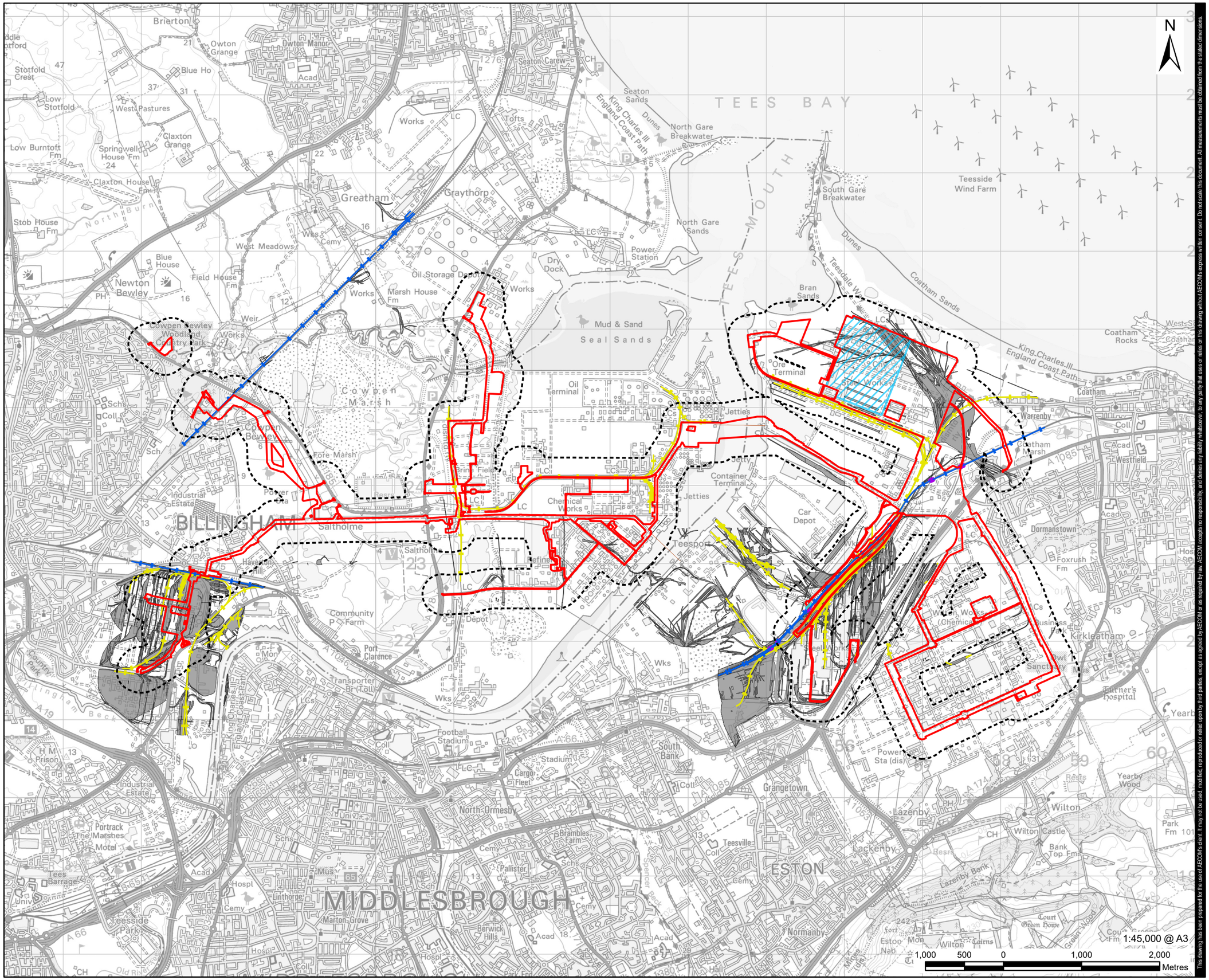

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Railway Track
- Railway Tunnels
- Historical Railways
- Historical Tunnel Features
- Historical Railway Features

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Historical Industrial Land Use - Railway Features

FIGURE NUMBER

Figure 10-8d

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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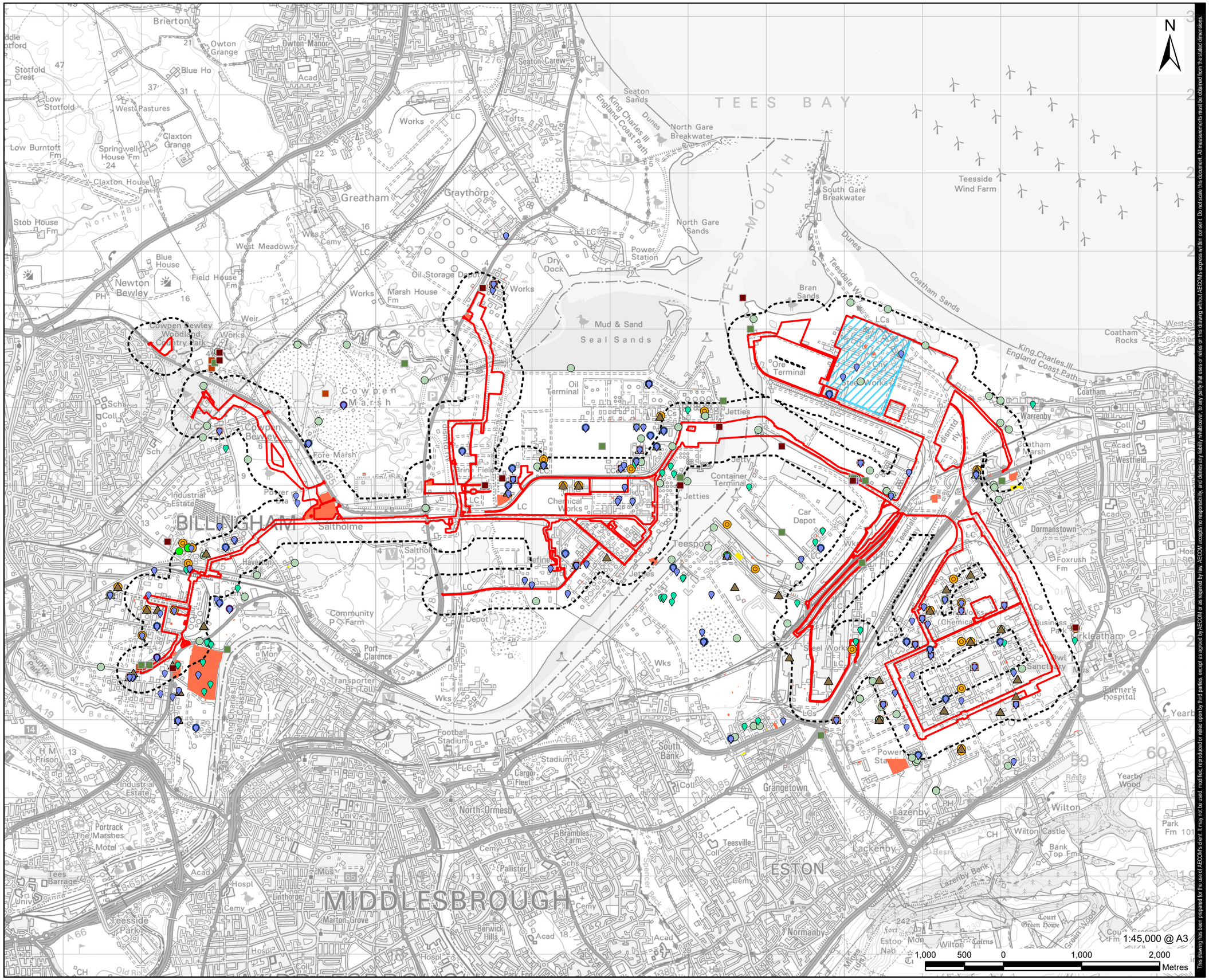

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Licensed Industrial Activities PartA1
- Licensed Pollutant Release PartA2 B
- List 1 Dangerous Substances
- List 2 Dangerous Substances
- Pollutant Release to Public Sewer
- Pollutant Release To Surface Waters Red List
- Pollution Incidents
- Pollution Inventory Radioactive
- Pollution Inventory Substances
- Pollution Inventory Waste Transfer
- Radioactive Substance Authorisations
- Historical Licensed Industrial Activities
- Historical Energy Features
- Historical Garages

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Historical Industrial Land Use - Other Features

FIGURE NUMBER

Figure 10-8e

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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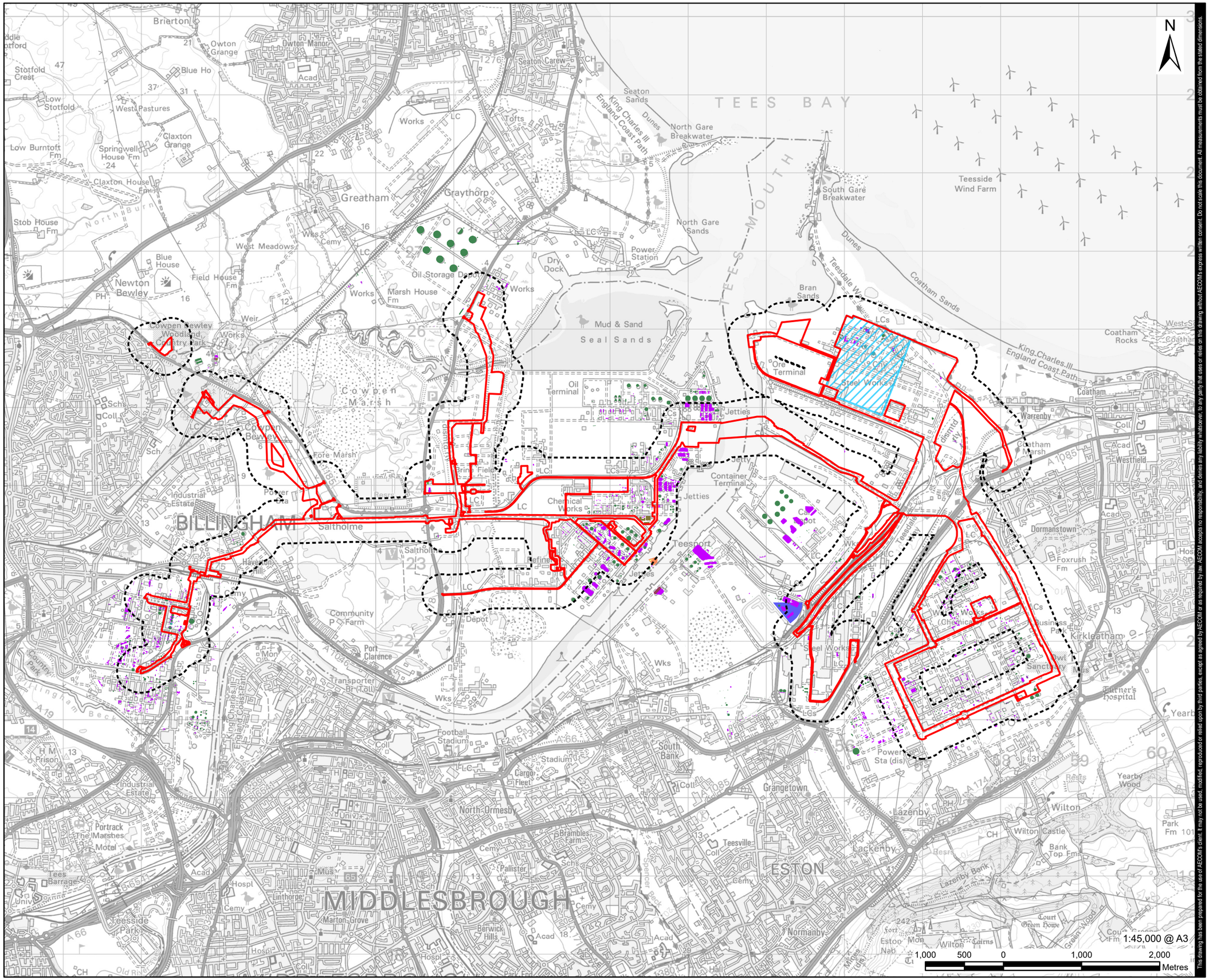

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Historical Tank

- Cooling Tank
- Gas Holder Station
- Gas Works
- Gas Holder
- Gasometer
- Oil Tank
- Oxygen Tank
- Settling Tank
- Tank Farm
- Tanks
- Unspecified Tank

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Historical Tanks

FIGURE NUMBER

Figure 10-9

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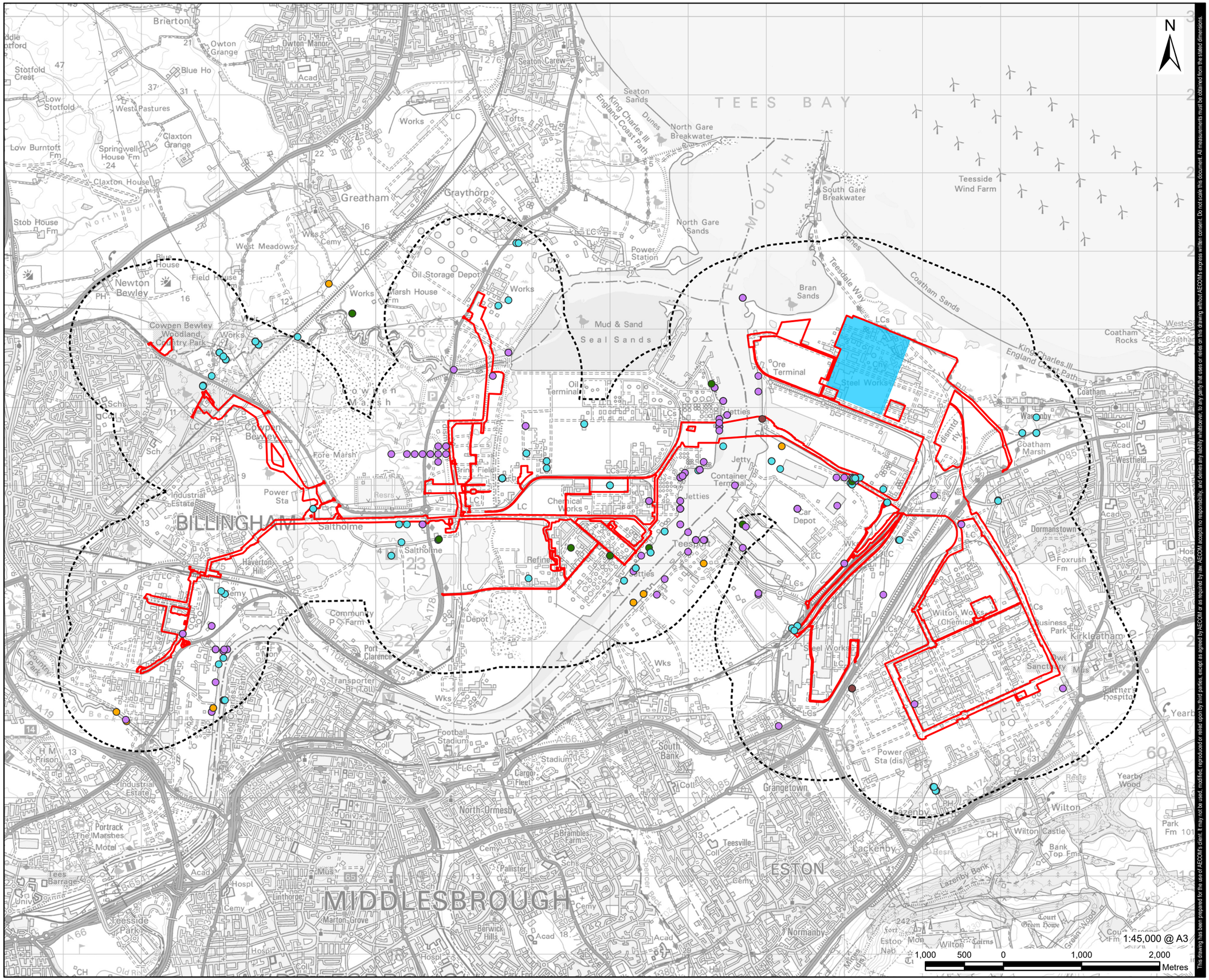

1:45,000 @ A3

1,000 500 0 1,000 2,000 Metres

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www.aecom.com

LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site

Licensed Discharges To Controlled Waters

- Miscellaneous Discharge
- Sewage and Trade Discharge
- Sewage Discharge
- Trade Discharge
- Unspecified Discharge

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Discharge Consents

FIGURE NUMBER

Figure 10-11

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15

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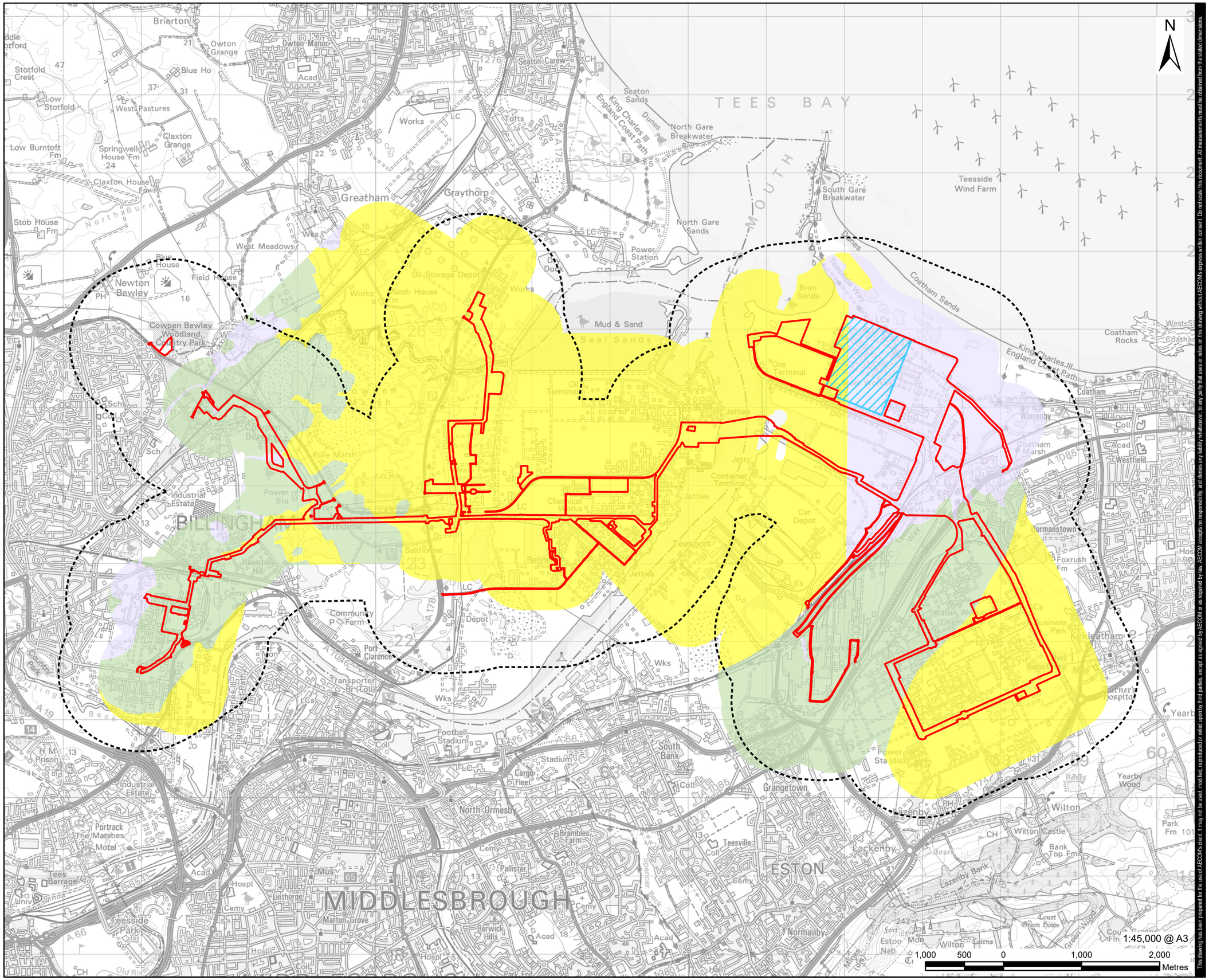

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

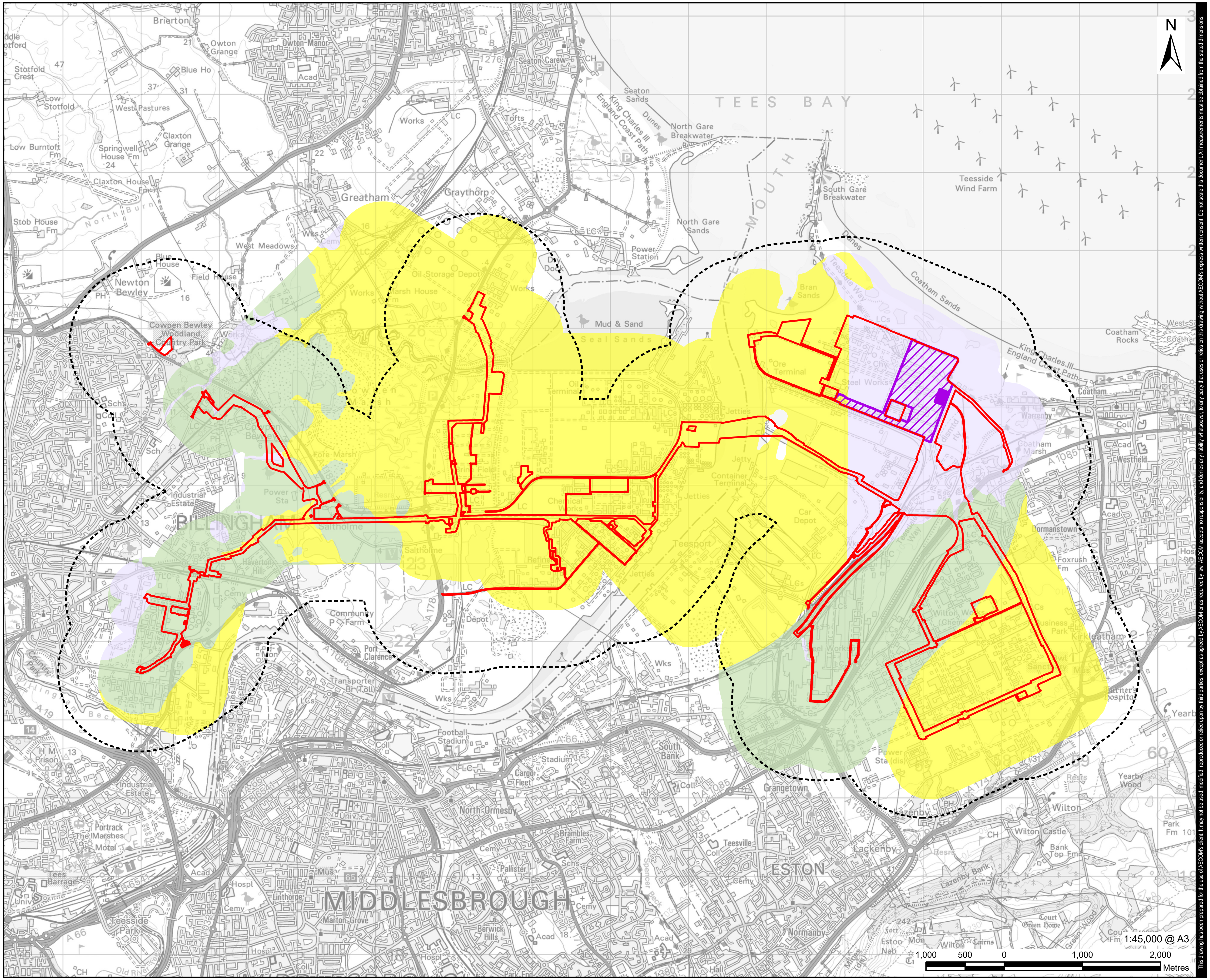
FIGURE TITLE

Superficial Aquifers - Main Site

FIGURE NUMBER

Figure 10-12a

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15



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H2 Teesside Limited

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Carbon Dioxide Export Pipeline & High-Pressure Compression Station

- Carbon Dioxide - Export Pipeline
- Carbon Dioxide - Above Ground Installation

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Superficial Aquifers - Carbon Dioxide Export Pipeline and High-Pressure Compression Station

FIGURE NUMBER

Figure 10-12b

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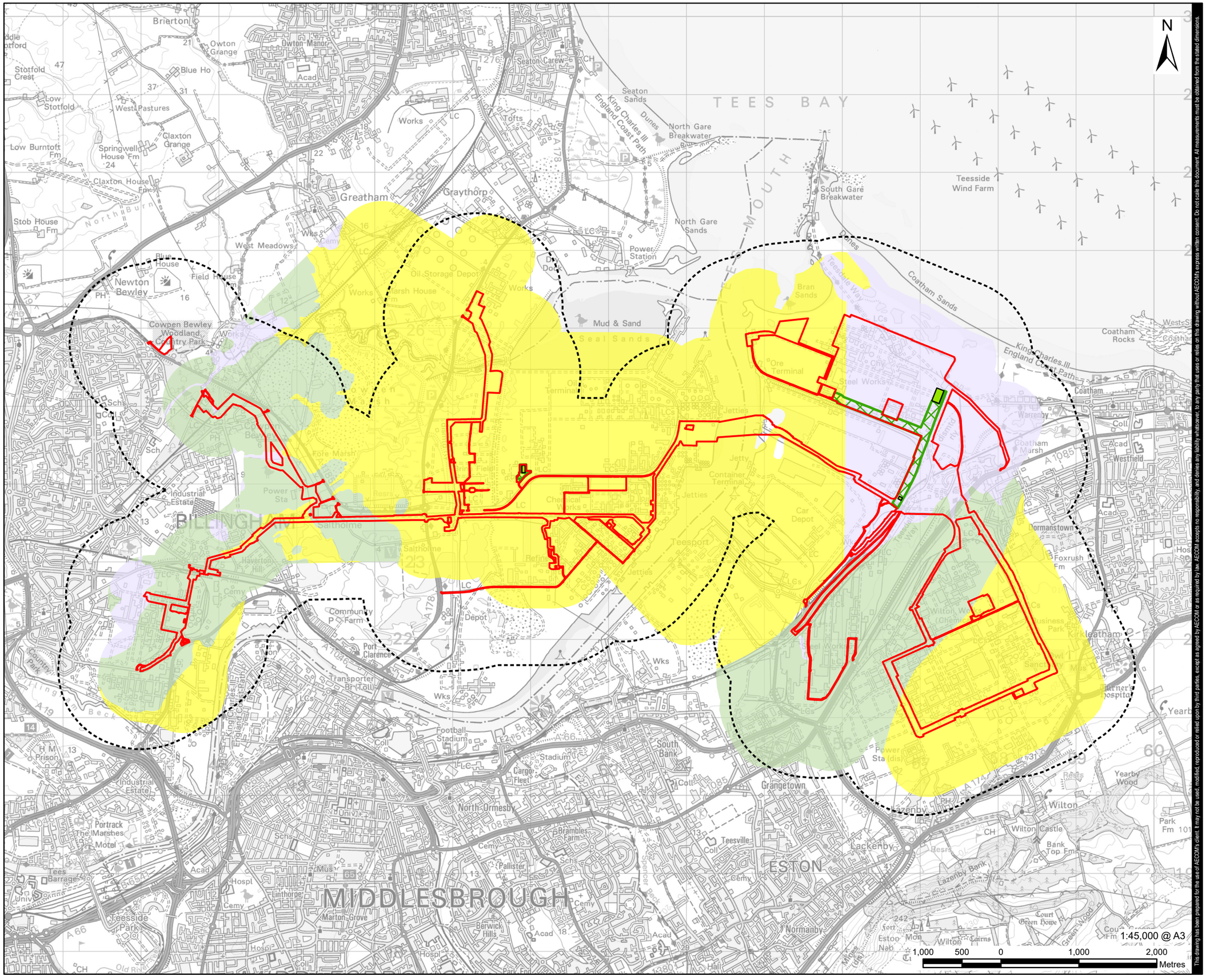

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Natural Gas Connection Works

- Natural Gas Connection - Underground High Pressure Gas Pipeline
- Natural Gas Connection - Above Ground Installation

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Superficial Aquifers - Natural Gas Connection Works

FIGURE NUMBER

Figure 10-12c

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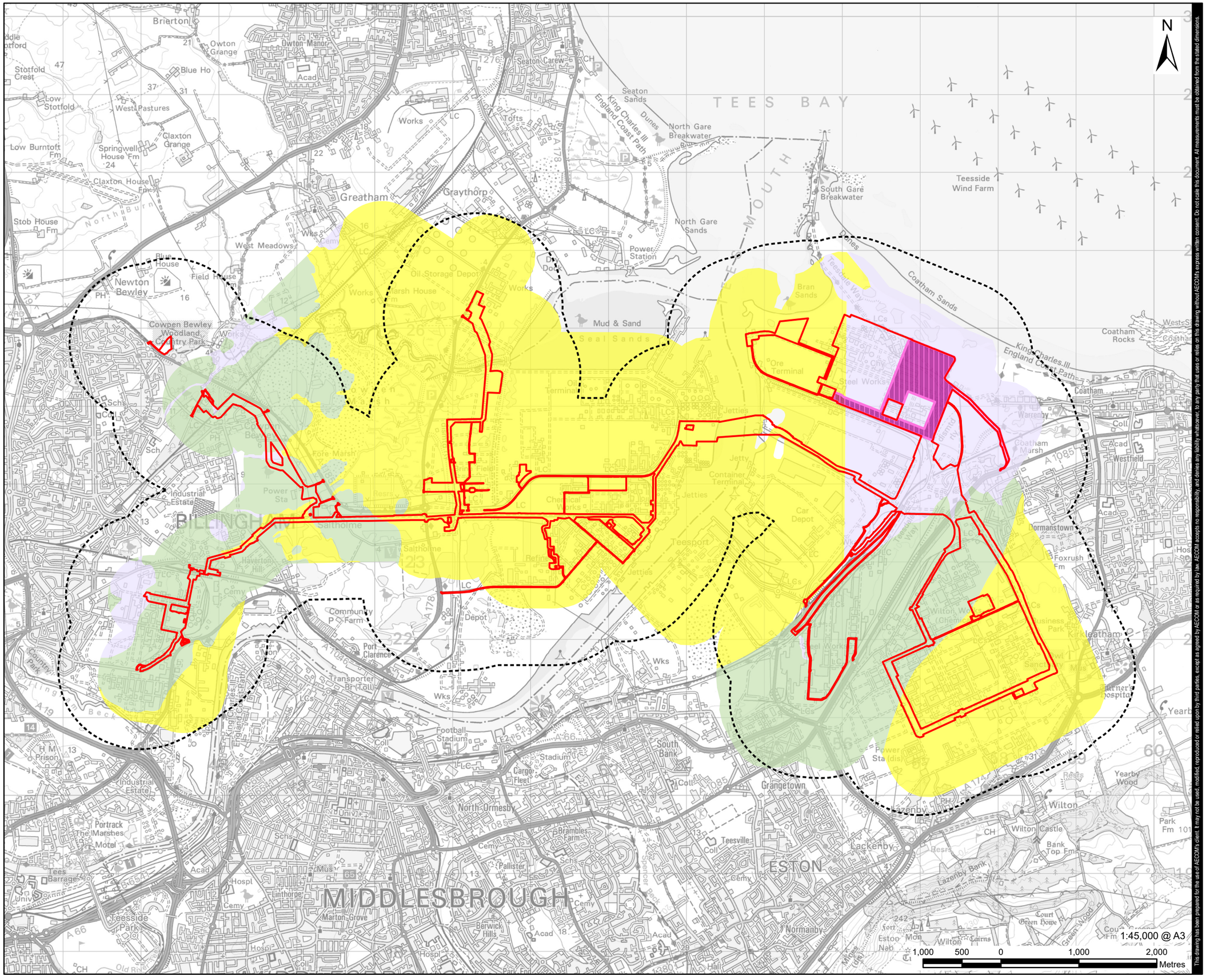

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Water Supply Connection Works

- Water Supply Connection Works
- Wastewater Disposal Works

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

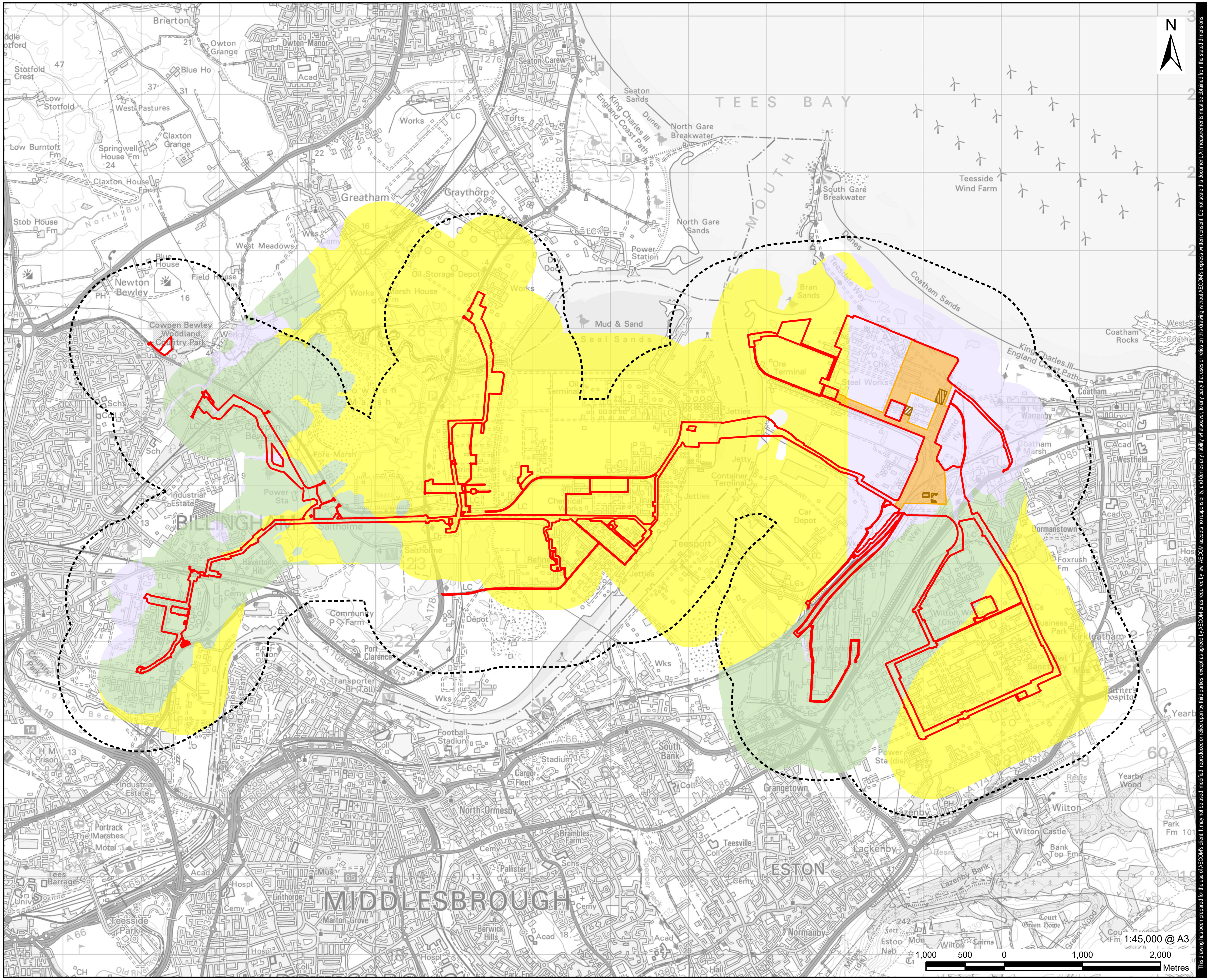
60689030

FIGURE TITLE

Superficial Aquifers - Water and Wastewater Connection Works

FIGURE NUMBER

Figure 10-12d



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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Electrical Connection Works

- Electrical Connection Works
- Above Ground Installation Connecting Work No. 3A to Pellet-Sinter Substation
- Above Ground Installation Connecting Work No. 3A to Tod Point Substation
- Above Ground Installation Connecting Work No. 3A to a New Substation

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Superficial Aquifers - Electrical Connection Works

FIGURE NUMBER

Figure 10-12e

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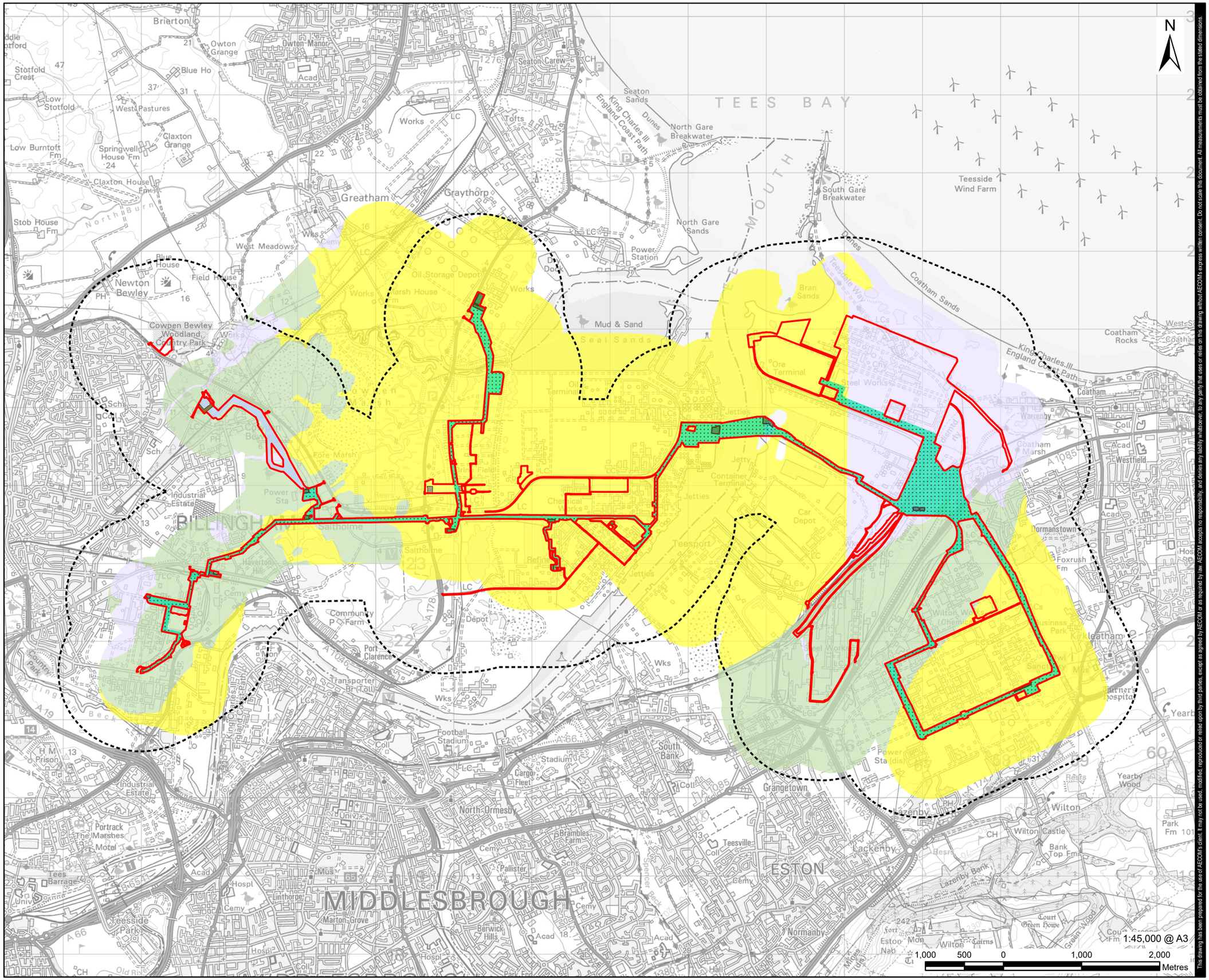

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Hydrogen Distribution Network

- Overground and Underground Pipelines
- Overground and Underground Pipelines to connect to Work No. 6B.2
- Overground and Underground Pipelines to connect to Work No. 6B.3
- Above Ground Installations
- Above Ground Installation at Cowpen Bewley
- Above Ground Installation at Saltholme Brinefields

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Superficial Aquifers - Hydrogen Distribution Network

FIGURE NUMBER

Figure 10-12f

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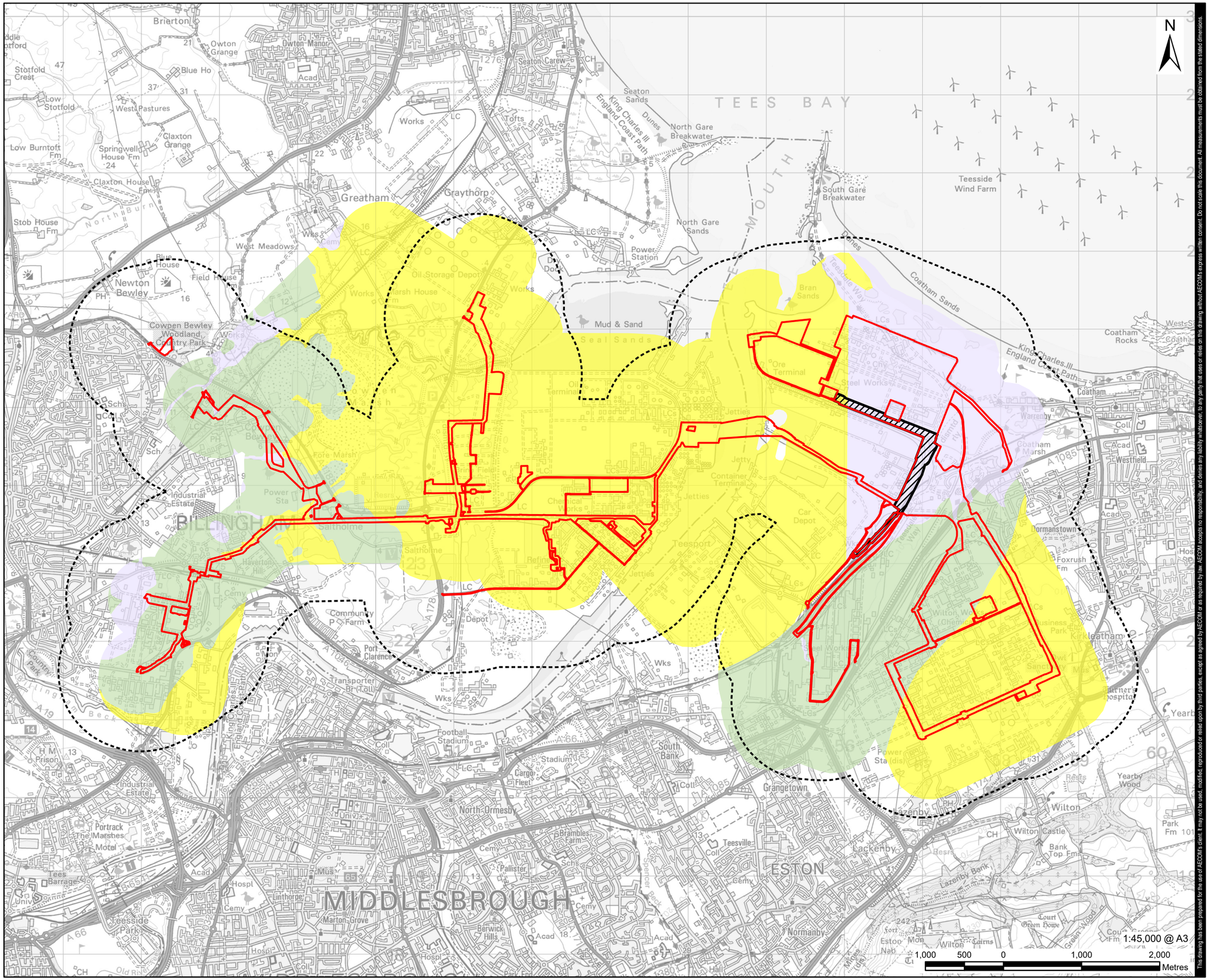

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H2 Teesside Limited

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Manchester, M3 7FB
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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Oxygen and Nitrogen Gas Connections

Superficial Aquifer

- Superficial Aquifer - Secondary A
- Superficial Aquifer - Undifferentiated
- Superficial Aquifer - Unproductive

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Superficial Aquifers - Oxygen and Nitrogen Gas Connections

FIGURE NUMBER

Figure 10-12g

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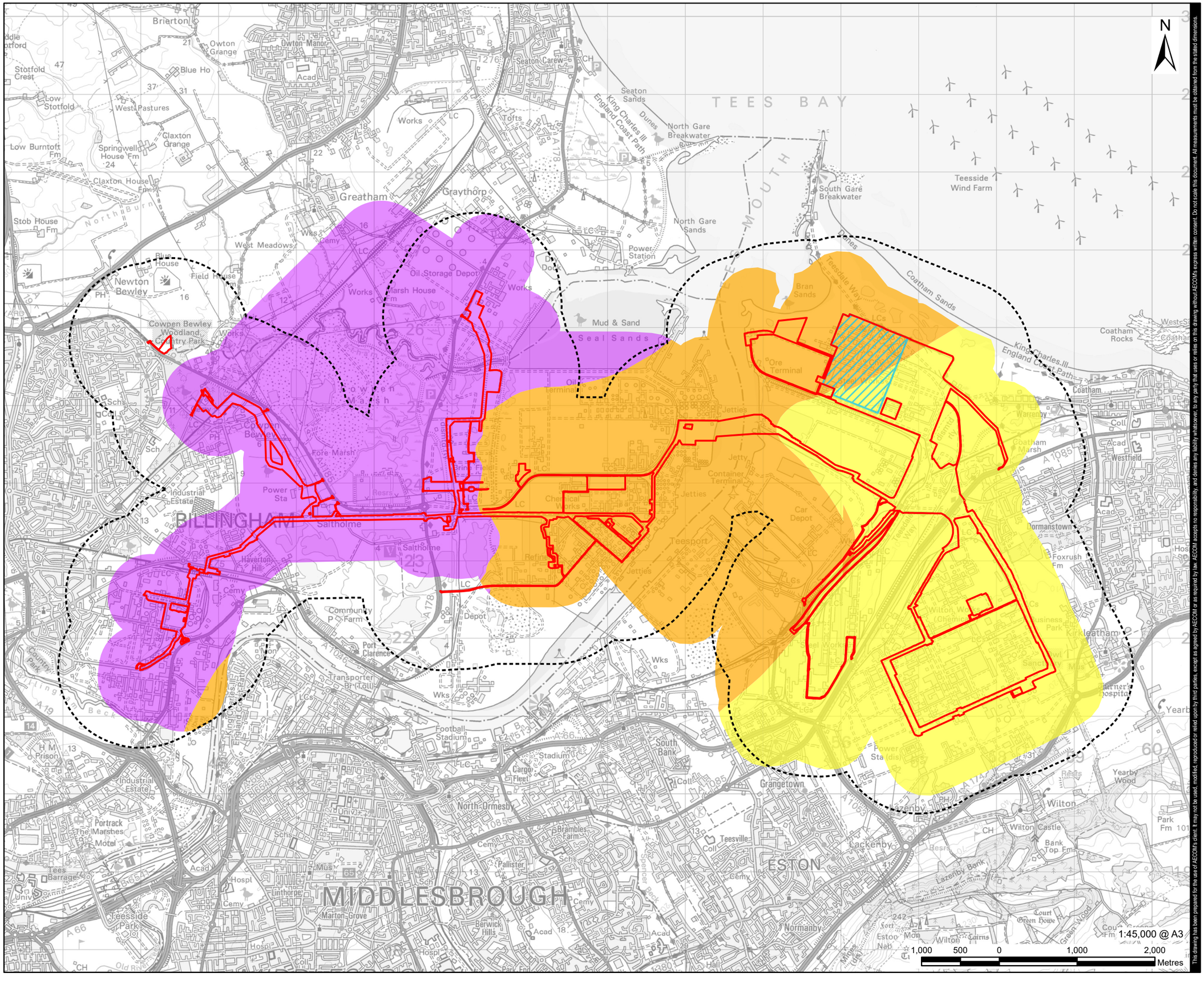

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - Undifferentiated
- Secondary Aquifer - B

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Aquifers - Main Site

FIGURE NUMBER

Figure 10-13a

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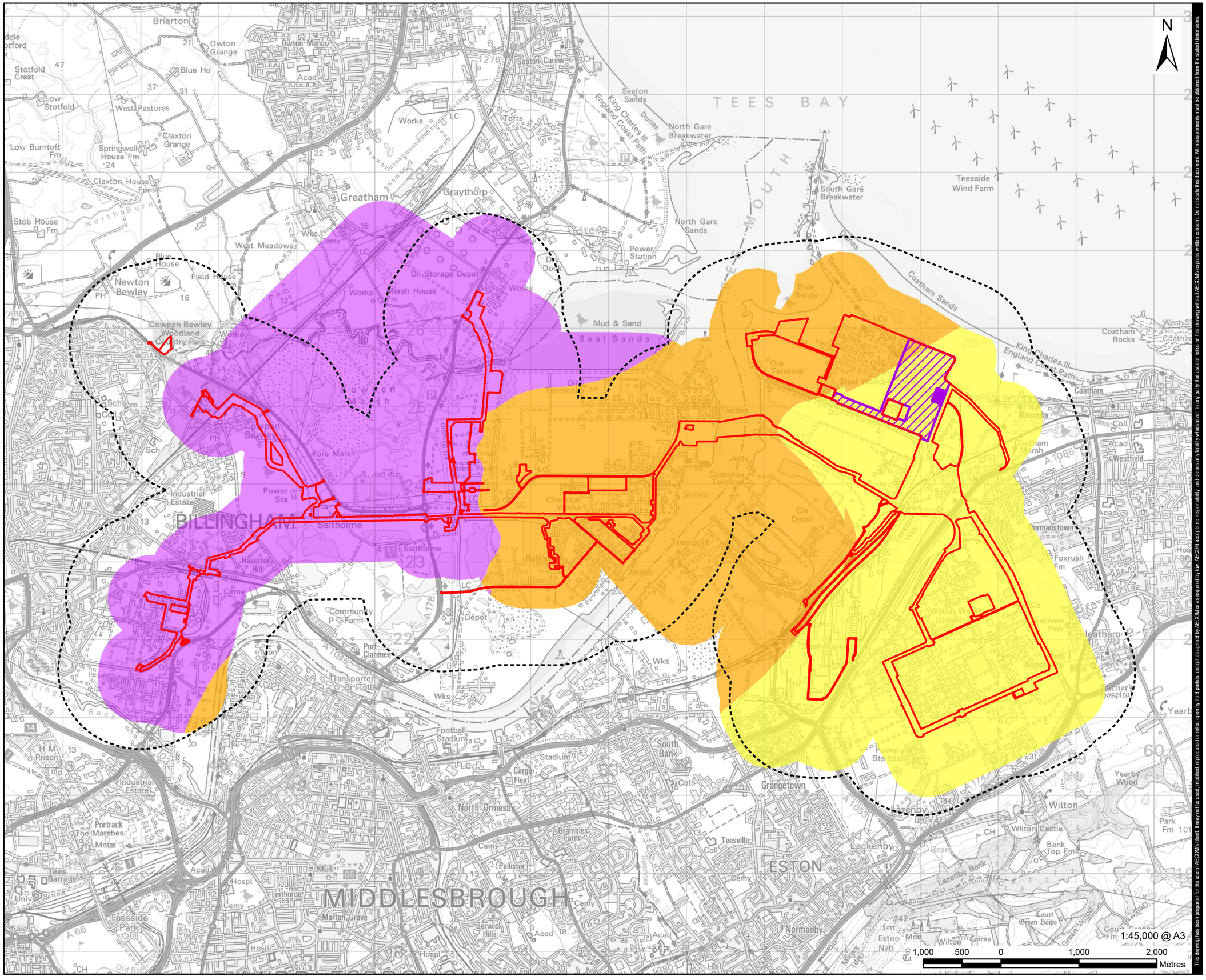

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Carbon Dioxide Export Pipeline & High-Pressure Compression Station

- Carbon Dioxide - Export Pipeline
- Carbon Dioxide - Above Ground Installation

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - B
- Secondary Aquifer - Undifferentiated

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Aquifers - Carbon Dioxide Export Pipeline and High-Pressure Compression Station

FIGURE NUMBER

Figure 10-13b

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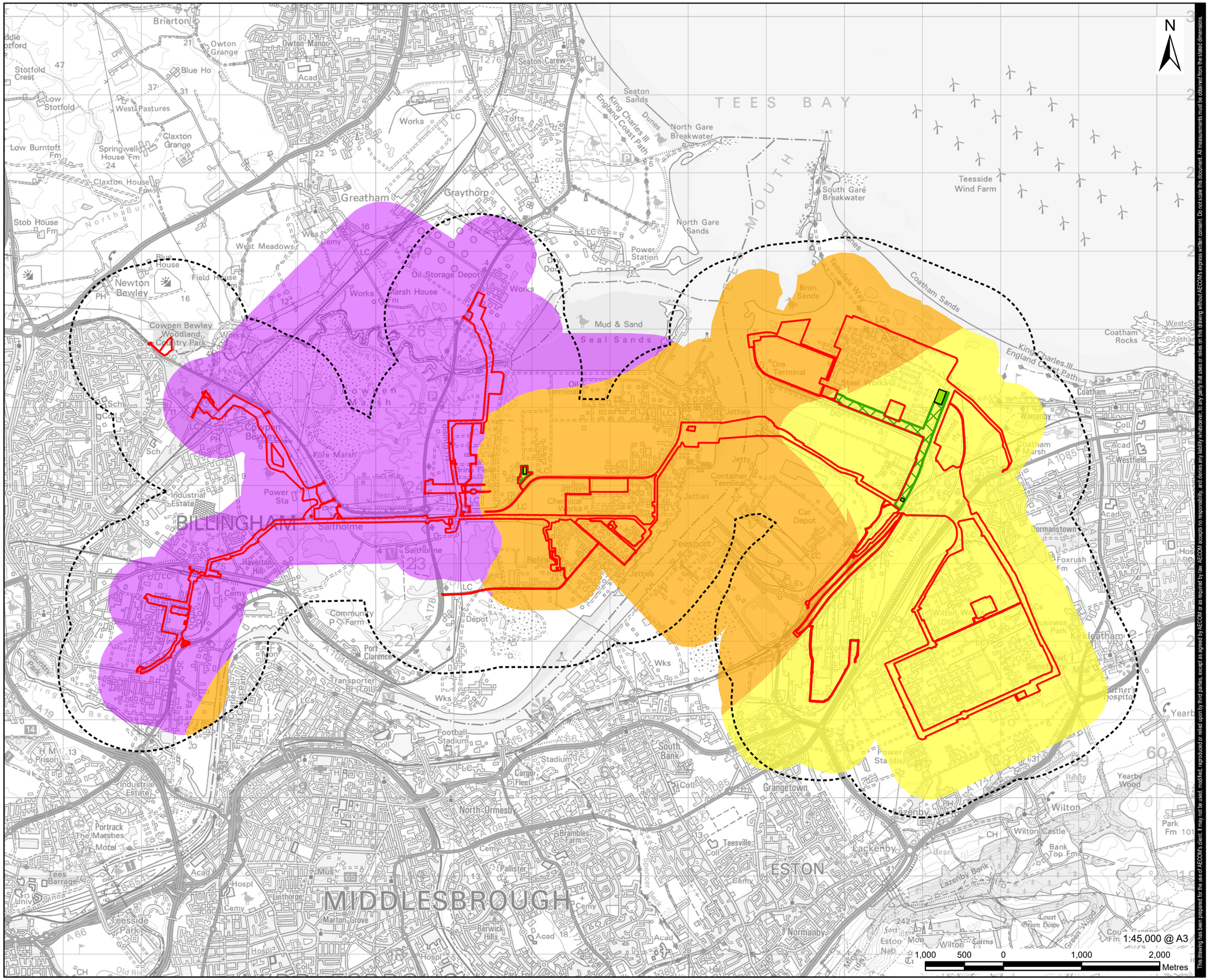

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Natural Gas Connection Works

- Natural Gas Connection - Underground High Pressure Gas Pipeline
- Natural Gas Connection - Above Ground Installation

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - B
- Secondary Aquifer - Undifferentiated

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Aquifers - Natural Gas Connection Works

FIGURE NUMBER

Figure 10-13c

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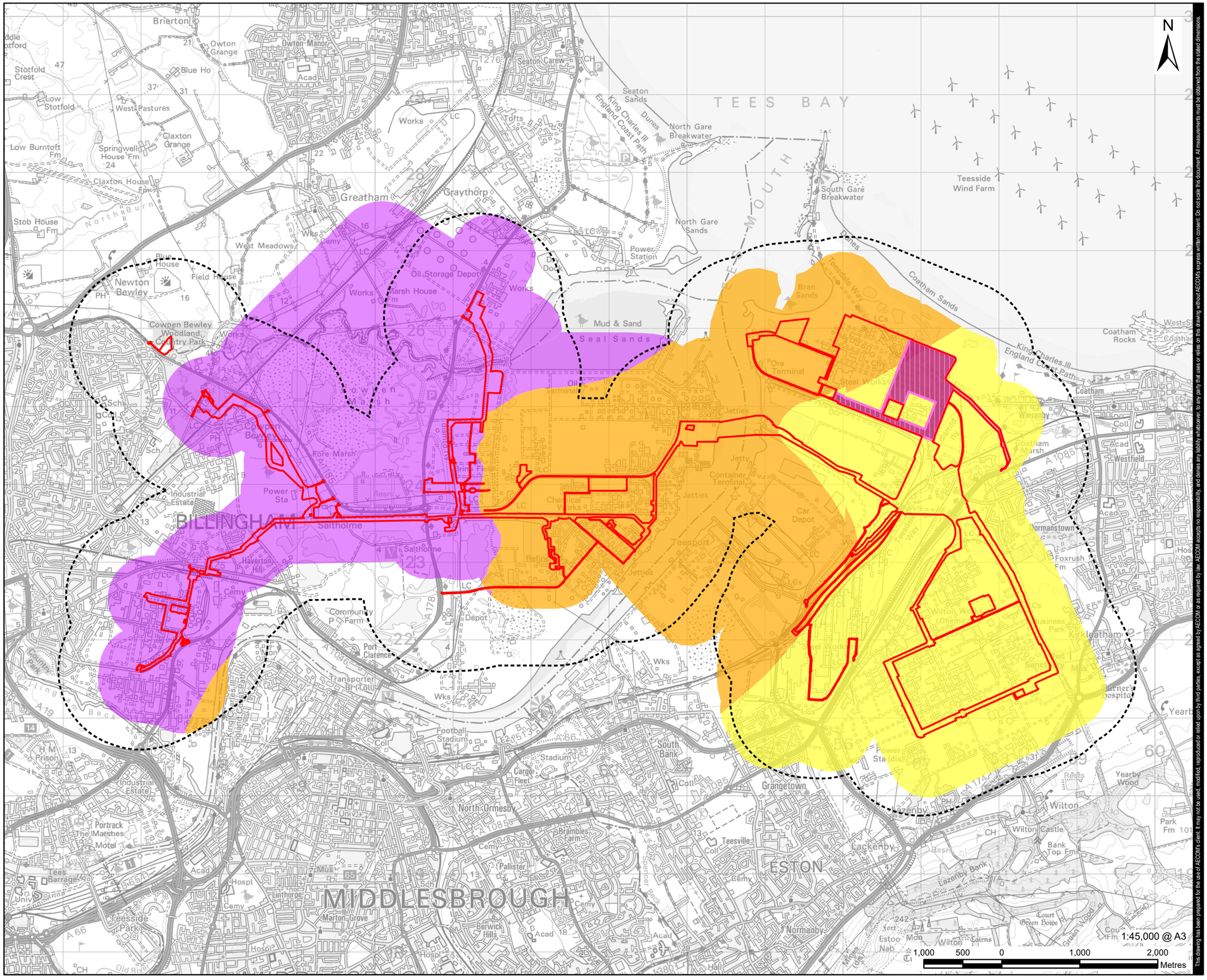

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Water Supply Connection Works

- Water Supply Connection Works
- Wastewater Disposal Works

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - B
- Secondary Aquifer - Undifferentiated

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Aquifers - Water and Wastewater Connection Works

FIGURE NUMBER

Figure 10-13d

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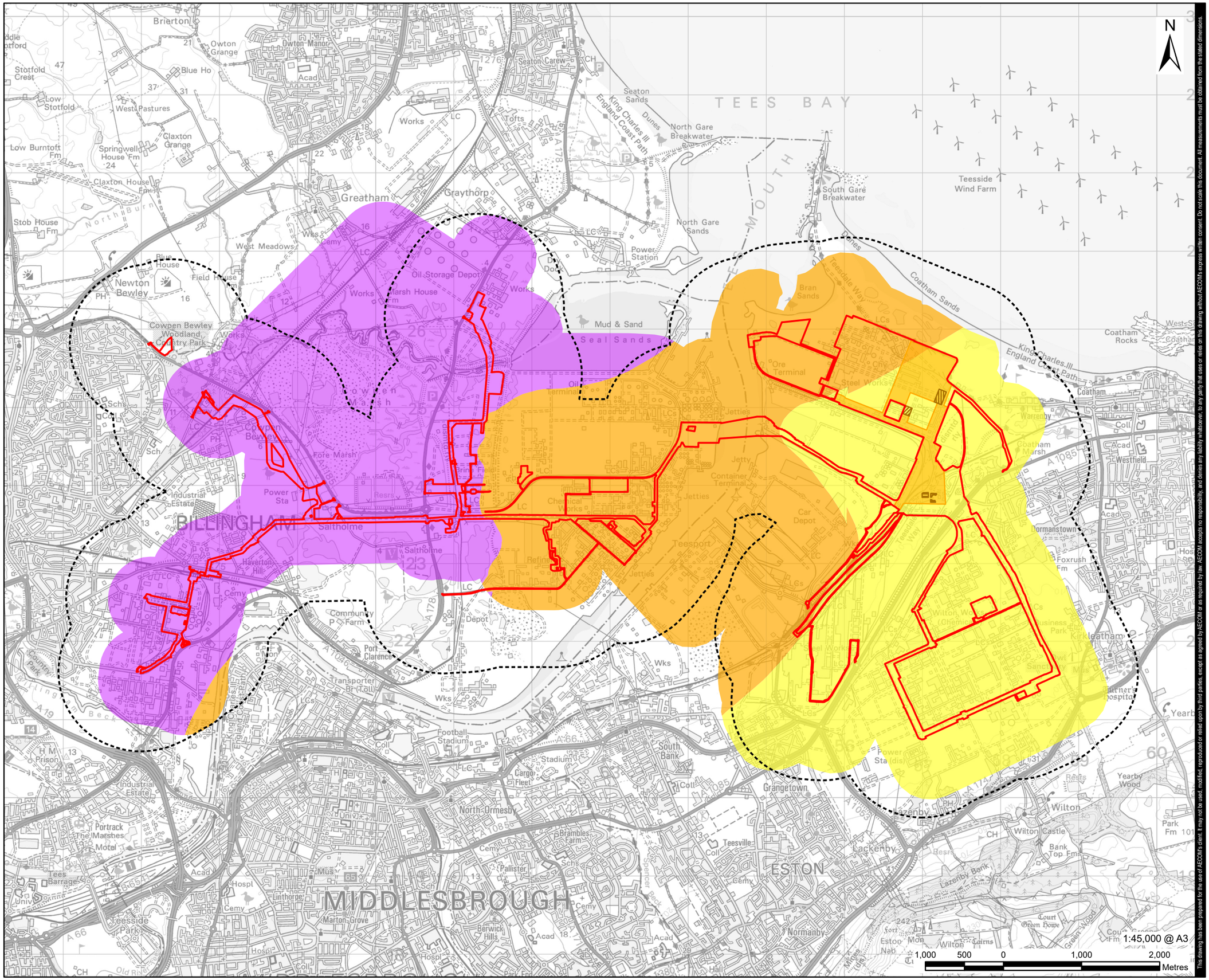

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Electrical Connection Works

- Electrical Connection Works
- Above Ground Installation Connecting Work No. 3A to Pellet-Sinter Substation
- Above Ground Installation Connecting Work No. 3A to Tod Point Substation
- Above Ground Installation Connecting Work No. 3A to a New Substation

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - B
- Secondary Aquifer - Undifferentiated

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Aquifers - Electrical Connection Works

FIGURE NUMBER

Figure 10-13e

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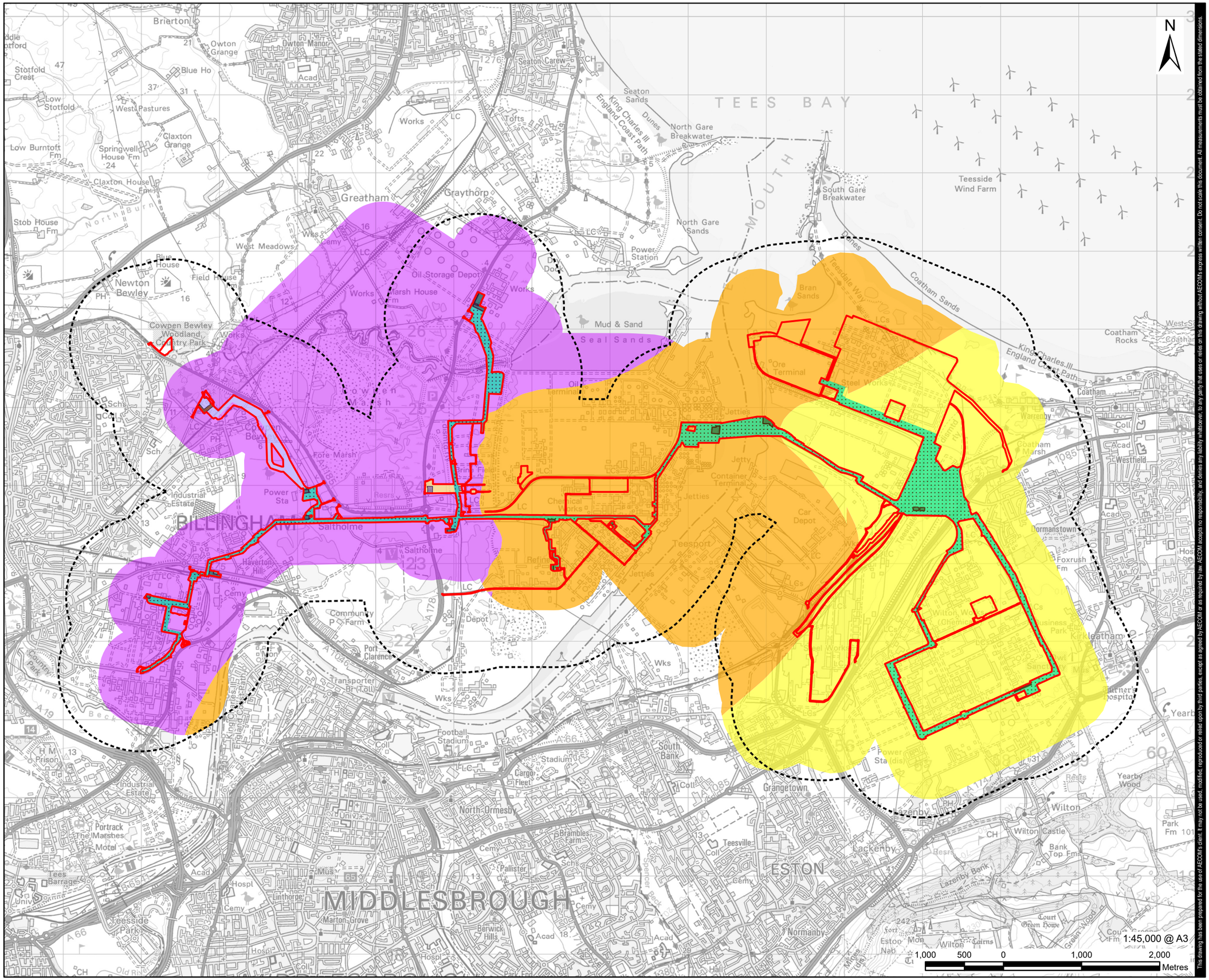

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Hydrogen Distribution Network

- Overground and Underground Pipelines
- Overground and Underground Pipelines to connect to Work No. 6B.2
- Overground and Underground Pipelines to connect to Work No. 6B.3
- Above Ground Installations
- Above Ground Installation at Cowpen Bewley
- Above Ground Installation at Saltholme Brinefields

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - B
- Secondary Aquifer - Undifferentiated

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

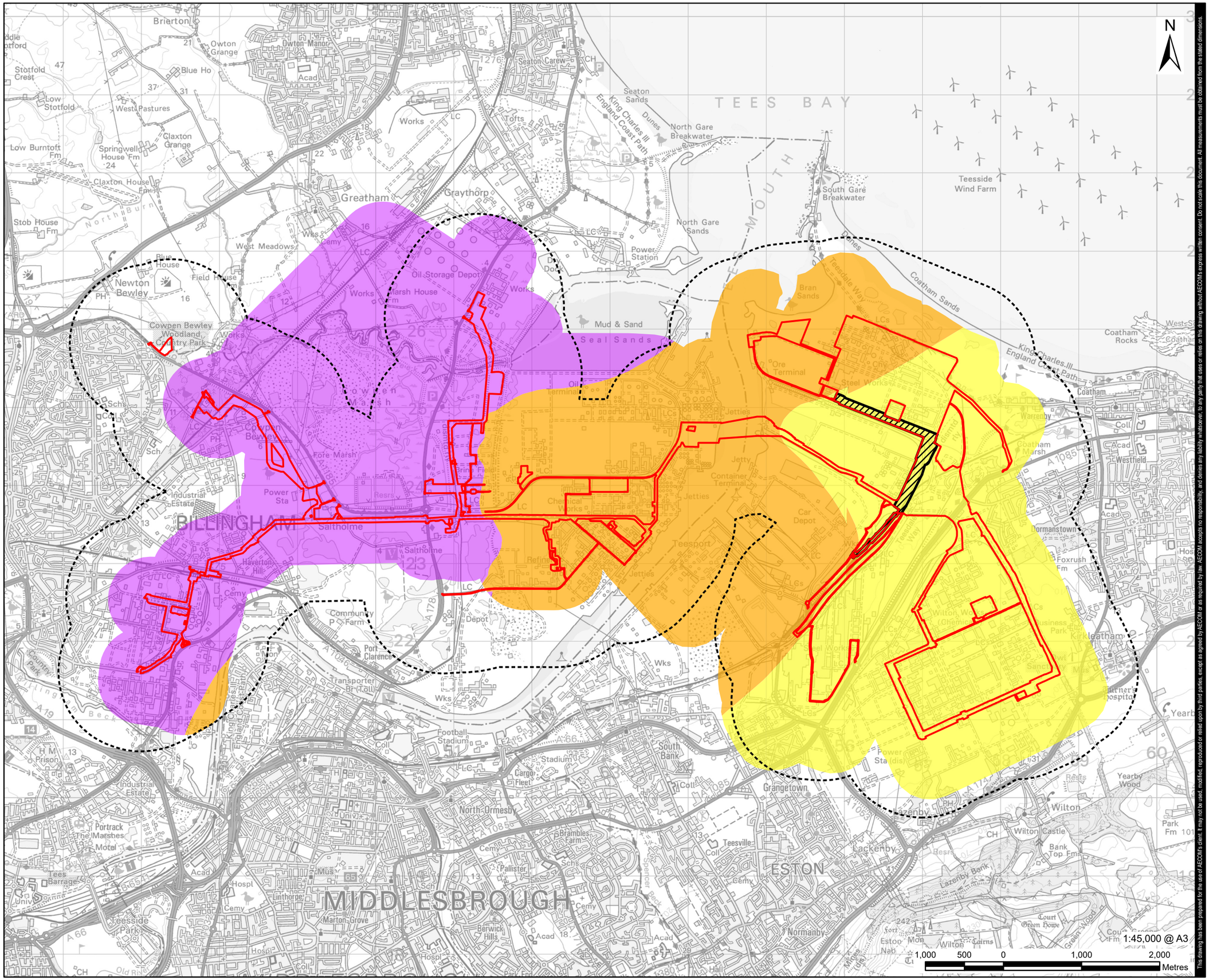
60689030

FIGURE TITLE

Bedrock Aquifers - Hydrogen Distribution Network

FIGURE NUMBER

Figure 10-13f



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1,000 500 0 1,000 2,000 Metres

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Oxygen and Nitrogen Gas Connections

Bedrock Aquifer

- Principal Aquifer
- Secondary Aquifer - B
- Secondary Aquifer - Undifferentiated

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Bedrock Aquifers - Oxygen and Nitrogen Gas Connections

FIGURE NUMBER

Figure 10-13g

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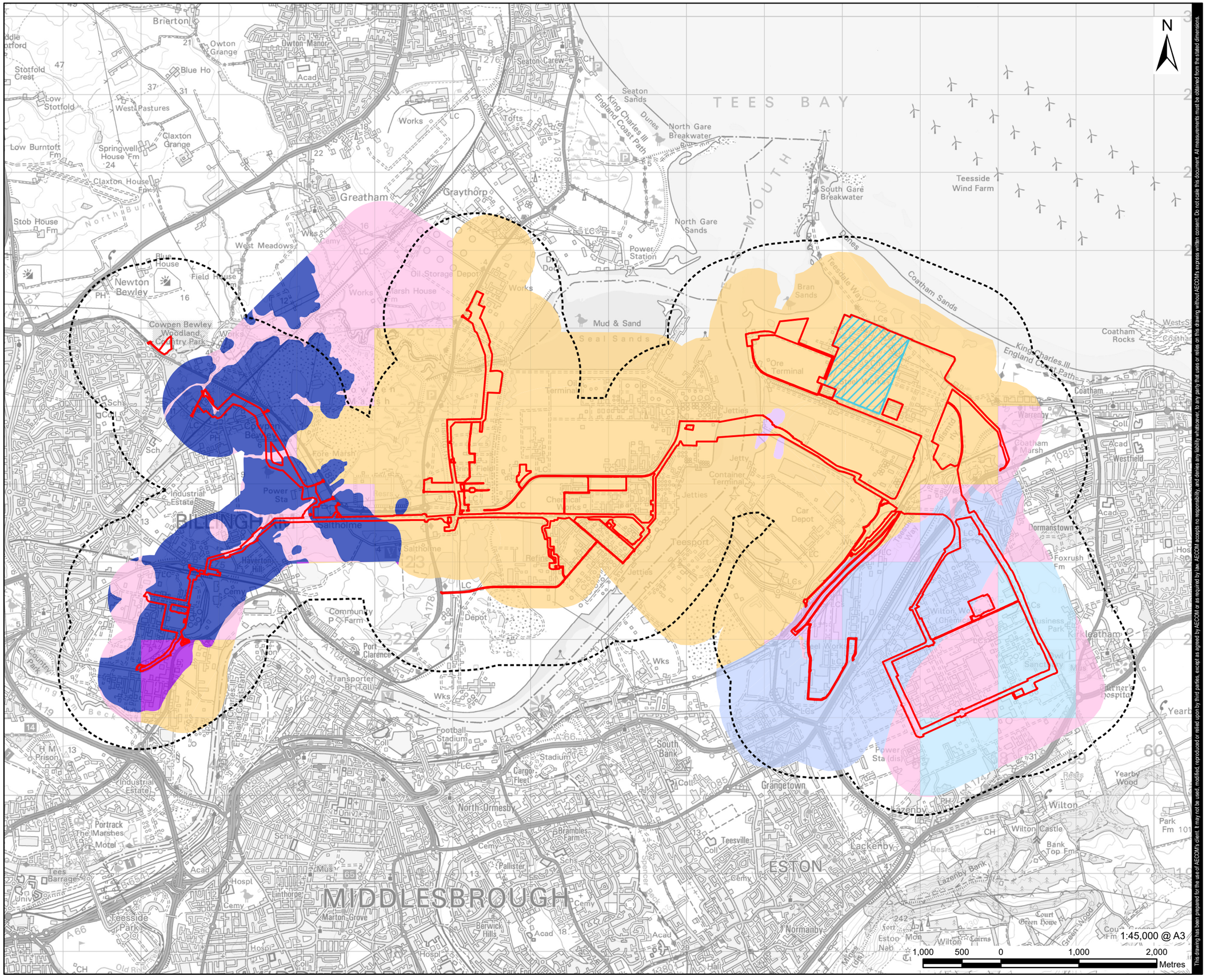

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

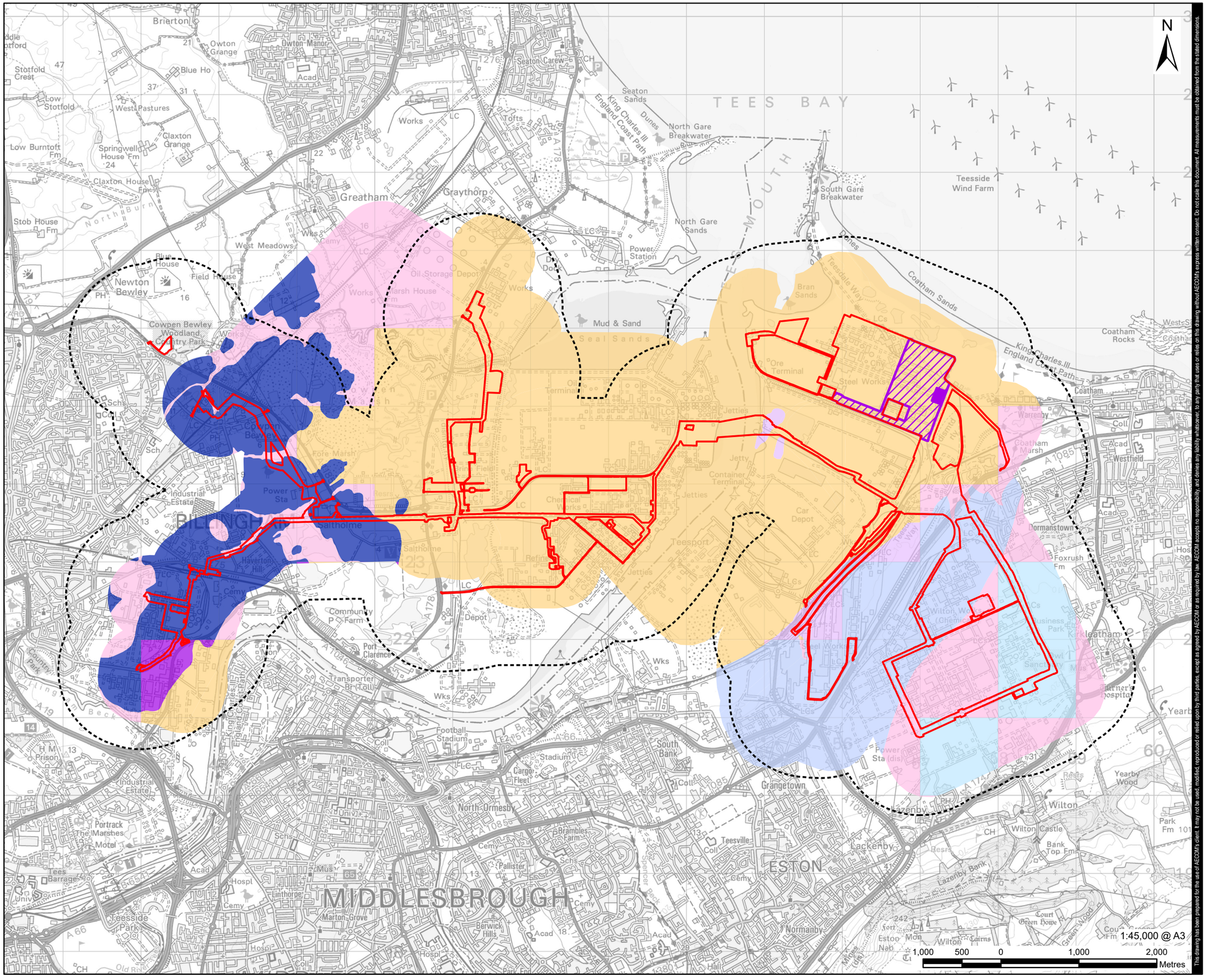
60689030

FIGURE TITLE

Groundwater Vulnerability - Main Site

FIGURE NUMBER

Figure 10-14a



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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Carbon Dioxide Export Pipeline & High-Pressure Compression Station

- Carbon Dioxide - Export Pipeline
- Carbon Dioxide - Above Ground Installation

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Vulnerability - Carbon Dioxide Export Pipeline and High-Pressure Compression Station

FIGURE NUMBER

Figure 10-14b

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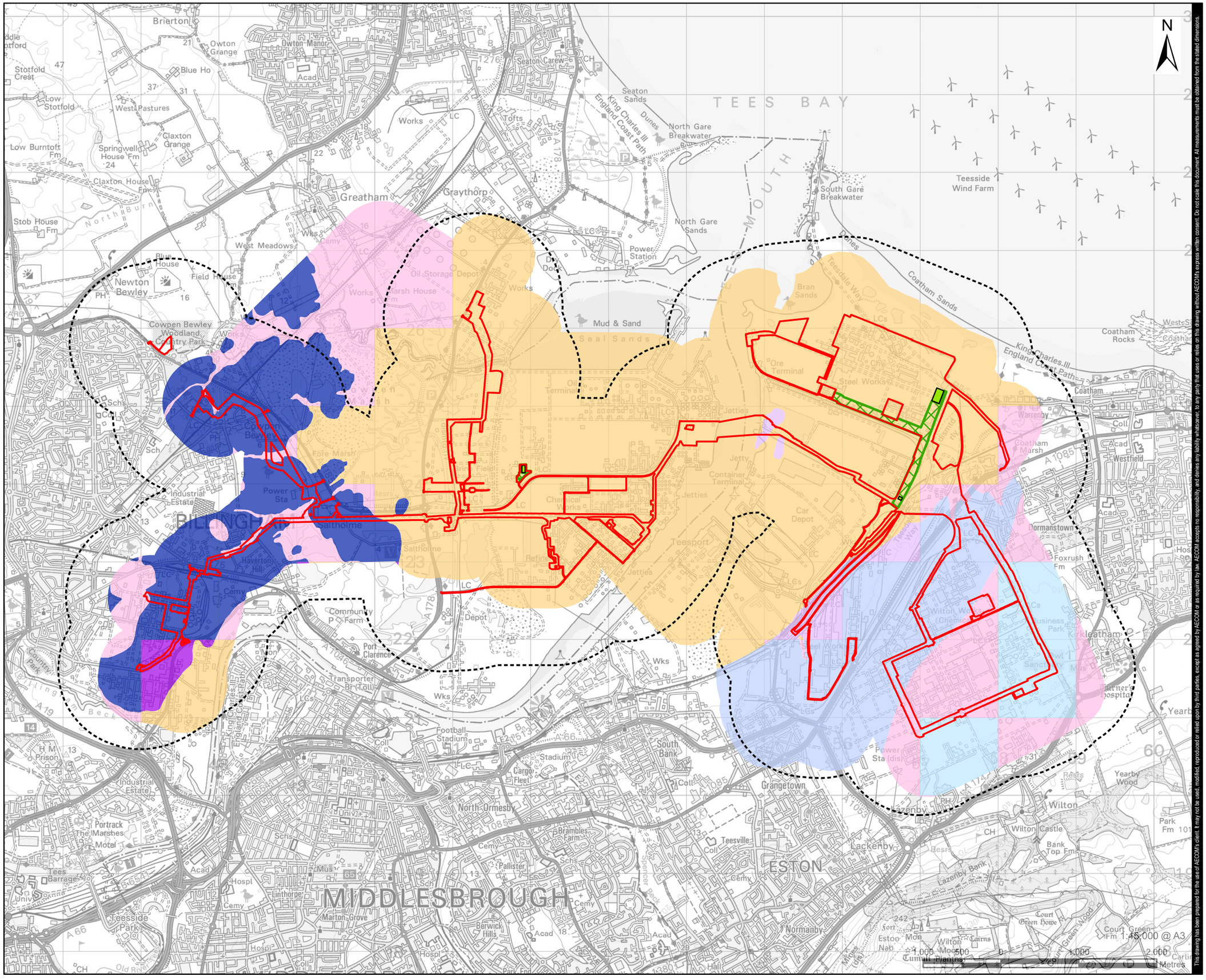

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Natural Gas Connection Works

- Natural Gas Connection - Underground High Pressure Gas Pipeline
- Natural Gas Connection - Above Ground Installation

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Vulnerability - Natural Gas Connection Works

FIGURE NUMBER

Figure 10-14c

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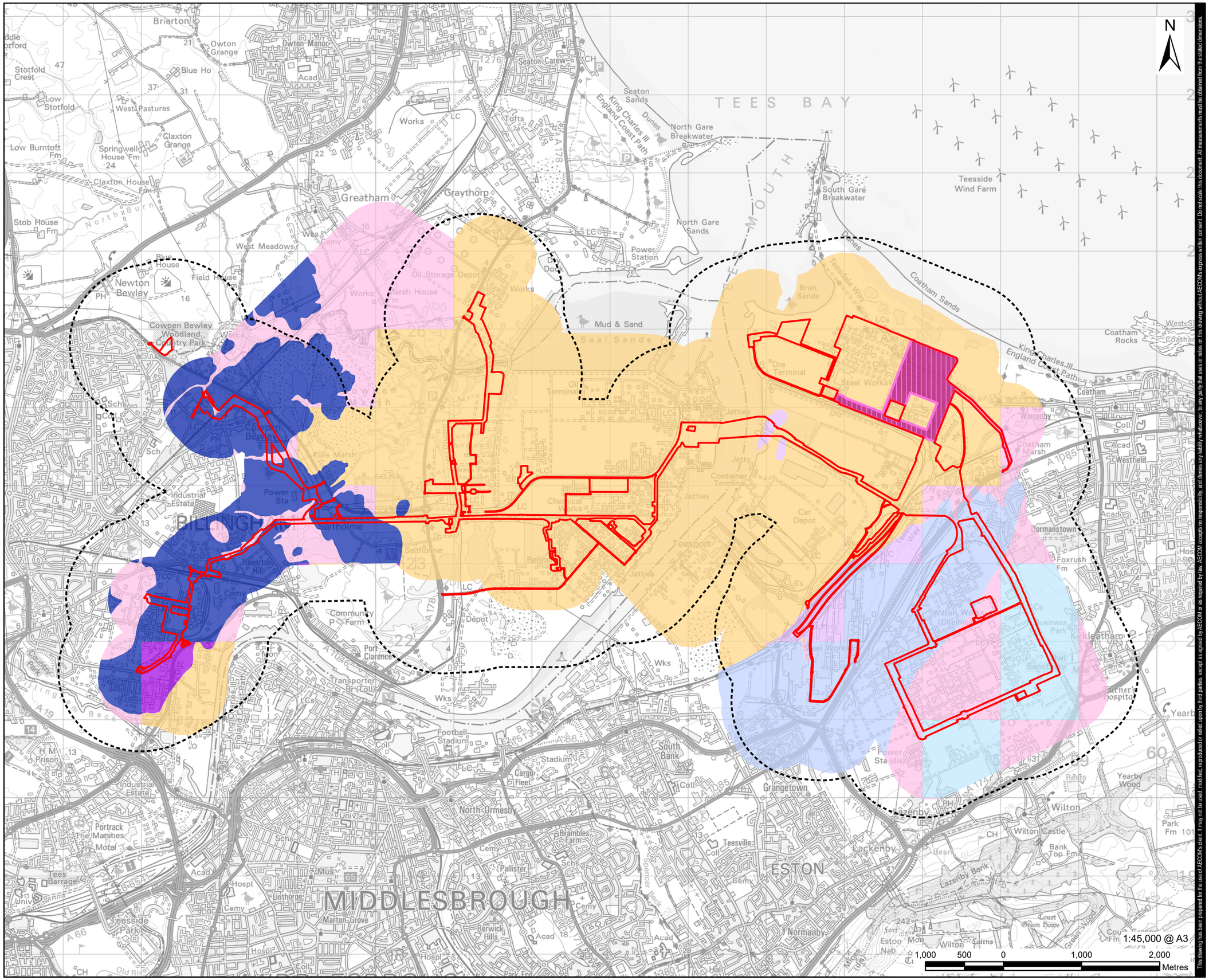

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Water Supply Connection Works

- Water Supply Connection Works
- Wastewater Disposal Works

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Vulnerability - Water and Wastewater Connection Works

FIGURE NUMBER

Figure 10-14d

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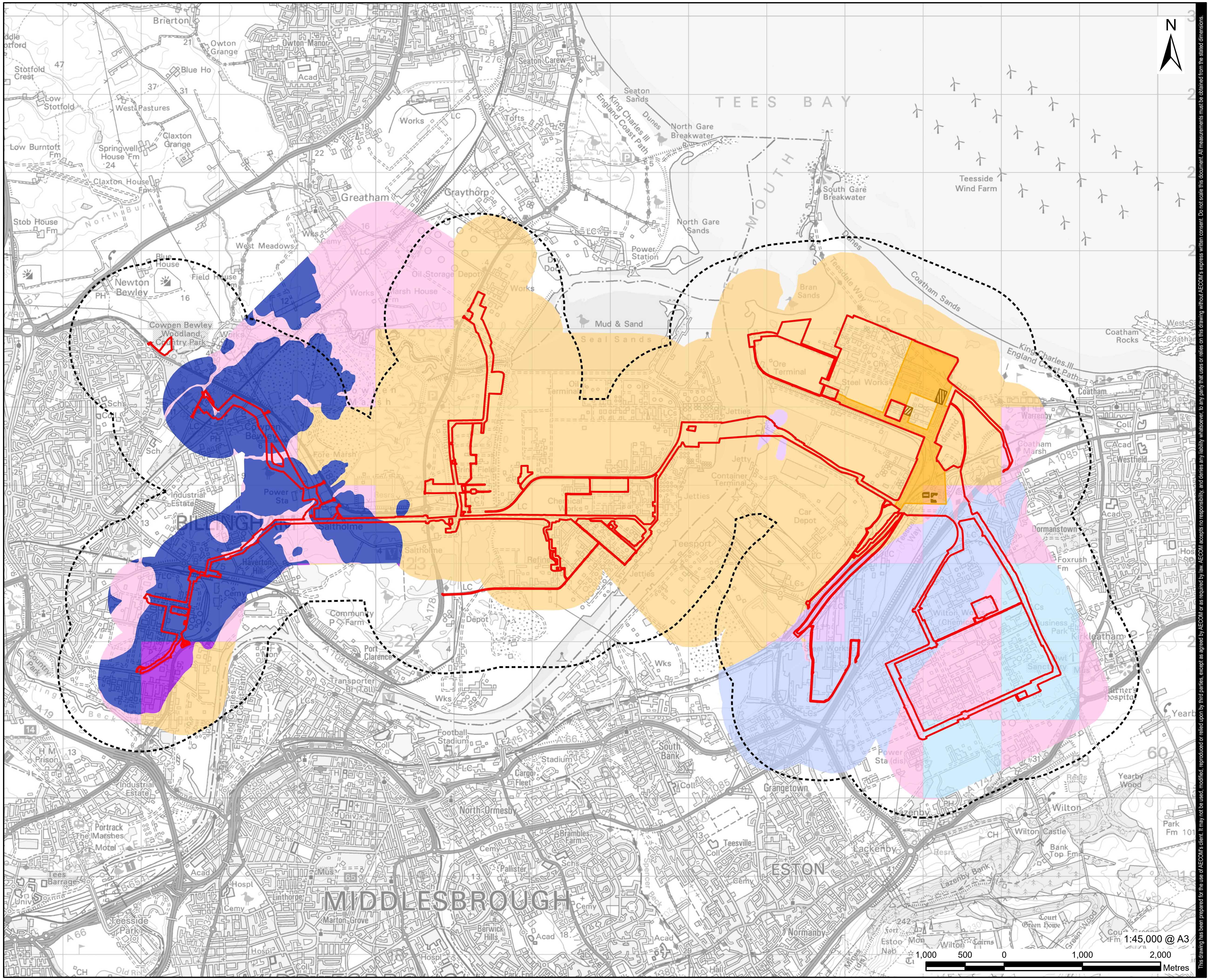

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Electrical Connection Works

- Electrical Connection Works
- Above Ground Installation Connecting Work No. 3A to Pellet-Sinter Substation
- Above Ground Installation Connecting Work No. 3A to Tod Point Substation
- Above Ground Installation Connecting Work No. 3A to a New Substation

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Vulnerability - Electrical Connection Works

FIGURE NUMBER

Figure 10-14e

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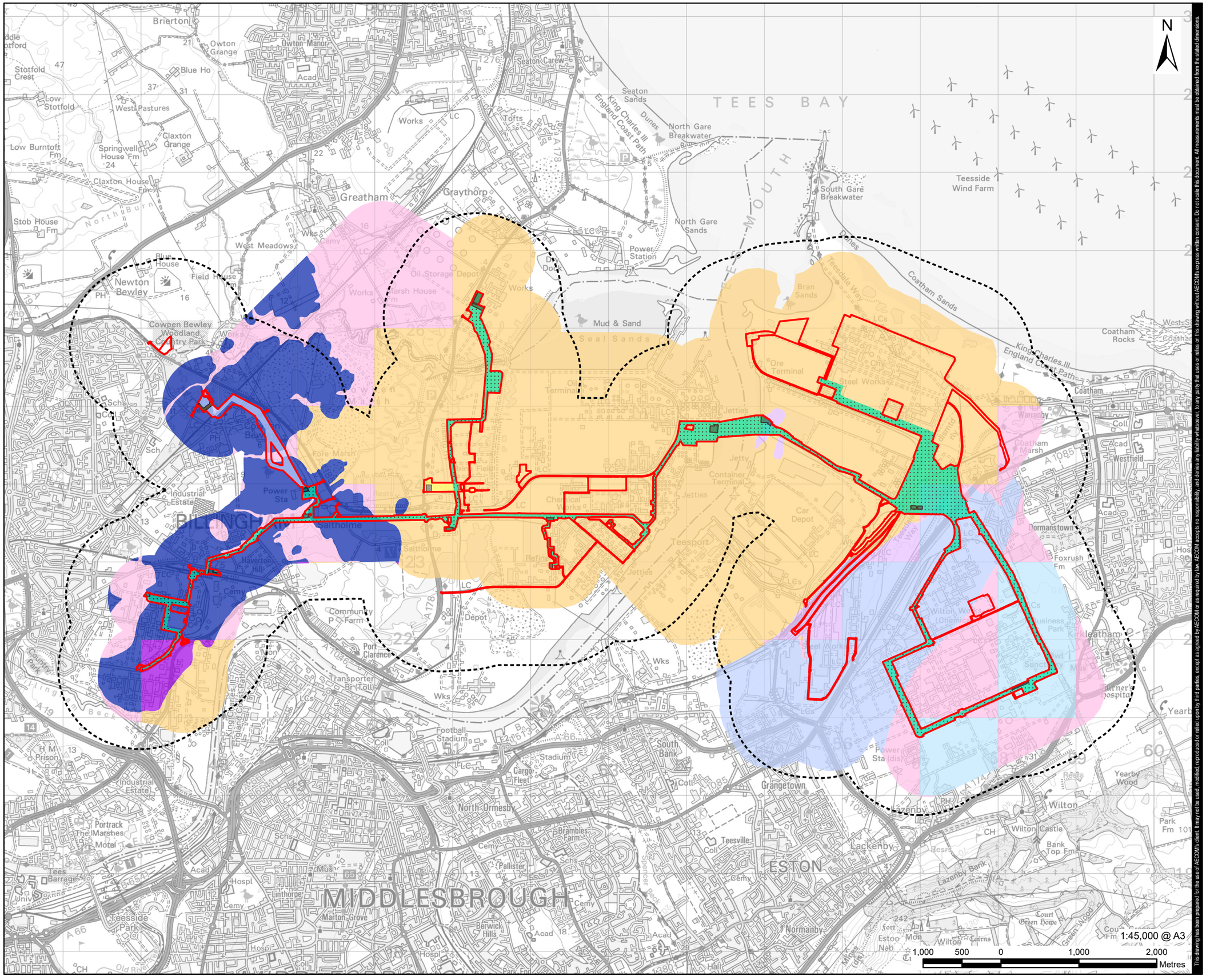

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer

Hydrogen Distribution Network

- Overground and Underground Pipelines
- Overground and Underground Pipelines to connect to Work No. 6B.2
- Overground and Underground Pipelines to connect to Work No. 6B.3
- Above Ground Installations
- Above Ground Installation at Cowpen Bewley
- Above Ground Installation at Saltholme Brinefields

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Vulnerability - Hydrogen Distribution Network

FIGURE NUMBER

Figure 10-14f

Revision: 0 Drawn: CL Checked: MAB Approved: LF Date: 2024-03-15

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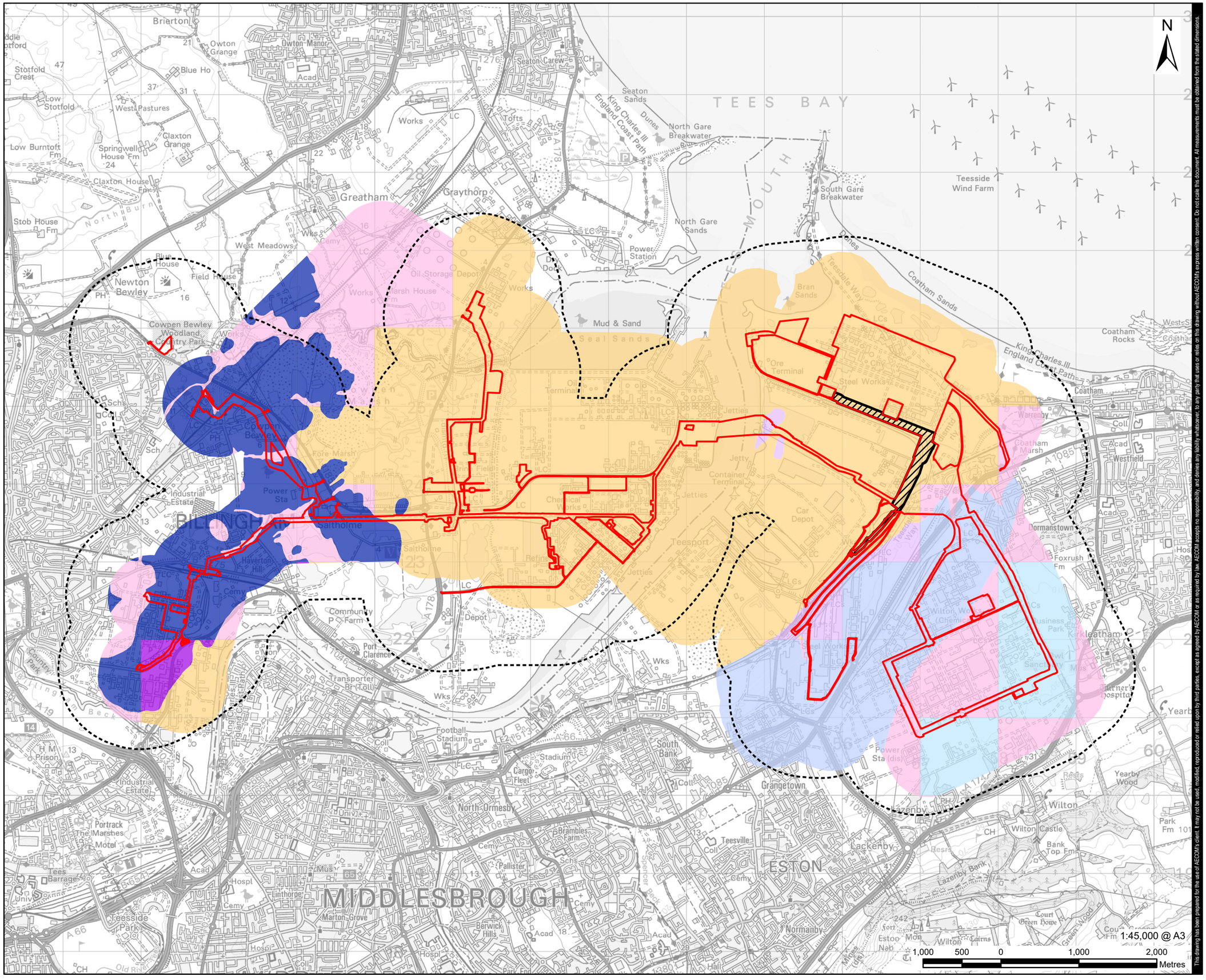

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Oxygen and Nitrogen Gas Connections

Groundwater Vulnerability

- Principal Bedrock Aquifer - Low Vulnerability
- Principal Bedrock Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - Low Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability
- Secondary Bedrock Aquifer - Low Vulnerability
- Secondary Bedrock Aquifer - Medium Vulnerability

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

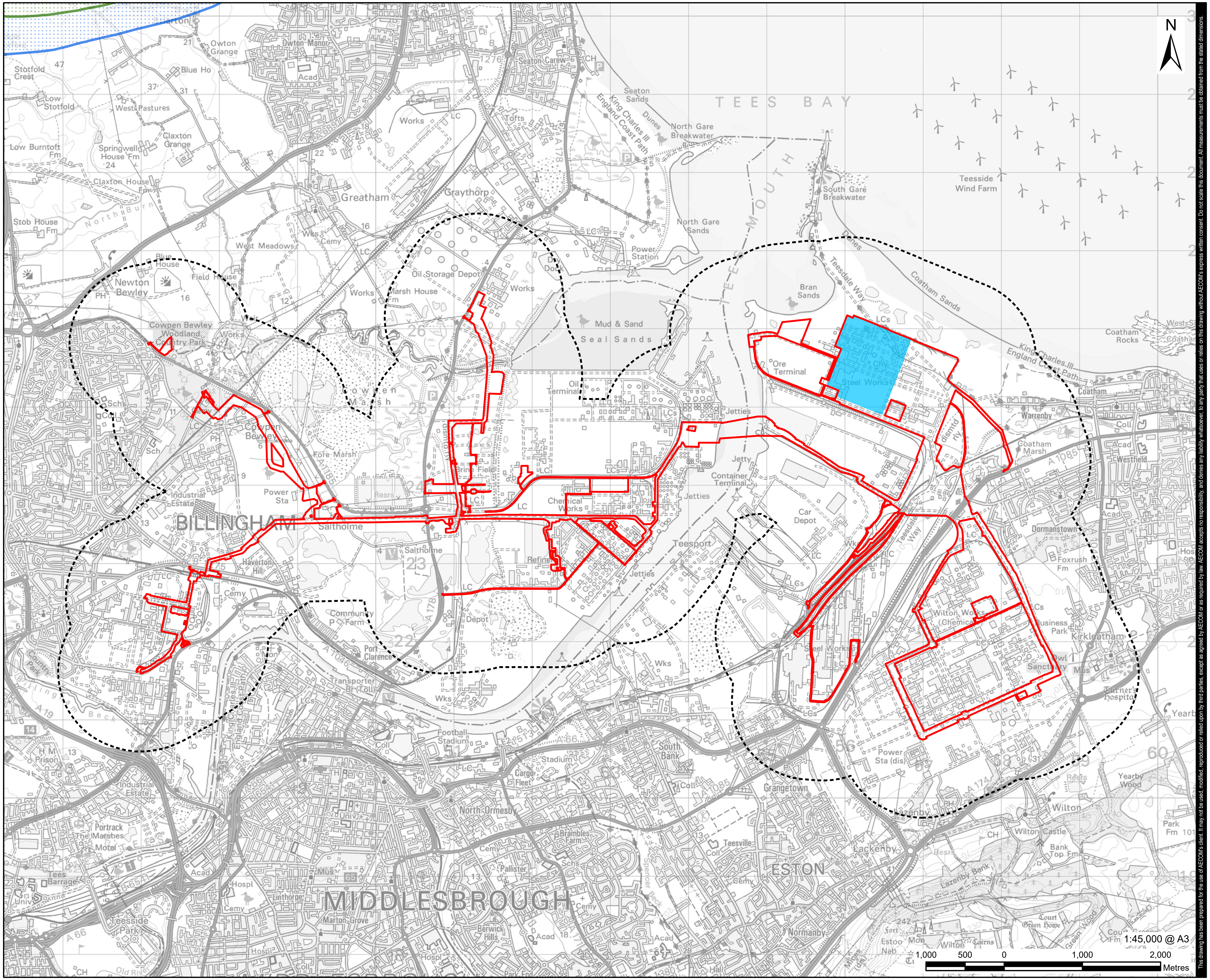
60689030

FIGURE TITLE

Groundwater Vulnerability - Oxygen and Nitrogen Gas Connections

FIGURE NUMBER

Figure 10-14g



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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site

Source Protection Zone

- Zone II - Outer Protection Zone
- Zone III - Total Catchment

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Source Protection Zones

FIGURE NUMBER

Figure 10-15

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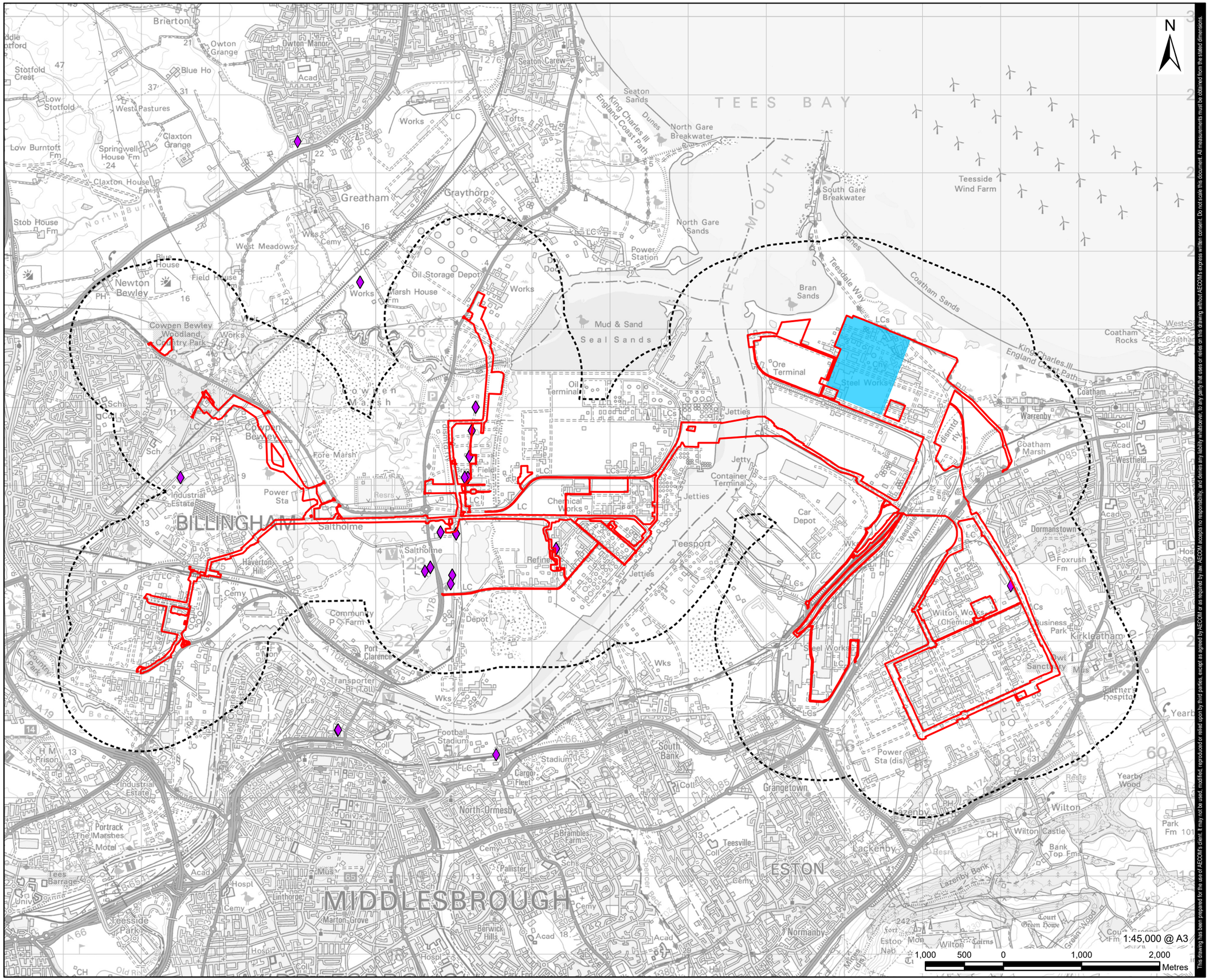

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site
- Groundwater Abstractions

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Groundwater Abstractions

FIGURE NUMBER

Figure 10-16

Revision: 0 Drawn: MAB Checked: SM Approved: LF Date: 2024-03-11

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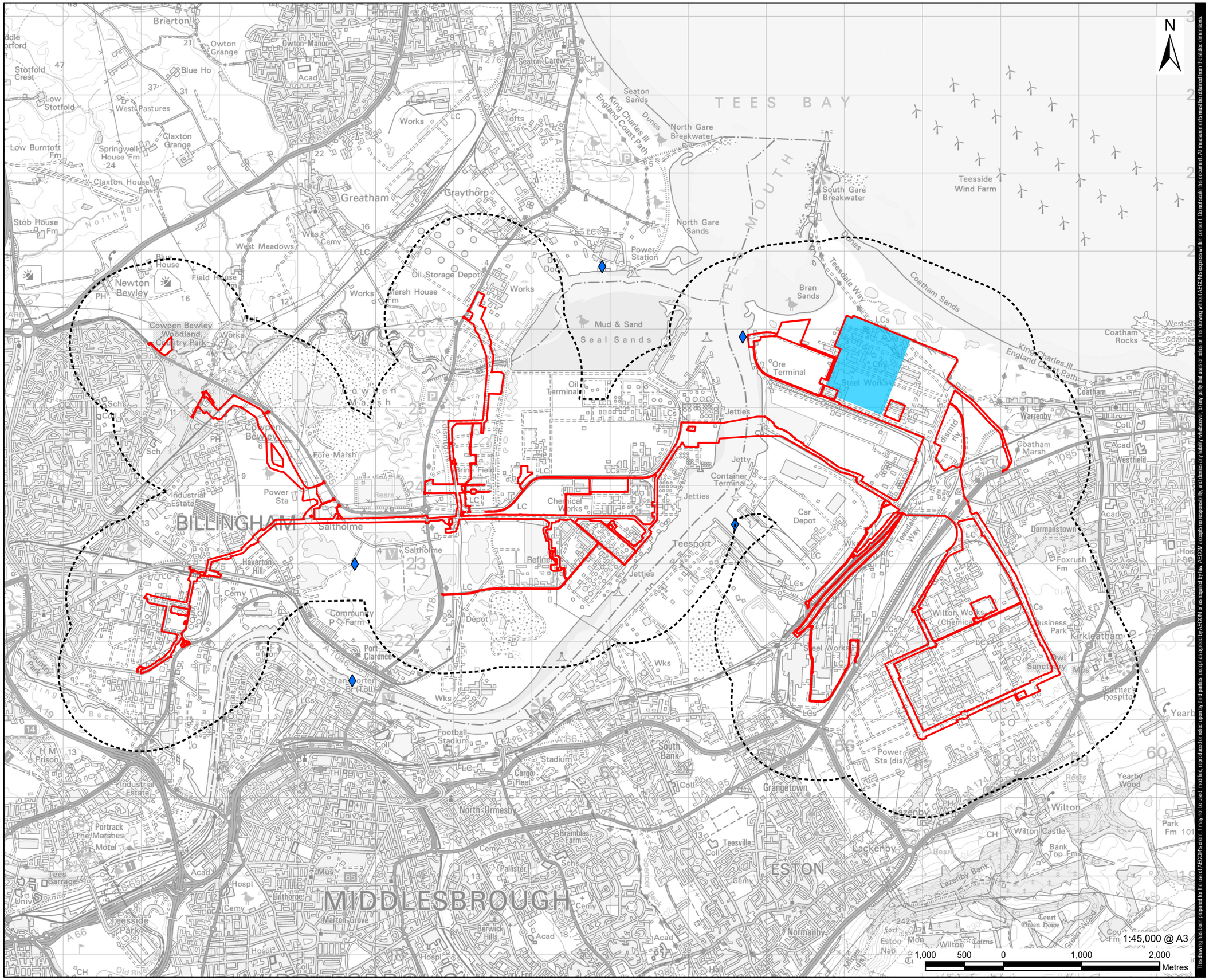

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LEGEND

- Proposed Development Site
- Proposed Development Site - 1 km Buffer
- Main Site
- Surface Water Abstractions

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Environmental Statement

PROJECT NUMBER

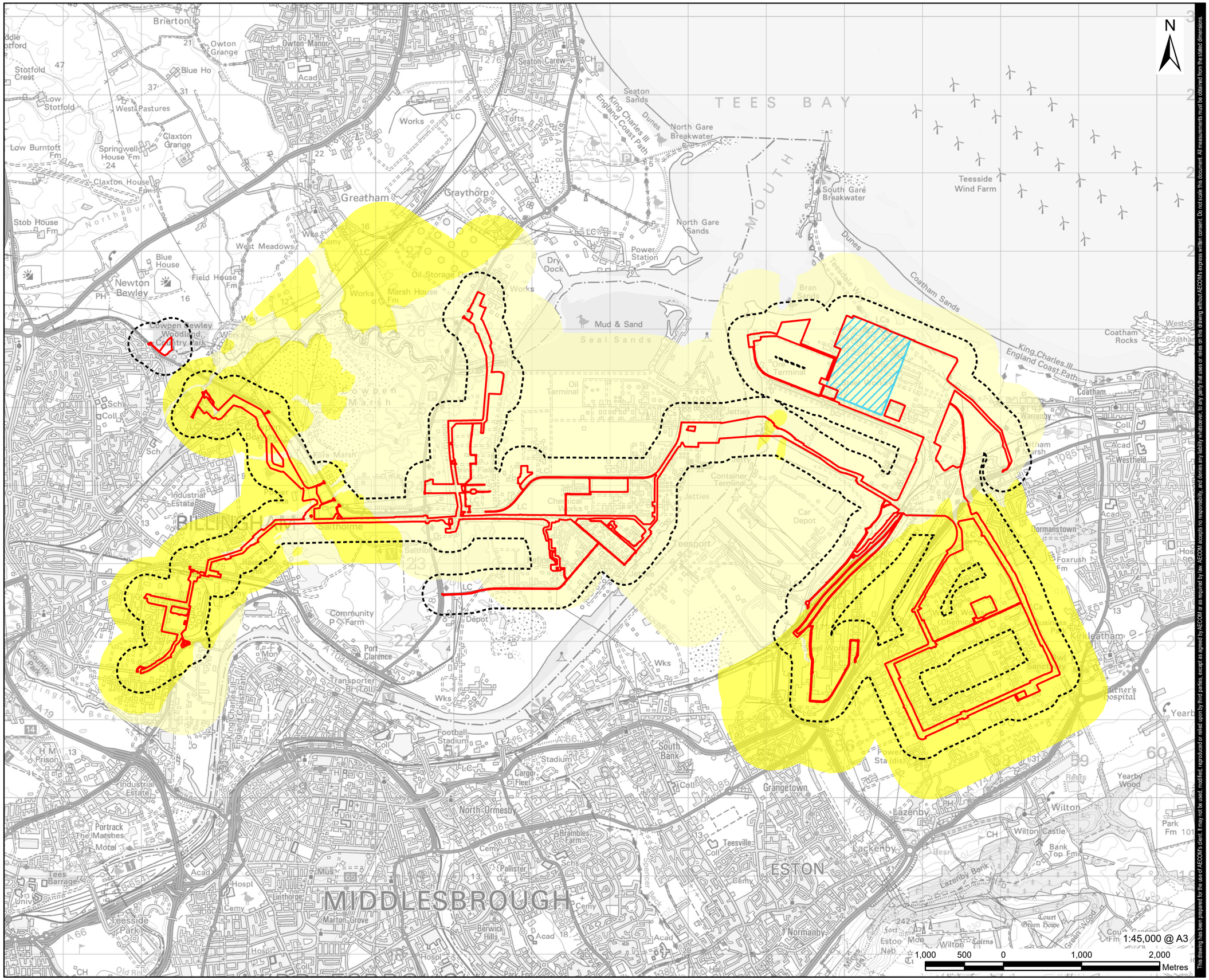
60689030

FIGURE TITLE

Surface Water Abstractions

FIGURE NUMBER

Figure 10-17



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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Natural Ground Subsidence - Collapsible Deposits

- Deposits With Potential To Collapse When Loaded And Saturated Are Believed Not To Be Present.
- Deposits With Potential To Collapse When Loaded And Saturated Are Unlikely To Be Present.

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Natural Ground Subsidence - Collapsible Deposits

FIGURE NUMBER

Figure 10-18a

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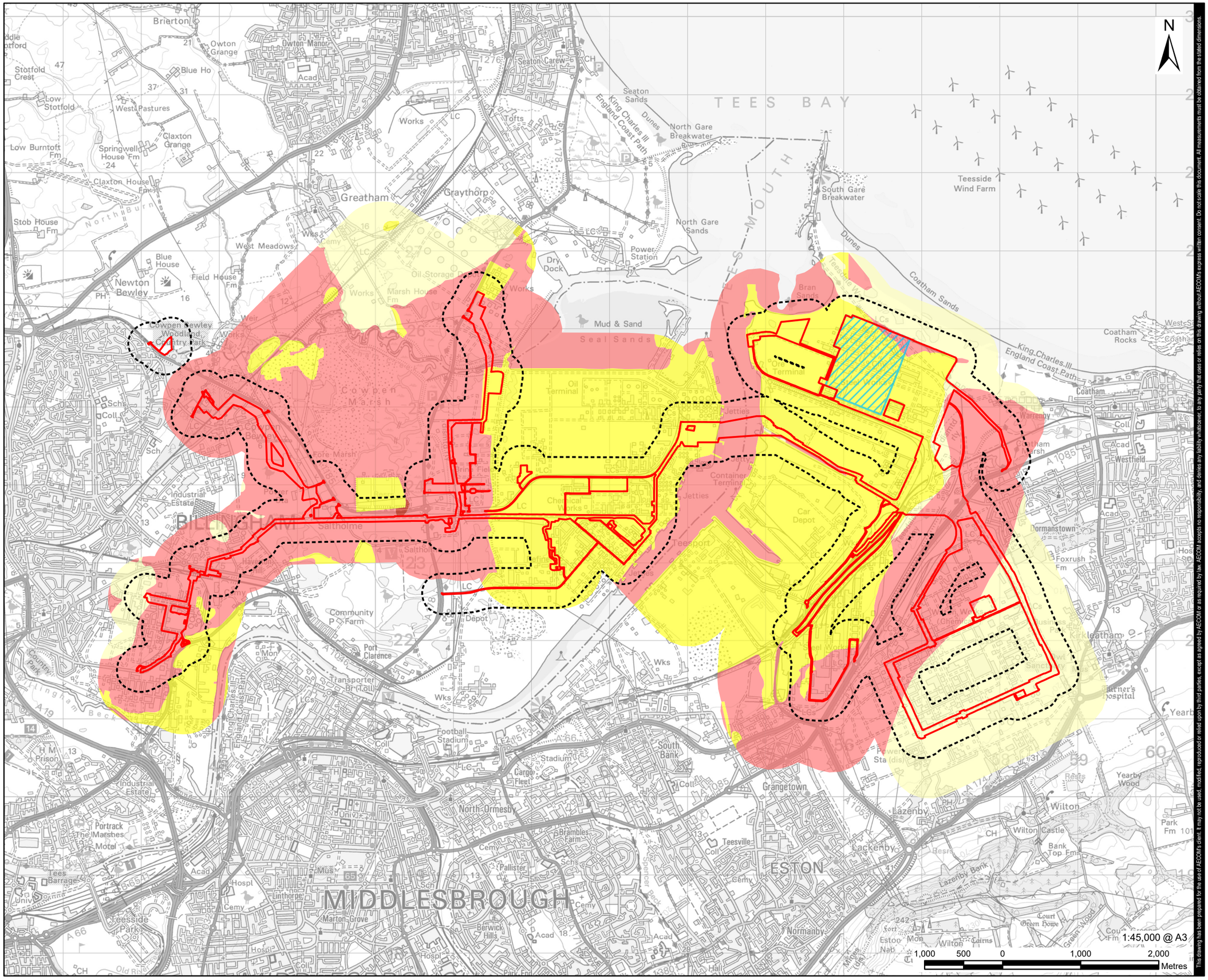

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Natural Ground Subsidence - Compressible Deposits

- Compressible Strata Are Not Thought To Occur.
- Compressibility And Uneven Settlement Problems Are Not Likely To Be Significant On The Site For Most Land Uses.
- Compressibility And Uneven Settlement Hazards Are Probably Present. Land Use Should Consider Specifically The Compressibility And Variability Of The Site.
- Highly Compressible Strata Present. Significant Constraint On Land Use Depending On Thickness.

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Natural Ground Subsidence - Compressible Deposits

FIGURE NUMBER

Figure 10-18b

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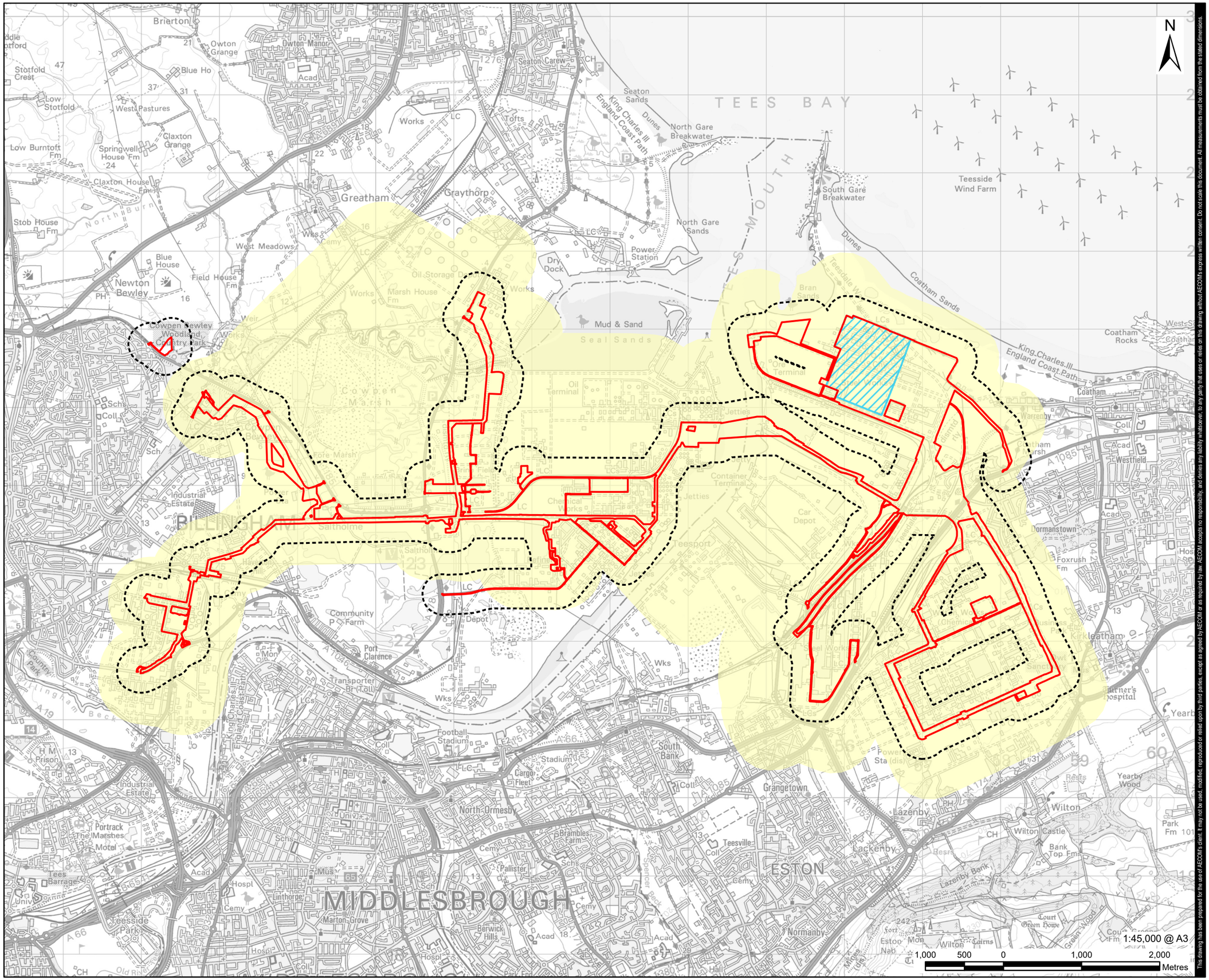

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Natural Ground Subsidence - Ground Dissolution of Soluble Rocks

- Soluble Rocks Are Either Not Thought To Be Present Within The Ground, Or Not Prone To Dissolution. Dissolution Features Are Unlikely To Be Present.

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Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Natural Ground Subsidence - Ground Dissolution of Soluble Rocks

FIGURE NUMBER

Figure 10-18c

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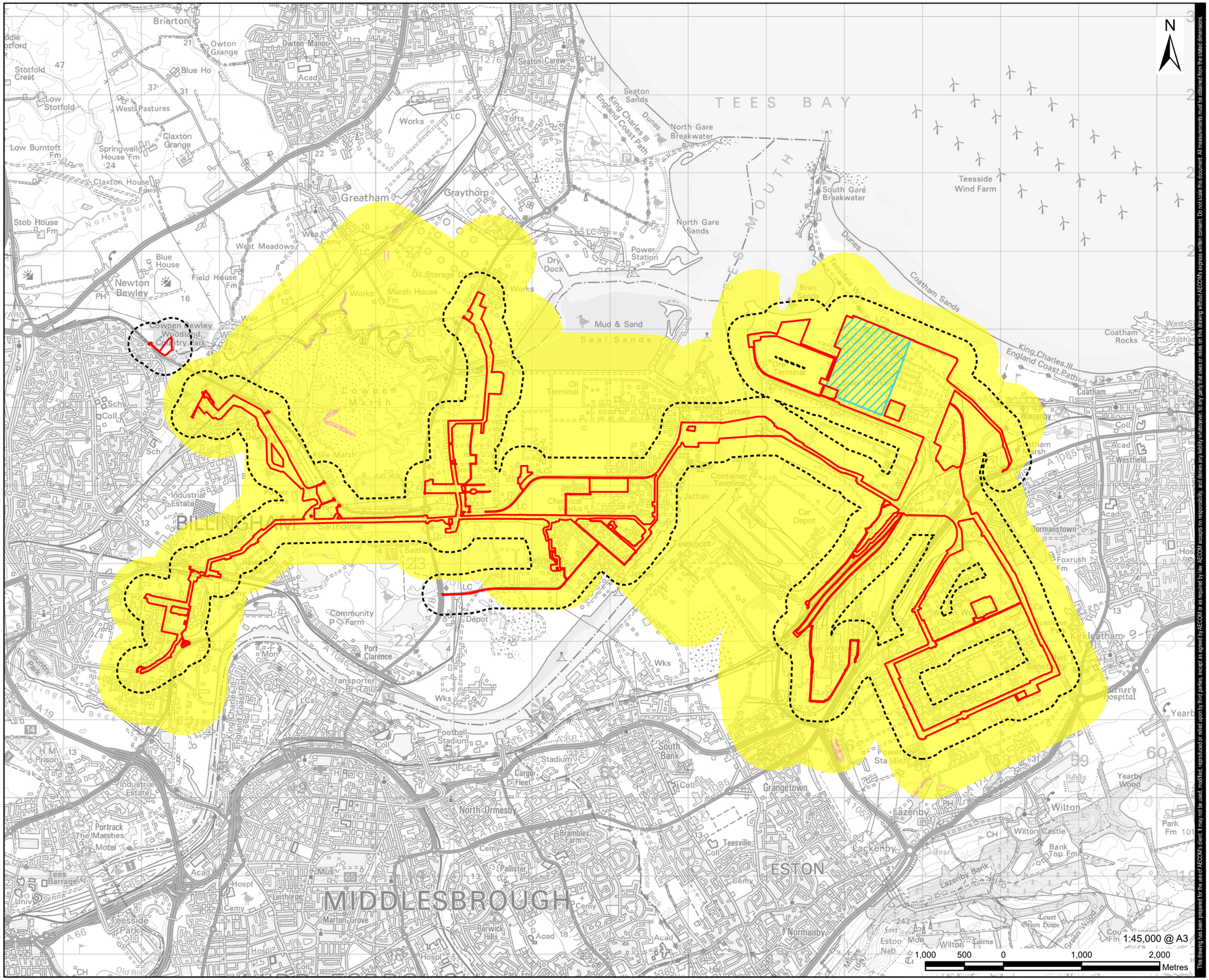

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Natural Ground Subsidence - Landslides

- Slope Instability Problems Are Not Likely To Occur But Consideration To Potential Problems Of Adjacent Areas Impacting On The Site Should Always Be Considered.
- Slope Instability Problems May Be Present Or Anticipated. Site Investigation Should Consider Specifically The Slope Stability Of The Site.

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Natural Ground Subsidence - Landslides

1:45,000 @ A3

FIGURE NUMBER

Figure 10-18d

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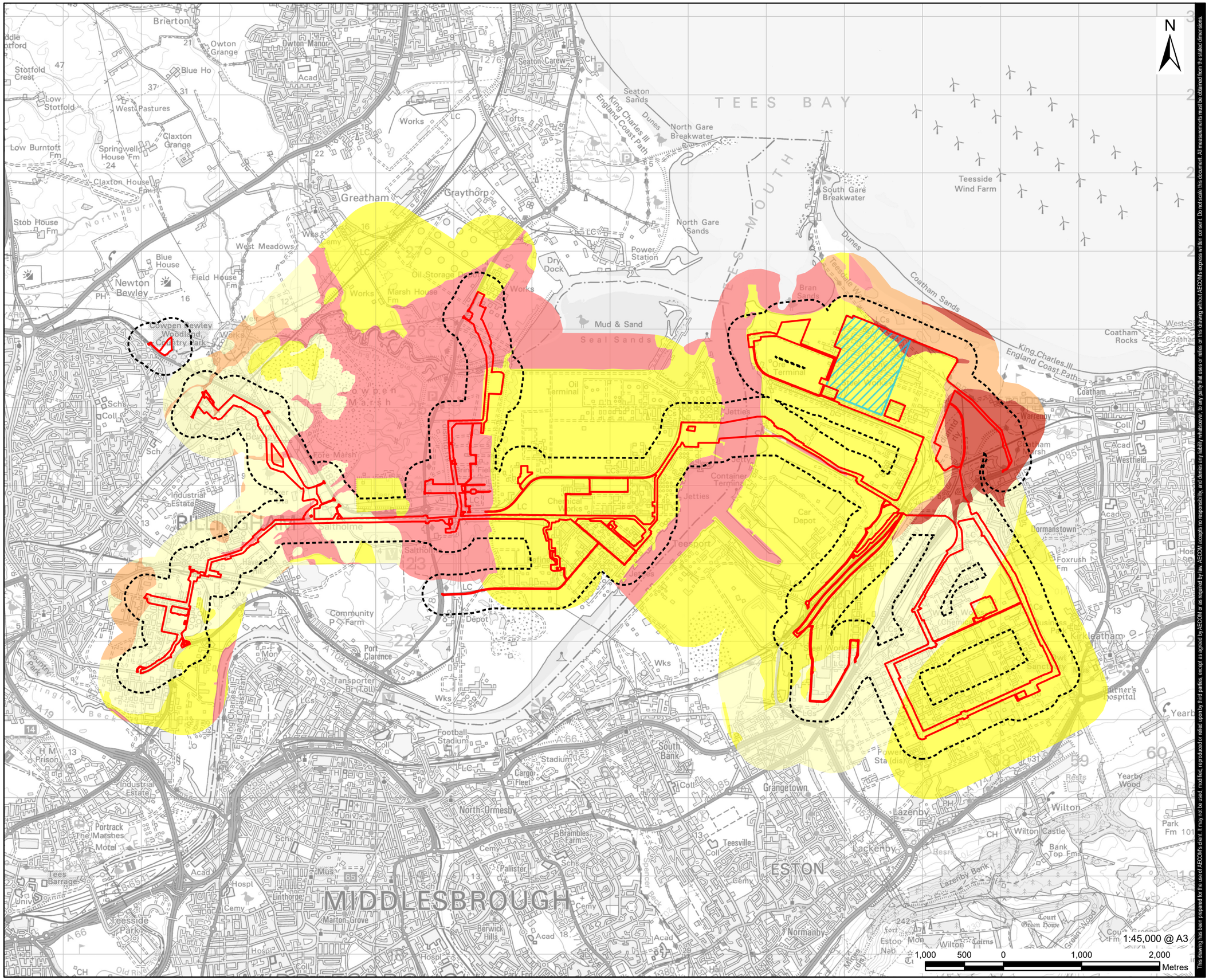

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Natural Ground Subsidence - Running Sand

- Running Sand Conditions Are Not Thought To Occur Whatever The Position Of The Water Table. No Identified Constraints On Lands Use Due To Running Conditions.
- Running Sand Conditions Are Unlikely. No Identified Constraints On Land Use Due To Running Conditions Unless Water Table Rises Rapidly.
- Running Sand Conditions May Be Present. Constraints May Apply To Land Uses Involving Excavation Or The Addition Or Removal Of Water.
- Running Sand Conditions Are Probably Present. Constraints May Apply To Land Uses Involving Excavation Or The Addition Or Removal Of Water.
- Running Sand Conditions Are Almost Certainly Present. Constraints Will Apply To Land Uses Involving Excavation Or The Addition Or Removal Of Water.

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Natural Ground Subsidence - Running Sand

FIGURE NUMBER

Figure 10-18e

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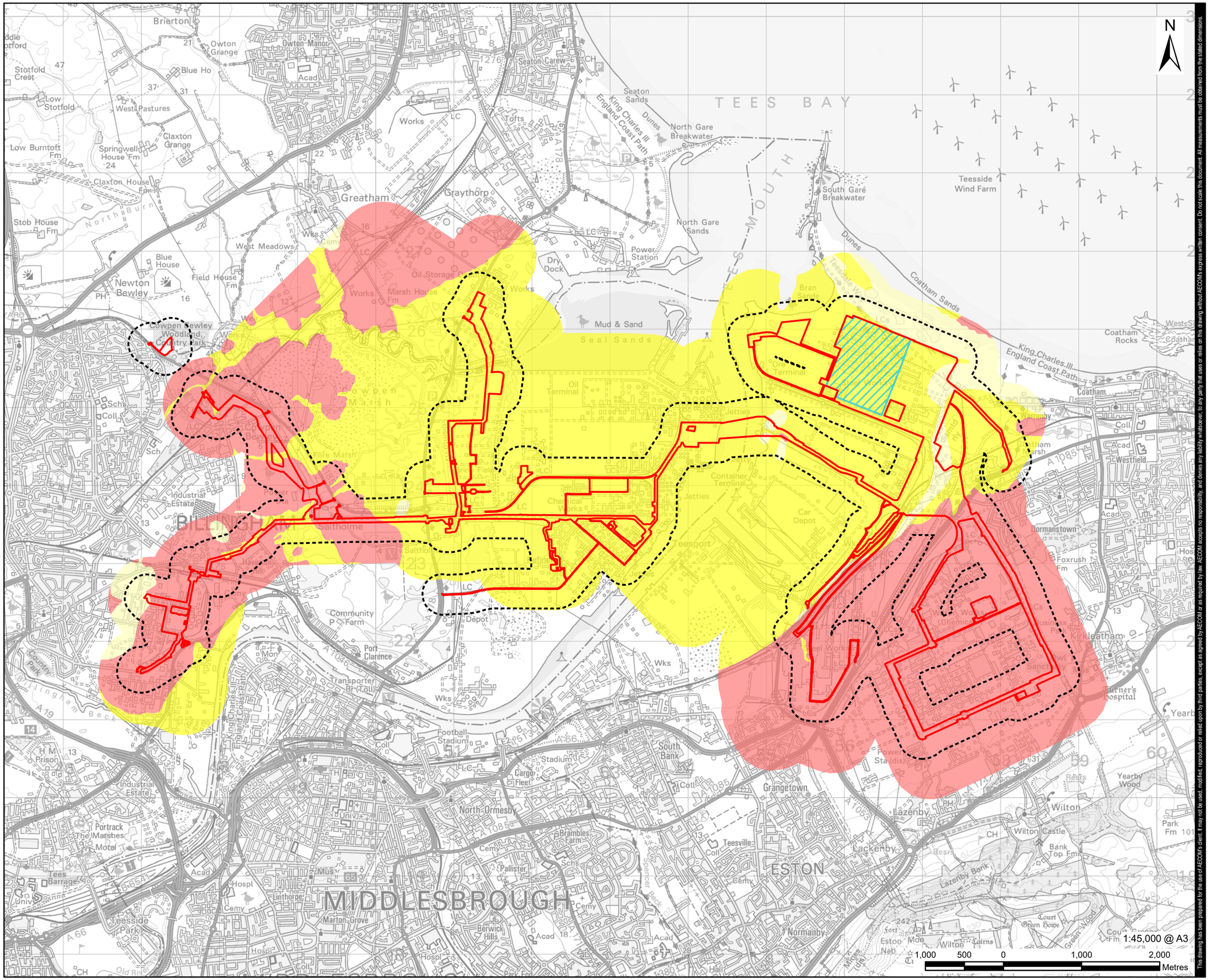

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Natural Ground Subsidence - Shrink Swell Clays

- Ground Conditions Predominantly Non-Plastic.
- Ground Conditions Predominantly Low Plasticity.
- Ground Conditions Predominantly Medium Plasticity.

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Natural Ground Subsidence - Shrink Swell Clays

FIGURE NUMBER

Figure 10-18f

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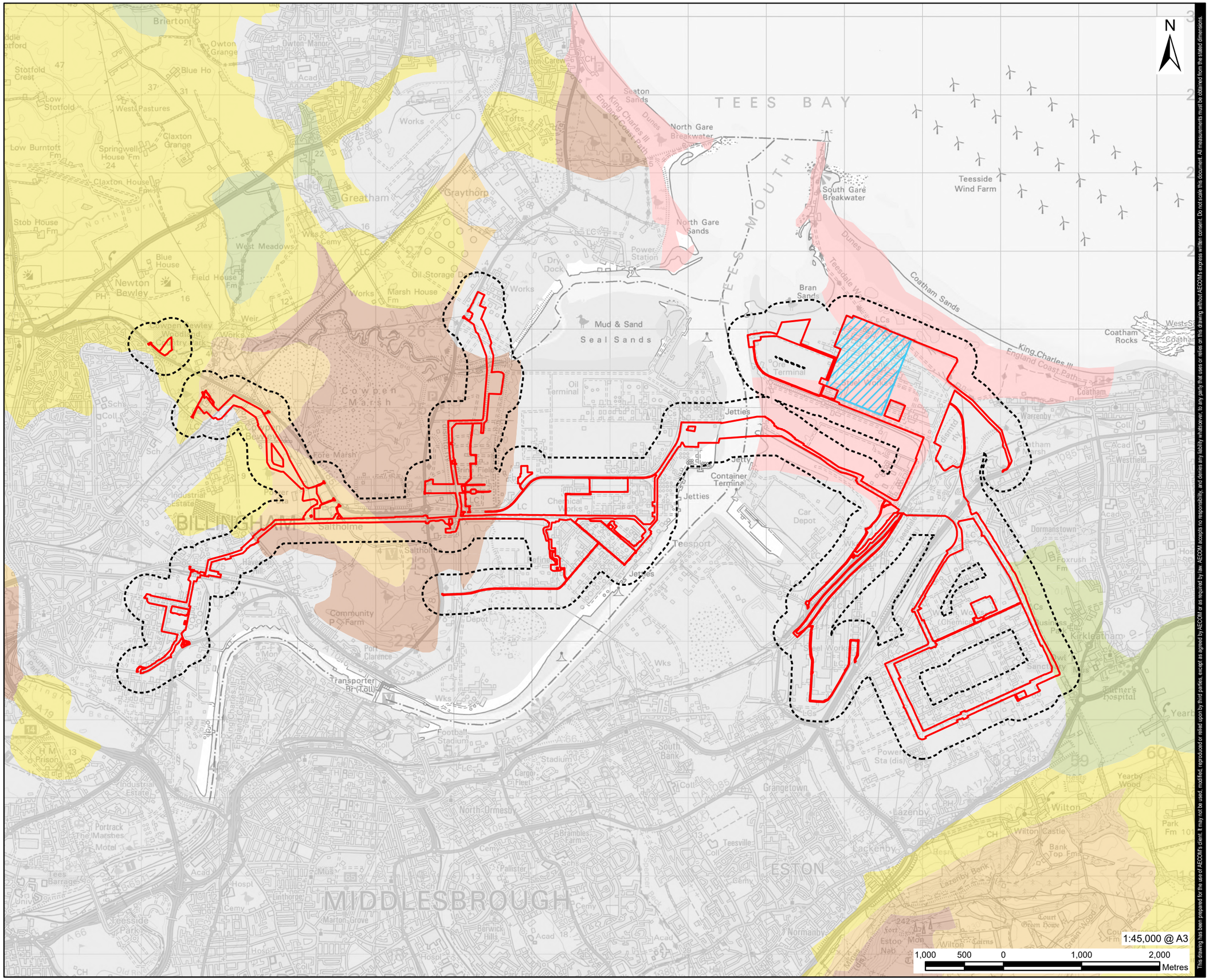

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

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FIGURE TITLE

Agricultural Land Classification - Main Site

FIGURE NUMBER

Figure 10-19a

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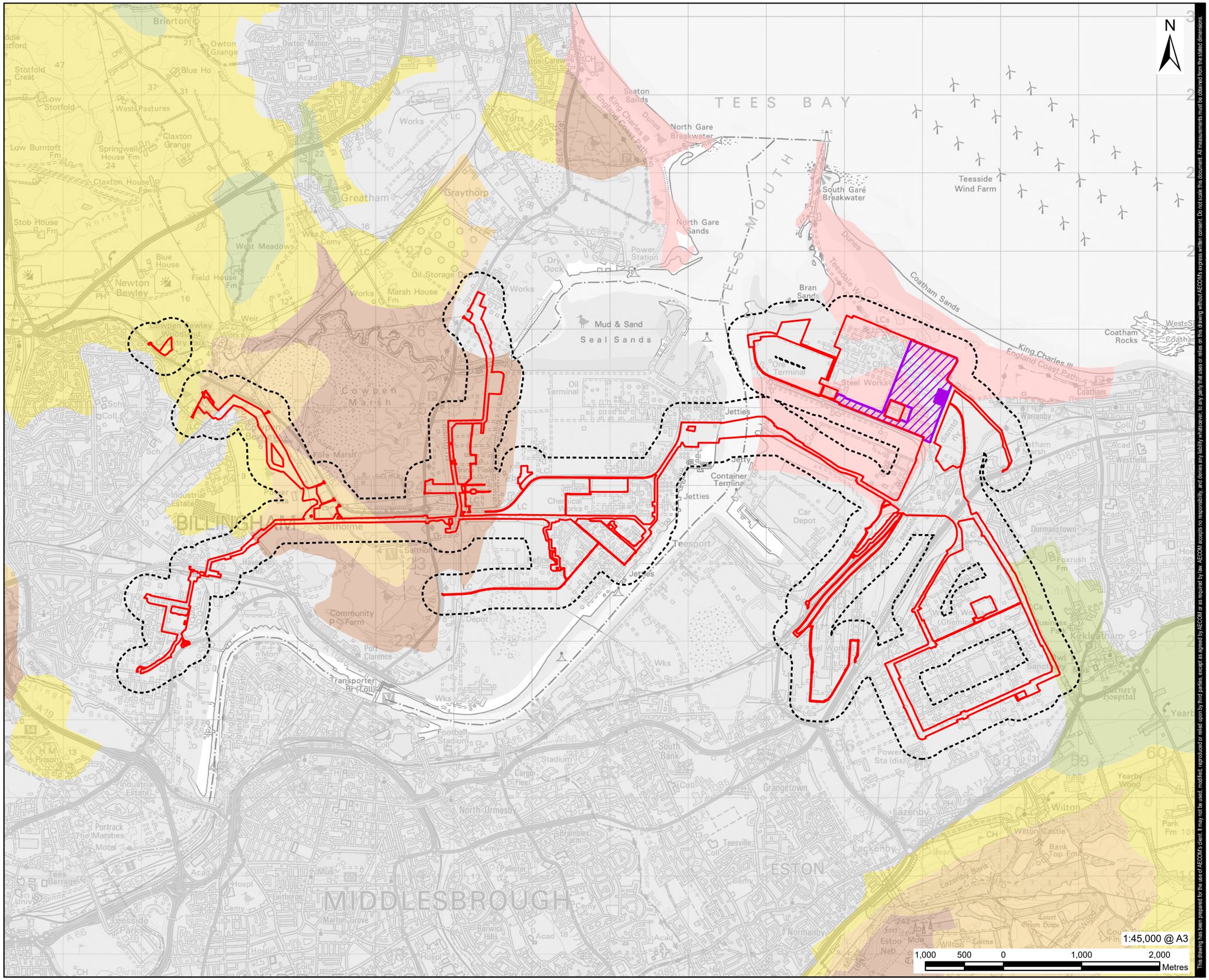

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Carbon Dioxide Export Pipeline & High-Pressure Compression Station

- Carbon Dioxide - Export Pipeline
- Carbon Dioxide - Above Ground Installation

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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FIGURE TITLE

Agricultural Land Classification - Carbon Dioxide Export Pipeline and High-Pressure Compression Station

FIGURE NUMBER

Figure 10-19b

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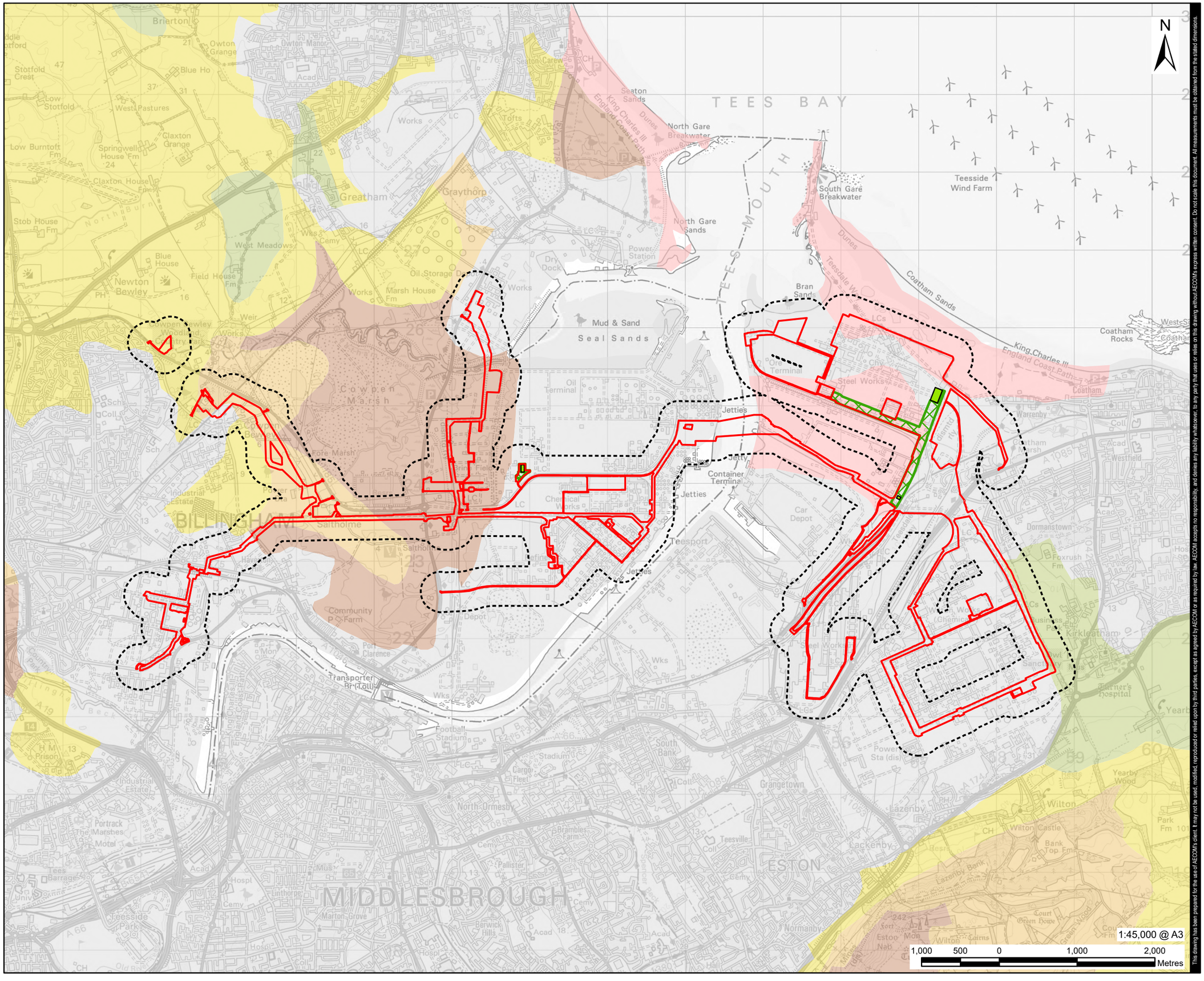

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Natural Gas Connection Works

- Natural Gas Connection - Underground High Pressure Gas Pipeline
- Natural Gas Connection - Above Ground Installation

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

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FIGURE TITLE

Agricultural Land Classification - Natural Gas Connection Works

FIGURE NUMBER

Figure 10-19c

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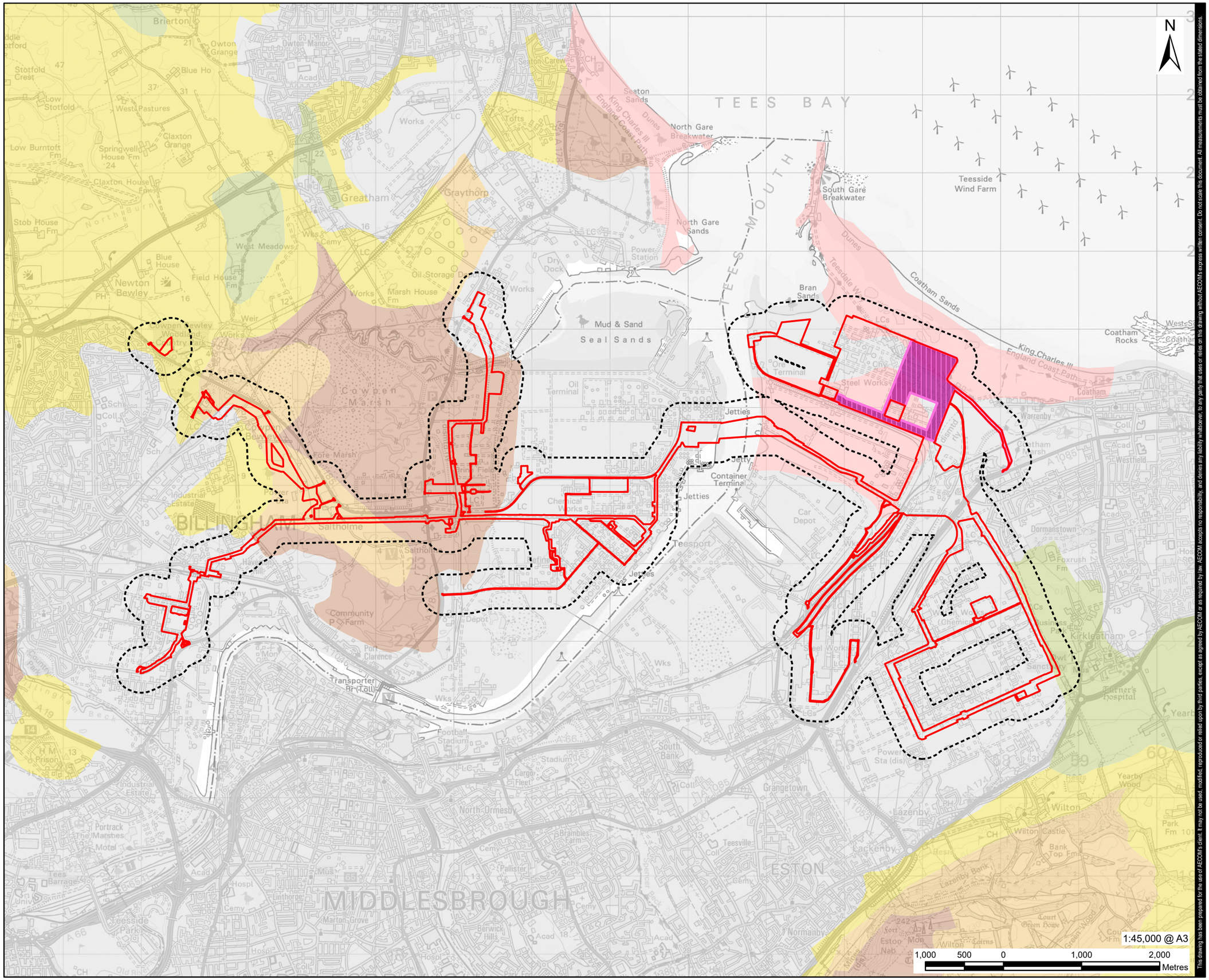

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PROJECT

H2Teesside DCO

APPLICANT

H2 Teesside Limited

CONSULTANT

AECOM Limited
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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Water Supply Connection Works

- Water Supply Connection Works
- Wastewater Disposal Works

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Agricultural Land Classification - Water and Wastewater Connection Works

FIGURE NUMBER

Figure 10-19d

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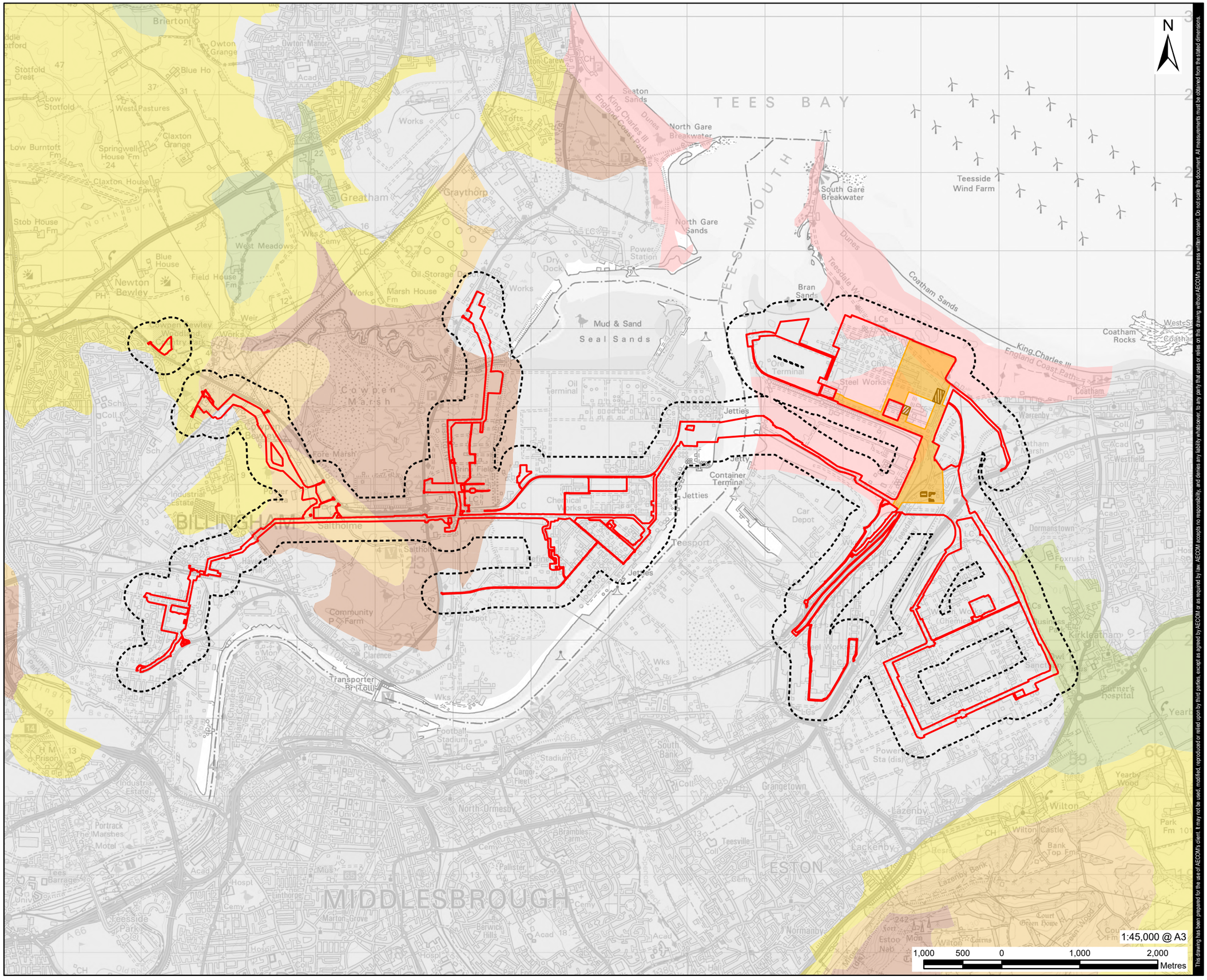

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Electrical Connection Works

- Electrical Connection Works
- Above Ground Installation Connecting Work No. 3A to Pellet-Sinter Substation
- Above Ground Installation Connecting Work No. 3A to Tod Point Substation
- Above Ground Installation Connecting Work No. 3A to a New Substation

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Agricultural Land Classification - Electrical Connection Works

FIGURE NUMBER

Figure 10-19e

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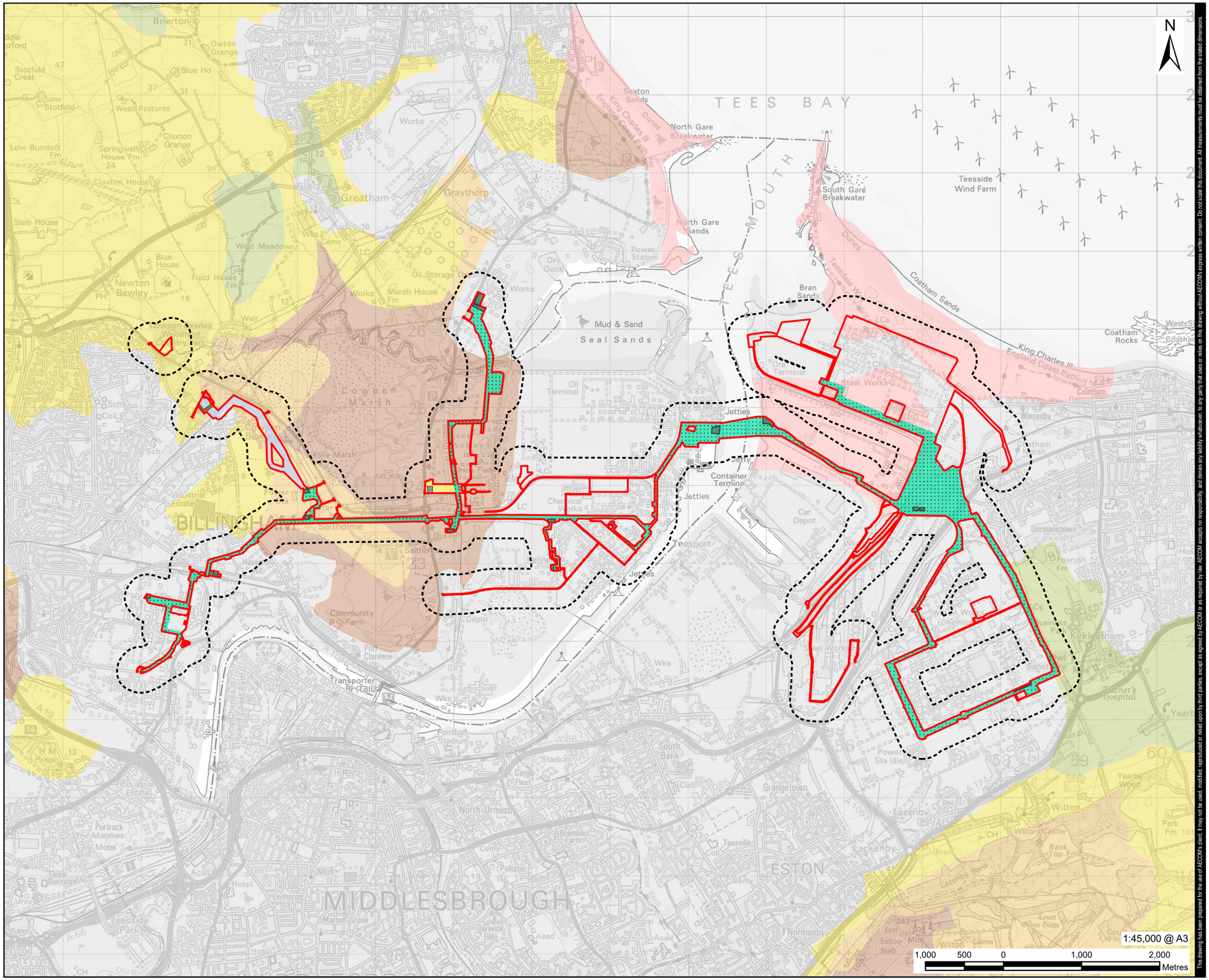

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer

Hydrogen Distribution Network

- Overground and Underground Pipelines
- Overground and Underground Pipelines to connect to Work No. 6B.2
- Overground and Underground Pipelines to connect to Work No. 6B.3
- Above Ground Installations
- Above Ground Installation at Cowpen Bewley
- Above Ground Installation at Saltholme Brinefields

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Agricultural Land Classification - Hydrogen Distribution Network

FIGURE NUMBER

Figure 10-19f

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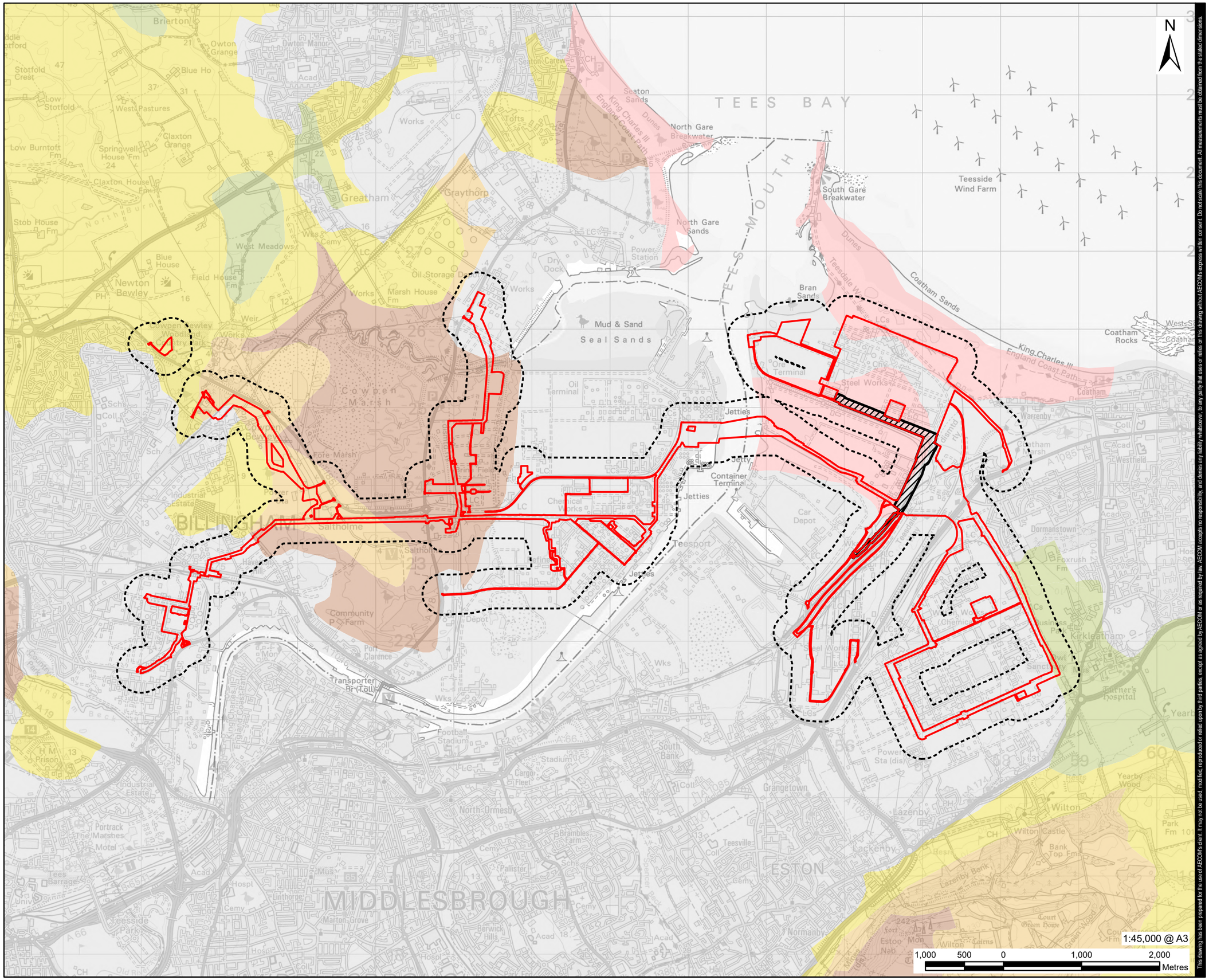

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Oxygen and Nitrogen Gas Connections

Agricultural Land Classification Grade

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Agricultural Land Classification - Oxygen and Nitrogen Gas Connections

FIGURE NUMBER

Figure 10-19g

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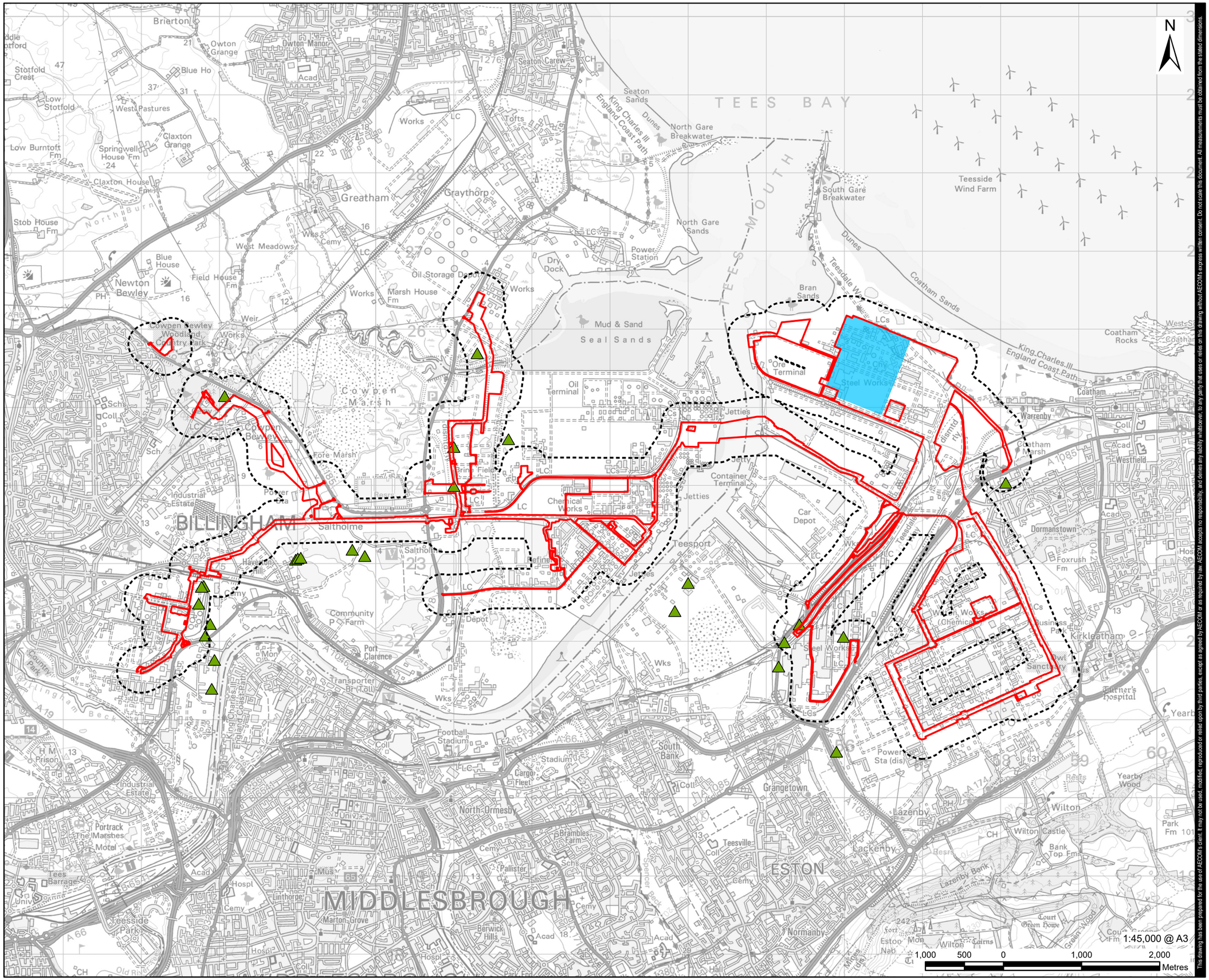

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Brit Pits

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Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Brit Pits

FIGURE NUMBER

Figure 10-20

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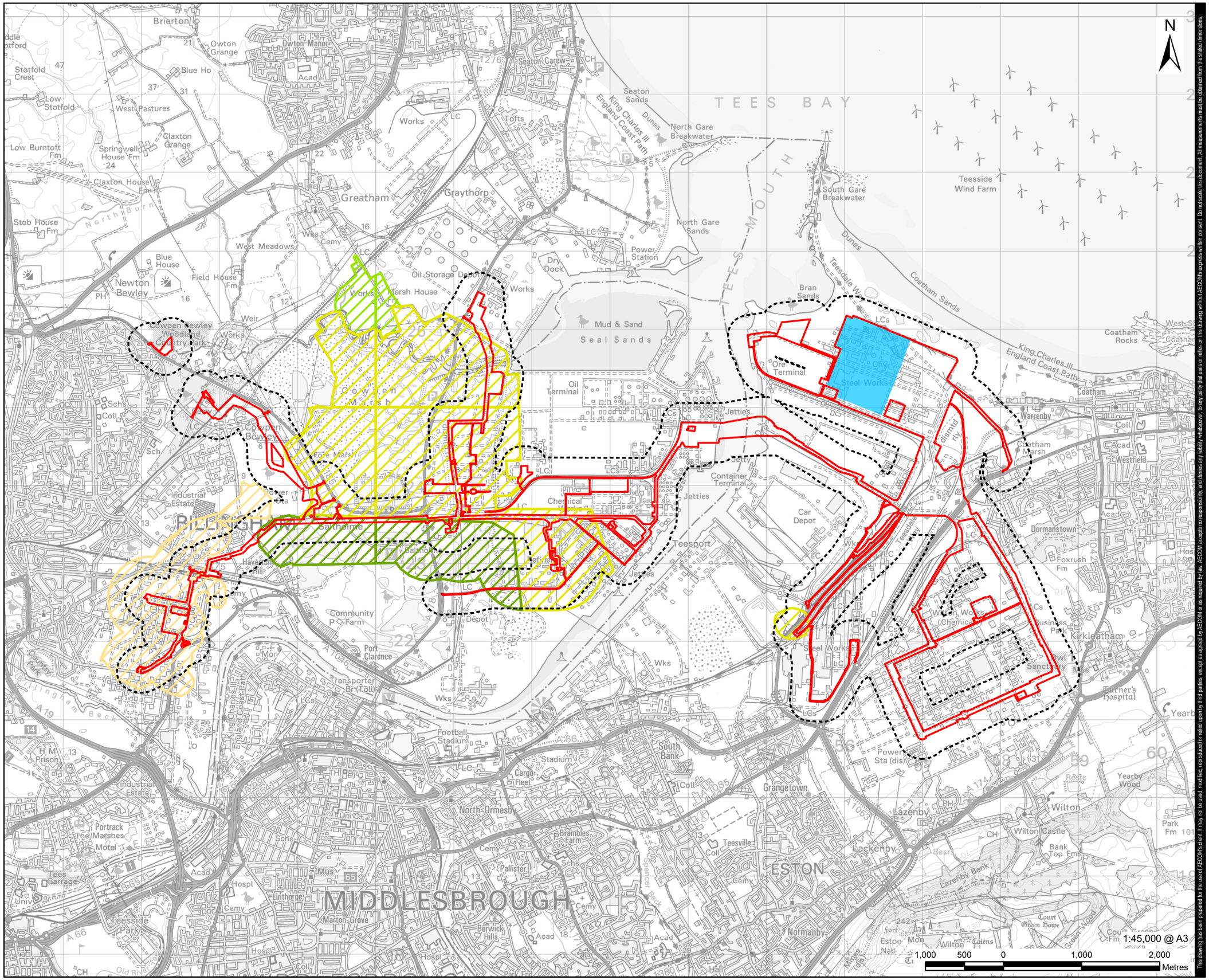

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site

Non-Coal Mining Class

- A
- B
- C
- D

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Non-Coal Mining

FIGURE NUMBER

Figure 10-21

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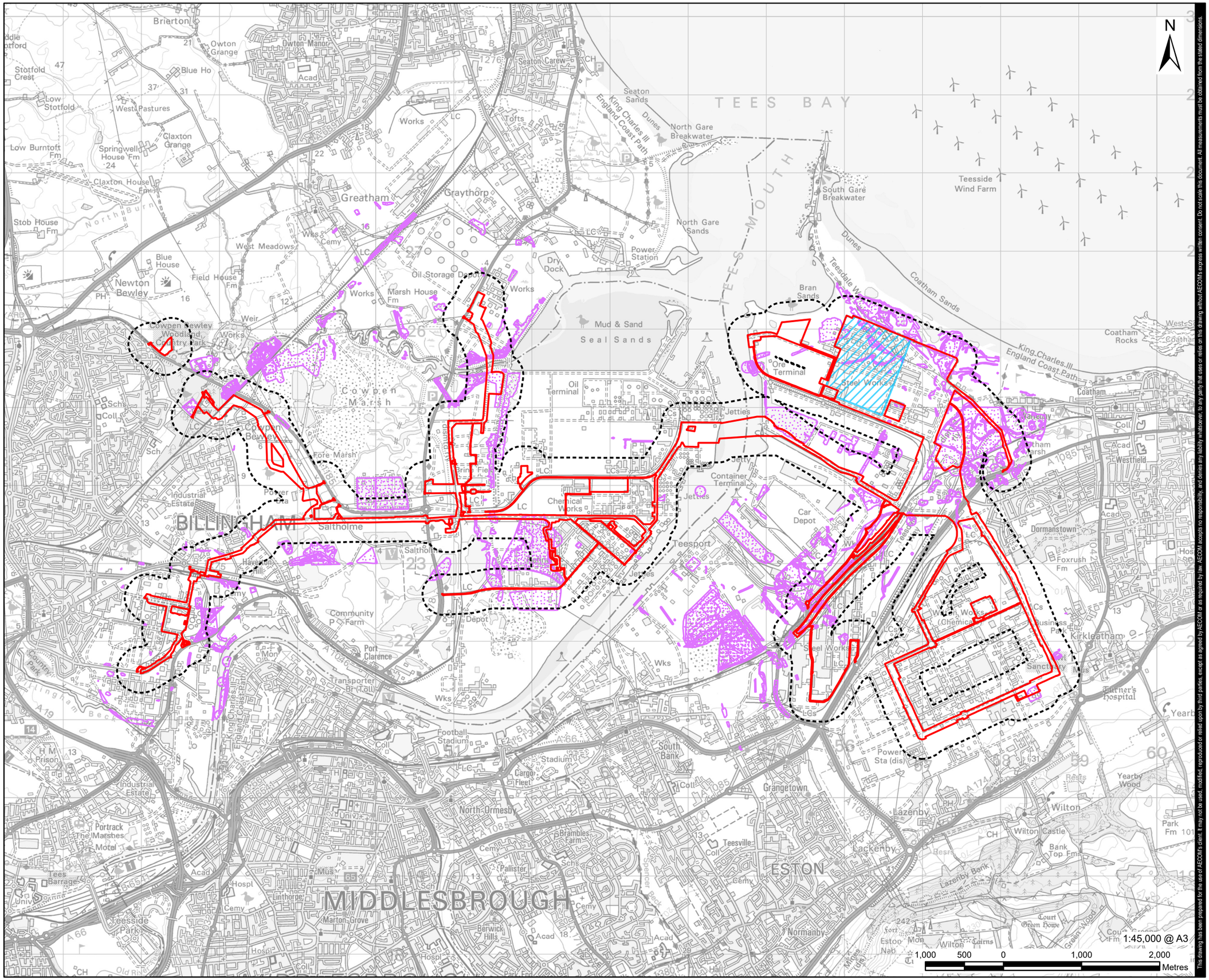

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Surface Ground Workings

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Surface Ground Workings

FIGURE NUMBER

Figure 10-22

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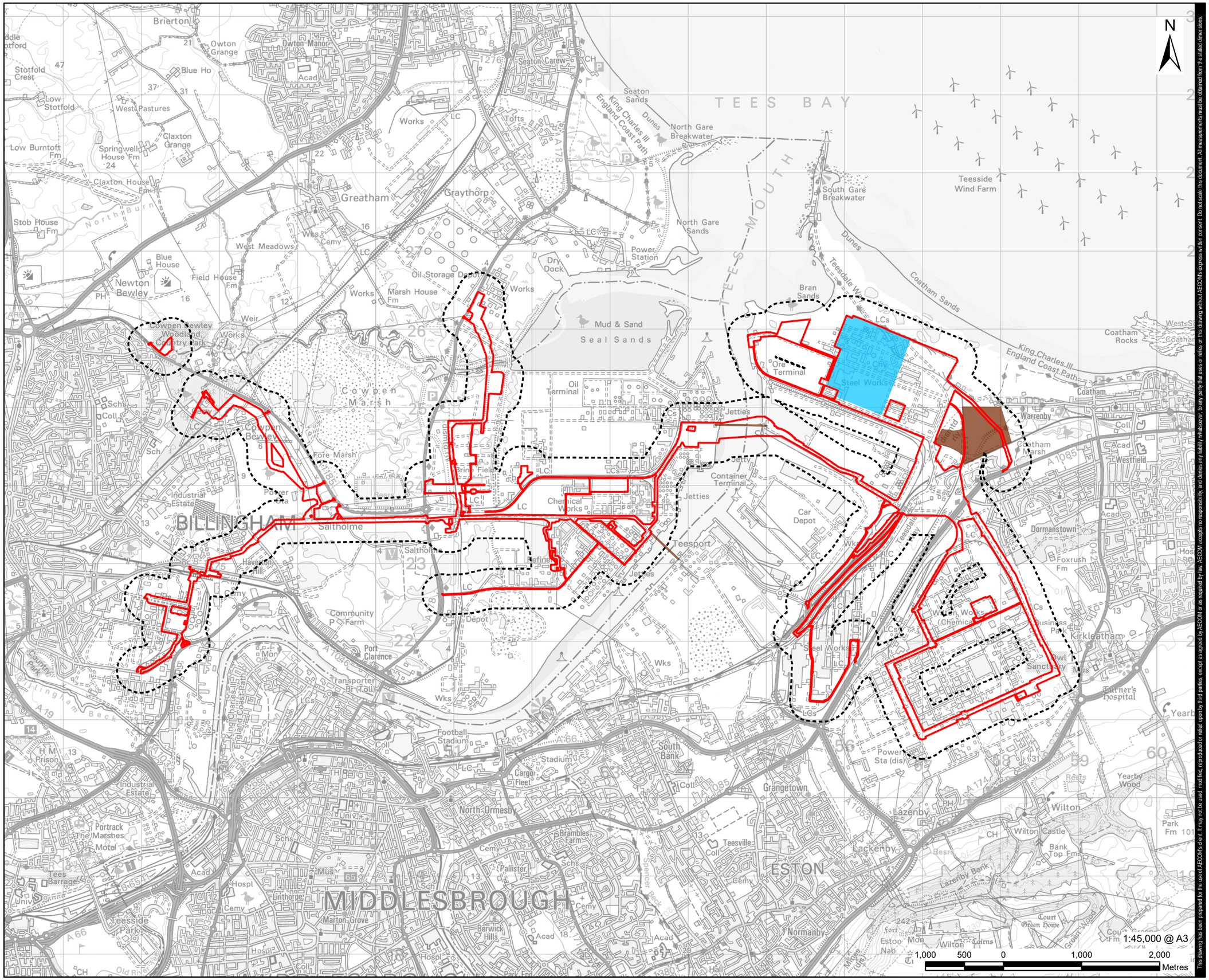

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LEGEND

- Proposed Development Site
- Proposed Development Site - 250 m Buffer
- Main Site
- Underground Workings

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ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60689030

FIGURE TITLE

Underground Workings

FIGURE NUMBER

Figure 10-23