PORT OF TILBURY LONDON

PLANNING ACT 2008
INFRASTRUCTURE PLANNING
(APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009
REGULATION 5 (2) (a)

PROPOSED PORT TERMINAL AT FORMER TILBURY POWER STATION

TILBURY2

TR030003

VOLUME 6 PART B

ES APPENDIX 15.G: HYDROGEOLOGY AND GROUND CONDITIONS IMPACT ASSESSMENTS

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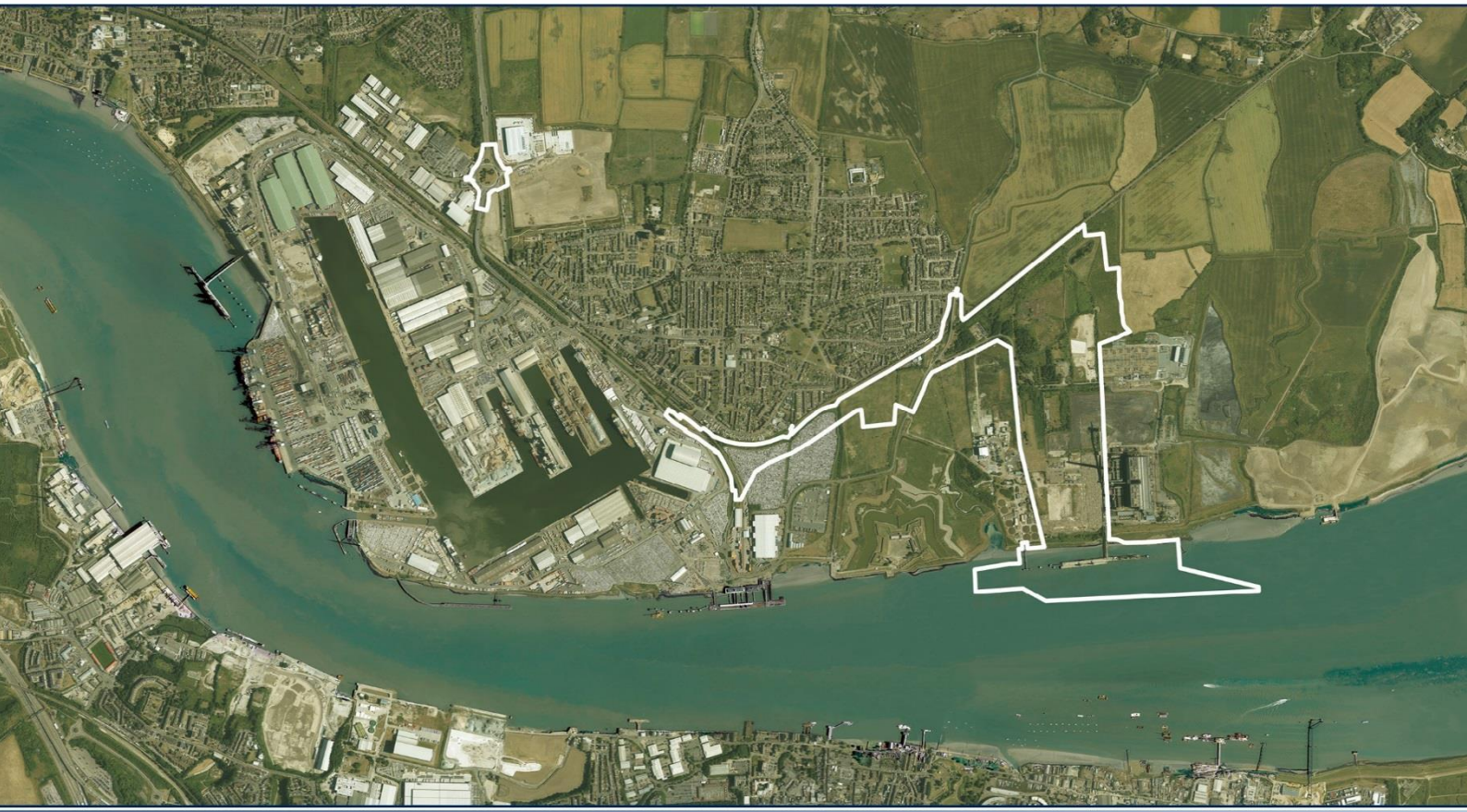

TILBURY2

Appendix 15.G: Table 1: Construction Impact Assessment for the proposed development (with mitigation)

Source	Receptor	Pathway	Baseline (current) risk assessment	Construction phase risk assessment (with mitigation)	Effect
On-site Historical operation and demolition of the former Tilbury A Power Station. This includes operation of the power station and potential spills / leaks from machinery, equipment, vehicles and underground cables. Railway activities associated with the railway line including associated engine sheds and trains / goods vehicles using the railway line. Made Ground associated with the construction of the former Tilbury A Power Station, the railway line and all associated infrastructure e.g. roads. Activities relating to the former gas works located within the west of the development area. Activities relating to the vehicle maintenance and storage yard to the south of railway line and west of Fort Road. Activities relating to the electricity substation including associated electricity lines and spills from vehicles. Historical tipping in the northern part of the power station area including ash, clinker, brick, concrete, wood, plastic, fabrics, car tyres, metal and rope. *(A range of inorganic and recalcitrant organic contaminants including heavy metals, hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), Polychlorinated Biphenyls (PCBs), solvents, creosote, asbestos)*.	**Human (on-site)** Current workers at and visitors to former Tilbury A Power Station site	Dermal contact with and/or ingestion of contaminants in soil, soil-derived dusts and water Inhalation of contaminants in soils/dust including asbestos fibres Inhalation of ground gases and/or vapours	Moderate / low	Receptor not present at construction stage	Negligible[1]
	Human (on-site) Railway maintenance workers		Moderate / low risk	Receptor not present at construction stage	Negligible[1]
	Human (on-site) Workers at electricity substation		Moderate / low	Moderate / low	Negligible
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage	Receptor not present at construction stage	Negligible
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage	Receptor not present at construction stage	Negligible
	Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works	Dermal contact with and / or ingestion of contaminants in windblown soil-derived dusts and water which may have migrated off-site Inhalation of contaminants in windblown dust including asbestos fibres Inhalation of ground gases and / or vapours which may have migrated off-site	Moderate / low	Moderate / low	Negligible
	Human (off-site) Residents living adjacent to the proposed development, north of the development area and visitors		Moderate / low	Moderate / low	Negligible
	Human (off-site) Workers in adjacent commercial properties		Moderate / low	Moderate / low	Negligible
	Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal)		Moderate / low	Moderate / low	Negligible
	Human (off-site) Farmers working on nearby agricultural land		Moderate / low	Moderate / low	Negligible
	Controlled Waters Principal Bedrock aquifer Secondary A aquifer	Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Moderate / low	Moderate / low	Negligible
		Migration of contaminants via preferential pathways to deeper groundwater	Moderate / low	Moderate / low	Negligible
	Controlled Waters River Thames, Thames Estuary, West Tilbury Main, Bill Meroy Creek, various on-site and off-site unnamed streams and drainage networks and off-site ponds	Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge	Low	Low	Negligible
		Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Low	Low	Negligible
		Migration of contaminants via preferential pathways to surface water	Low	Low	Negligible
	Property (on-site) Existing structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Low	Low	Negligible
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Low	Low	Negligible

[1] Removal of this receptor at construction phase automatically triggers a minor beneficial effect. However, professional judgement has been exercised and this effect has been reduced to negligible.

Source	Receptor	Pathway	Baseline (current) risk assessment	Construction phase risk assessment (with mitigation)	Effect
	Property (on-site) Future structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Receptor not present at baseline stage	Low	Negligible[2]
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Receptor not present at baseline stage	Low	Negligible[2]
	Property (off-site) Existing structures and services	Direct contact of new and existing structures with contaminants in groundwater	Very low	Very low	Negligible
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Very low	Very low	Negligible
	Property (off-site) Tilbury Fort Scheduled Monument	Direct contact of new and existing structures with contaminants in groundwater	Very low	Very low	Negligible
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Very low	Very low	Negligible
On-site Ground gas associated with peat and organic-rich alluvium underlying the site Ground gas and vapours from Made Ground associated with former Tilbury A Power Station (*Methane and carbon dioxide*)	**Human (on-site)** Current workers and visitors to former Tilbury A Power Station	Inhalation of ground gases and vapours	Low	Receptor not present at construction stage	Negligible[1]
	Human (on-site) Railway maintenance workers		Low	Receptor not present at construction stage	Negligible[1]
	Human (on-site) Workers at electricity substation		Low	Low	Negligible
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage	Receptor not present at construction stage	Negligible
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage	Receptor not present at construction stage	Negligible
	Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works	Inhalation of ground gases and vapours which may have migrated off-site	Low	Low	Negligible
	Human (off-site) Residents living adjacent to the proposed development, north of the development area and visitors		Low	Low	Negligible
	Human (off-site) Workers in adjacent commercial properties		Low	Low	Negligible
	Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal)		Low	Low	Negligible
	Human (off-site) Farmers working on nearby agricultural land		Low	Low	Negligible
	Property (on-site) Existing structures and services		Moderate / low	Moderate / low	Negligible

[2] Introduction of this receptor at construction phase automatically triggers a minor adverse effect. However, professional judgement has been exercised and this effect has been reduced to negligible.

Source	Receptor	Pathway	Baseline (current) risk assessment	Construction phase risk assessment (with mitigation)	Effect
	Property (on-site) Future structures and services	Migration of ground gases and vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Receptor not present	Moderate / low risk	Minor adverse
	Property (off-site) Existing structures and services	Migration of ground gases and vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Moderate / low risk	Moderate / low risk	Negligible
	Property (off-site) Tilbury Fort Scheduled Monument		Moderate / low risk	Moderate / low risk	Negligible
Off-site Operation of the former Tilbury B Power Station. This includes potential spills / leaks from machinery, equipment, vehicles and underground cables. Activities relating to the sewage works adjacent west of the proposed development. This includes associated infrastructure such as tanks, filter beds and sludge beds Made Ground associated with the construction of the former Tilbury B Power Station and earthworks adjacent to the eastern boundary of the development area Historical and authorised landfills within study area Agricultural activities within the study area *(A range of inorganic and recalcitrant organic contaminants including heavy metals, hydrocarbons, fuels / oil, PAH, TPH, PCB, coal, asbestos, leachate / sludge, nitrates, sulphates, ammoniacal nitrogen, biological contaminants and the potential for ground gas generation (methane, carbon dioxide, hydrogen sulphide and carbon monoxide)).*	**Human (on-site)** Current workers at and visitors to former Tilbury A Power Station site	Dermal contact with and/or ingestion of contaminants in soil, soil-derived dusts and water Inhalation of contaminants in soils/dust including asbestos fibres Inhalation of ground gases and/or vapours	Low	Receptor not present at construction stage	Negligible[1]
	Human (on-site) Railway maintenance workers		Low	Receptor not present at construction stage	Negligible[1]
	Human (on-site) Workers at electricity substation		Low	Low	Negligible
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage	Receptor not present at construction stage	Negligible
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage	Receptor not present at construction stage	Negligible
	Controlled Waters Principal Bedrock aquifer Secondary A aquifer	Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Moderate / low	Moderate / low	Negligible
		Migration of contaminants via preferential pathways such as via piles to deeper groundwater	Moderate / low	Moderate / low	Negligible
		Lateral migration of contaminants in groundwater.	Moderate / low	Moderate / low	Negligible
	Controlled Waters Various on-site unnamed streams and drainage networks.	Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge	Very low	Very low	Negligible
		Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Very low	Very low	Negligible
		Migration of contaminants via preferential pathways such as service runs to surface water	Very low	Very low	Negligible
		Lateral migration of contaminants in groundwater with discharge to surface water as base flow.	Very low	Very low	Negligible
	Property (on-site) Existing structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Very low	Very low	Negligible
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Very low	Very low	Negligible
	Property (on-site)	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Receptor not present at baseline stage	Very low	Negligible[2]

Source	Receptor	Pathway	Baseline (current) risk assessment	Construction phase risk assessment (with mitigation)	Effect
	Future structures and services	Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Receptor not present at baseline stage	Very low	Negligible[2]

Appendix 15.G: Table 2: Operational Impact Assessment for the proposed development

Source	Receptor	Pathway	Baseline (current) risk assessment	Operational risk assessment	Effect
On-site Historical operation and demolition of the former Tilbury A Power Station. This includes operation of the power station and potential spills / leaks from machinery, equipment, vehicles and underground cables. Railway activities associated with the railway line including associated engine sheds and trains / goods vehicles using the railway line. Made Ground associated with the construction of the former Tilbury A Power Station, the railway line and all associated infrastructure e.g. roads. Activities relating to the former gas works located within the west of the development area. Activities relating to the vehicle maintenance and storage yard to the south of railway line and west of Fort Road. Activities relating to the electricity substation including associated electricity lines and spills from vehicles. Historical tipping in a small area of the northern part of the power station area including ash, clinker, brick, concrete, wood, plastic, fabrics, car tyres, metal and rope. *(A range of inorganic and recalcitrant organic contaminants including heavy metals, hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), Polychlorinated Biphenyls (PCBs), solvents, creosote, asbestos).*	**Human (on-site)** Current workers at and visitors to former Tilbury A Power Station site	Dermal contact with and/or ingestion of contaminants in soil, soil-derived dusts and water Inhalation of contaminants in soils/dust including asbestos fibres Inhalation of ground gases and/or vapours	Moderate / low	Receptor not present at operational stage	Negligible[3]
	Human (on-site) Railway maintenance workers		Moderate / low	Low	Minor beneficial
	Human (on-site) Workers at electricity substation		Moderate / low	Low	Minor beneficial
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage	Low	Negligible[4]
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage	Low	Negligible[5]
	Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works	Dermal contact with and / or ingestion of contaminants in windblown soil-derived dusts and water which may have migrated off-site Inhalation of contaminants in windblown dust including asbestos fibres Inhalation of ground gases and / or vapours which may have migrated off-site	Moderate / low	Low	Minor beneficial
	Human (off-site) Residents living adjacent to the proposed development, north of the development area and visitors		Moderate / low	Low	Minor beneficial
	Human (off-site) Workers in adjacent commercial properties		Moderate / low	Low	Minor beneficial
	Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal)		Moderate / low	Low	Minor beneficial
	Human (off-site) Farmers working on nearby agricultural land		Moderate / low	Low	Minor beneficial
	Controlled Waters Principal Bedrock aquifer Secondary A aquifer	Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Moderate / low	Low	Minor beneficial
		Migration of contaminants via preferential pathways to deeper groundwater	Moderate / low	Low	Minor beneficial
	Controlled Waters River Thames, West Tilbury Main, Bill Meroy Creek, various on-site and off-site unnamed	Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge	Low	Very low	Minor beneficial
		Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Low	Very low	Minor beneficial

[3] Removal of this receptor at operational phase automatically triggers a minor beneficial effect. However, professional judgement has been exercised and this effect has been reduced to negligible.
[4] Introduction of this receptor at operational phase automatically triggers a minor adverse effect. However, professional judgement has been exercised and this effect has been reduced to negligible.
[5] Introduction of this receptor at operational phase automatically triggers a minor adverse effect. However, professional judgement has been exercised and this effect has been reduced to negligible.

Source	Receptor	Pathway	Baseline (current) risk assessment	Operational risk assessment	Effect
	streams and drainage networks and off-site ponds	Migration of contaminants via preferential pathways to surface water	Low	Very low	Minor beneficial
	Property (on-site) Existing structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Low	Very low	Minor beneficial
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Low	Very low	Minor beneficial
	Property (on-site) Future structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Receptor not present at baseline stage	Very low	Negligible[4]
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Receptor not present at baseline stage	Very low	Negligible[4]
	Property (off-site) Existing structures and services	Direct contact of new and existing structures with contaminants in groundwater	Very low	Very low	Negligible
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Low	Very low	Minor beneficial
	Property (off-site) Tilbury Fort Scheduled Monument	Direct contact of new and existing structures with contaminants in groundwater	Very low	Very low	Negligible
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Very low	Very low	Negligible
On-site Ground gas associated with peat and organic-rich alluvium underlying the site Ground gas and vapours from Made Ground associated with former Tilbury A Power Station (*Methane and carbon dioxide*)	**Human (on-site)** Current workers and visitors to former Tilbury A Power Station	Inhalation of ground gases and vapours	Low	Receptor not present at operational stage	Negligible[3]
	Human (on-site) Railway maintenance workers		Low	Low	Negligible
	Human (on-site) Workers at electricity substation		Low	Low	Negligible
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage	Low	Negligible[4]
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage	Low	Negligible[4]
	Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works	Inhalation of ground gases and vapours which may have migrated off-site	Low	Low	Negligible
	Human (off-site) Residents living adjacent to the proposed development, north of the development area		Low	Low	Negligible
	Human (off-site) Workers in adjacent commercial properties		Low	Low	Negligible

Source	Receptor	Pathway	Baseline (current) risk assessment	Operational risk assessment	Effect
	Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal)		Low	Low	Negligible
	Human (off-site) Farmers working on nearby agricultural land		Low	Low	Negligible
	Property (on-site) Existing structures and services	Migration of ground gases and vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Moderate / low	Moderate / low	Negligible
	Property (on-site) Future structures and services		Receptor not present at baseline stage	Moderate / low	Negligible[4]
	Property (off-site) Existing structures and services	Migration of ground gases and vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Moderate / low	Moderate / low	Negligible
	Property (off-site) Tilbury Fort Scheduled Monument		Moderate / low	Moderate / low	Negligible
Off-site Operation of the former Tilbury B Power Station. This includes potential spills / leaks from machinery, equipment, vehicles and underground cables. Activities relating to the sewage works adjacent west of the proposed development. This includes associated infrastructure such as tanks, filter beds and sludge beds Made Ground associated with the construction of the former Tilbury B Power Station and earthworks adjacent to the eastern boundary of the development area Historical and authorised landfills within study area Agricultural activities within the study area *(A range of inorganic and recalcitrant organic contaminants including heavy metals, hydrocarbons, fuels / oil, PAH, TPH, PCB, coal, asbestos, leachate / sludge, nitrates, sulphates, ammoniacal nitrogen, biological contaminants and the potential for ground gas generation (methane, carbon dioxide, hydrogen sulphide and carbon monoxide)).*	**Human (on-site)** Current workers at and visitors to former Tilbury A Power Station site	Dermal contact with and/or ingestion of contaminants in soil, soil-derived dusts and water Inhalation of contaminants in soils/dust including asbestos fibres Inhalation of ground gases and/or vapours	Low	Receptor not present at operational stage	Negligible[3]
	Human (on-site) Railway maintenance workers		Low	Low	Negligible
	Human (on-site) Workers at electricity substation		Low	Low	Negligible
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage	Low	Negligible[4]
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage	Low	Negligible[4]
	Controlled Waters Principal Bedrock aquifer Secondary A aquifer	Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Moderate / low	Moderate / low	Negligible
		Migration of contaminants via preferential pathways such as via piles to deeper groundwater	Moderate / low	Moderate / low	Negligible
		Lateral migration of contaminants in groundwater.	Moderate / low	Moderate / low	Negligible
	Controlled Waters Various on-site unnamed streams and drainage networks.	Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge	Very low	Very low	Negligible
		Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Very low	Very low	Negligible
		Migration of contaminants via preferential pathways such as service runs to surface water	Very low	Very low	Negligible
		Lateral migration of contaminants in groundwater with discharge to surface water as base flow.	Very low	Very low	Negligible
	Property (on-site)	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Very low	Very low	Negligible

Source	Receptor	Pathway	Baseline (current) risk assessment	Operational risk assessment	Effect
	Existing structures and services	Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Very low	Very low	Negligible
	Property (on-site) Future structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Receptor not present at baseline stage	Very low	Negligible[4]
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces	Receptor not present at baseline stage	Very low	Negligible[4]