

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

PROPOSED PORT TERMINAL AT FORMER TILBURY POWER STATION

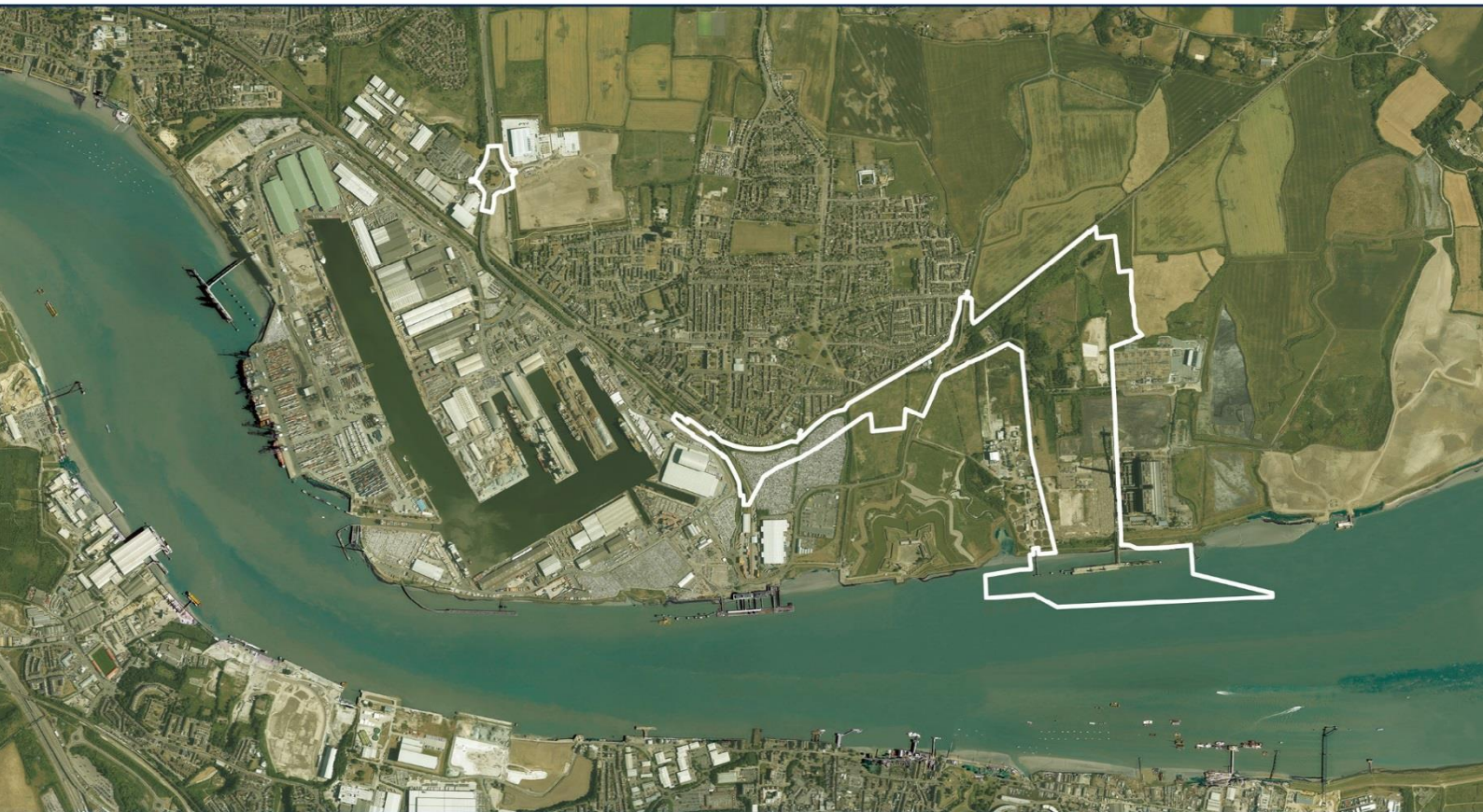
TILBURY2

TR030003

VOLUME 6 PART B

ES APPENDIX 15.F: HYDROGEOLOGY AND GROUND CONDITIONS CHAPTERS CSMS

DOCUMENT REF: 6.2 15.F



Appendix 15.F: Table 1: Land contamination CSM and risk assessment during the baseline, construction and operational phases for the proposed development

| Source | Receptor | Pathway | Baseline | | | Construction without mitigation | | | Mitigation measures | Construction with mitigation | | | Operation (including maintenance) (assuming all mitigation undertaken prior to and during construction) | | |
|--|--|--|--|-------------|----------------------------|--|-------------|----------------------|---|--|-------------|----------------------------|---|-------------|-----------------|
| | | | Probability | Consequence | Risk | Probability | Consequence | Risk | | Probability | Consequence | Risk | Probability | Consequence | Risk |
| <p>On-site</p> <p>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.</p> <p>Railway activities associated with the railway line including associated engine sheds and trains / goods vehicles using the railway line.</p> <p>Made Ground associated with the construction of the former Tilbury A Power Station, the railway line and all associated infrastructure e.g. roads.</p> <p>Activities relating to the former gas works located within the west of the development area.</p> <p>Activities relating to the vehicle maintenance and storage yard to the south of railway line and west of Fort Road.</p> <p>Activities relating to the electricity substation including associated electricity lines and spills from vehicles.</p> <p>Historical tipping in the northern part of the power station area including ash, clinker, brick, concrete, wood, plastic, fabrics, car tyres, metal and rope.</p> <p><i>(A range of inorganic and recalcitrant organic contaminants including heavy metals,</i></p> | <p>Human (on-site)</p> <p>Current workers at and visitors to former Tilbury A Power Station site</p> | <p>Dermal contact with and/or ingestion of contaminants in soil, soil-derived dusts and water</p> <p>Inhalation of contaminants in soils/dust including asbestos fibres</p> <p>Inhalation of ground gases and/or vapours</p> | Low likelihood | Medium | Moderate / low risk | Receptor not present at construction stage | | -- | <p>Further ground investigation and risk assessment to define risks.</p> <p>Remediation / removal of existing contamination if risk assessments deem necessary.</p> <p>Implementation of measures in the Construction Environmental Management Plan (CEMP).</p> <p>Site will mostly be covered in hardstanding or compacted aggregate which will minimise dust, infiltration.</p> | Receptor not present at construction stage | | -- | Receptor not present at operation stage | | -- |
| | <p>Human (on-site)</p> <p>Railway maintenance workers</p> | | Low likelihood | Medium | Moderate / low risk | Receptor not present at construction stage | | - | | Receptor not present at construction stage | | - | Unlikely | Medium | Low risk |
| | <p>Human (on-site)</p> <p>Workers at electricity substation</p> | | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk |
| | <p>Human (on-site)</p> <p>Future workers at / users of the new port facilities</p> | | Receptor not present at baseline stage | | -- | Receptor not present at construction stage | | -- | | Receptor not present at construction stage | | -- | Unlikely | Medium | Low risk |
| | <p>Human (on-site)</p> <p>Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor</p> | | Receptor not present at baseline stage | | -- | Receptor not present at construction stage | | -- | | Receptor not present at construction stage | | -- | Unlikely | Medium | Low risk |
| | <p>Human (off-site)</p> <p>Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works</p> | <p>Dermal contact with and / or ingestion of contaminants in windblown soil-derived dusts and water which may have migrated off-site</p> <p>Inhalation of contaminants in windblown dust including asbestos fibres</p> <p>Inhalation of ground gases and / or vapours which may have migrated off-site</p> | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk |
| | <p>Human (off-site)</p> <p>Residents living adjacent to the proposed development, north of the development area and visitors</p> | | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk |
| | <p>Human (off-site)</p> <p>Workers in adjacent commercial properties</p> | | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk |

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| <p><i>hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), Polychlorinated Biphenyls (PCBs), solvents, creosote, asbestos).</i></p> | <p>Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal)</p> | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk | |
| | <p>Human (off-site) Farmers working on nearby agricultural land</p> | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk | |
| | <p>Controlled Waters Principal Bedrock aquifer Secondary A Aquifer</p> | <p>Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers</p> | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | Further ground investigation and risk assessment to define risks. Remediation / removal of existing contamination if risk assessments deem necessary. | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk |
| | | <p>Migration of contaminants via preferential pathways such as via piles to deeper groundwater</p> | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | Piling risk assessment. Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. | Low likelihood | Medium | Moderate / low risk | Unlikely | Medium | Low risk |
| | <p>Controlled Waters River Thames, Thames Estuary, West Tilbury Main, Bill Meroy Creek, various on-site and off-site unnamed streams and drainage networks, on-site and off-site ponds</p> | <p>Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge</p> | Low likelihood | Mild | Low risk | Likely | Mild | Moderate / low risk | Further ground investigation and risk assessment to define risks. Remediation / removal of existing contamination if risk assessments deem necessary. | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | | <p>Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers</p> | Low likelihood | Mild | Low risk | Likely | Mild | Moderate / low risk | Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | | <p>Migration of contaminants via preferential pathways such as service runs to surface water</p> | Low likelihood | Mild | Low risk | Likely | Mild | Moderate / low risk | | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | <p>Property (on-site) Existing structures and services</p> | <p>Direct contact of new and existing structures with contaminants in soils and/or groundwater</p> | Low likelihood | Mild | Low risk | Likely | Mild | Moderate / low risk | Further ground investigation and risk assessment to define risks. | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |

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| | | 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 | Low likelihood | Mild | Low risk | Likely | Mild | Moderate / low risk | Remediation / removal of existing contamination if risk assessments deem necessary. Appropriate assessment and design of services resistant to chemical attack if risk assessments deem necessary. | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | Property (on-site) Future structures and services | Direct contact of new and existing structures with contaminants in groundwater | Receptor not present at baseline stage | | -- | Likely | Mild | Moderate / low risk | Additional monitoring risk assessment to determine mitigation measures which may need to be incorporated into design of buildings and services if required. | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | | 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 | | -- | Likely | Mild | Moderate / low risk | | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | Property (off-site) Existing structures and services | Direct contact of new and existing structures with contaminants in soils and/or groundwater | Low likelihood | Minor | Very low risk | Likely | Minor | Low risk | Remediation / removal of existing contamination if risk assessments deem necessary. | Low likelihood | Minor | Very low risk | Unlikely | Minor | Very low risk |
| | | 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 | Low likelihood | Mild | Low risk | Likely | Mild | Moderate / low risk | Appropriate assessment and design of services resistant to chemical attack if risk assessments deem necessary. Additional monitoring risk assessment to determine mitigation measures which may need to be incorporated into design of buildings and services if required. | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk |
| | Property (off-site) Tilbury Fort Scheduled Monument | Direct contact of new and existing structures with contaminants in soils and/or groundwater | Unlikely | Minor | Very low risk | Low likelihood | Minor | Very low risk | Additional monitoring risk assessment to determine mitigation measures which may need to be incorporated into design of buildings and services if required. | Low likelihood | Minor | Very low risk | Unlikely | Minor | Very low risk |
| | | 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 | Unlikely | Minor | Very low risk | Low likelihood | Minor | Very low risk | | Low likelihood | Minor | Very low risk | Unlikely | Minor | Very low risk |
| On-site Ground gas associated with peat and organic-rich alluvium underlying the site | Human (on-site) Current workers and visitors to former Tilbury A Power Station site | Inhalation of ground gases and vapours | Unlikely | Medium | Low risk | Receptor not present at construction stage | | - | Additional ground gas and vapour monitoring and risk assessments to identify mitigation | Receptor not present at construction stage | | - | Receptor not present at operation stage | | |

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|---|---|---|--|--------|----------|--|--------|-------------------|--|--|--------|----------|----------|--------|----------|
| Ground gas and vapours from Made Ground associated with former Tilbury A Power Station (Methane and carbon dioxide ground gas and vapours) | Human (on-site) Railway maintenance workers | | Unlikely | Medium | Low risk | Receptor not present at construction stage | | - | measures to be incorporated into design of buildings and services, if required. | Receptor not present at construction stage | | - | Unlikely | Medium | Low risk |
| | Human (on-site) Workers at electricity substation | | Unlikely | Medium | Low risk | Low likelihood | Medium | Moderate/low risk | | Unlikely | Medium | Low risk | Unlikely | Medium | Low risk |
| | Human (on-site) Future workers at / users of the new port facilities | | Receptor not present at baseline stage | | - | Receptor not present at construction stage | | - | | Receptor not present at construction stage | | - | Unlikely | Medium | Low risk |
| | 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 | | - | | Receptor not present at construction stage | | - | Unlikely | Medium | Low risk |
| | Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works | Inhalation of ground gases which may have migrated off-site | Unlikely | Medium | Low risk | Low likelihood | Medium | Moderate/low risk | Additional ground gas and vapour monitoring and risk assessment to identify mitigation measures to be incorporated into design of buildings and services, if required. | Unlikely | Medium | Low risk | Unlikely | Medium | Low risk |
| | Human (off-site) Residents living adjacent to the proposed development, north of the development area and visitors | | Unlikely | Medium | Low risk | Low likelihood | Medium | Moderate/low risk | | Unlikely | Medium | Low risk | Unlikely | Medium | Low risk |
| | Human (off-site) Workers in adjacent commercial properties | | Unlikely | Medium | Low risk | Low likelihood | Medium | Moderate/low risk | | Unlikely | Medium | Low risk | Unlikely | Medium | Low risk |
| | Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal) | | Unlikely | Medium | Low risk | Low likelihood | Medium | Moderate/low risk | | Unlikely | Medium | Low risk | Unlikely | Medium | Low risk |
| | Human (off-site) Farmers working on nearby agricultural land | | Unlikely | Medium | Low risk | Low likelihood | Medium | Moderate/low risk | | Unlikely | Medium | Low risk | Unlikely | Medium | Low risk |

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|--|--|---|--|--------|----------------------------|--|--------|---------------------------|--|--|----------|----------------------------|---|----------------------|----------------------------|----------------------------|
| | Property (on-site) Existing structures and services | Migration of ground gases 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 | Unlikely | Severe | Moderate / low risk | Low likelihood | Severe | Moderate risk | Additional ground gas and vapour monitoring and risk assessment to identify mitigation measures to be incorporated into design of buildings and services, if required. | Unlikely | Severe | Moderate / low risk | Unlikely | Severe | Moderate / low risk | |
| | Property (on-site) Future structures and services | Migration of ground gases 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 | | - | Low likelihood | Severe | Moderate risk | | Unlikely | Severe | Moderate / low risk | Unlikely | Severe | Moderate / low risk | |
| | Property (off-site) Existing structures and services | Migration of ground gases 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 | Unlikely | Severe | Moderate / low risk | Unlikely | Severe | Moderate/ low risk | | Additional ground gas and vapour monitoring and risk assessment to identify mitigation measures to be incorporated into design of buildings and services, if required. | Unlikely | Severe | Moderate / low risk | Unlikely | Severe | Moderate / low risk |
| | Property (off-site) Tilbury Fort Scheduled Monument | Migration of ground gases 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 | Unlikely | Severe | Moderate / low risk | Low likelihood | Severe | Moderate risk | | | Unlikely | Severe | Moderate / low risk | Unlikely | Severe | Moderate / low risk |
| 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 | 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 likelihood | Mild | Low risk | Receptor not present at construction stage | | -- | RAMS to be completed prior to construction and risks managed with appropriate personal protective equipment (PPE). | Receptor not present at construction stage | | -- | Receptor not present at operation stage | | -- | |
| | Human (on-site) Railway maintenance workers | | Low likelihood | Mild | Low risk | Receptor not present at construction stage | | - | | Receptor not present at construction stage | - | Unlikely | Mild | Very low risk | | |
| | Human (on-site) Workers at electricity substation | | Low likelihood | Mild | Low risk | Likely | Mild | Moderate/ low risk | | Low likelihood | Mild | Low risk | Unlikely | Mild | Very low risk | |
| | Human (on-site) Future workers at / users of the new port facilities | | Receptor not present at baseline stage | | -- | Receptor not present at construction stage | | -- | | Receptor not present at construction stage | | -- | Unlikely | Mild | Very low risk | |

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|--|--|--|--|--------|--|----------|--------|--|---|----------------|---------------|---------------------|----------------|---------------|---------------------|
| <p>construction of the former Tilbury B Power Station and earthworks adjacent to the eastern boundary of the development area</p> <p>Historical and authorised landfills within study area</p> <p>Agricultural activities within the study area</p> <p>(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)).</p> | <p>Human (on-site)</p> <p>Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor</p> | | Receptor not present at baseline stage | -- | Receptor not present at construction stage | -- | | Receptor not present at construction stage | -- | Unlikely | Mild | Very low risk | | | |
| | <p>Controlled Waters</p> <p>Principal Bedrock aquifer</p> <p>Secondary A aquifer</p> <p>Secondary</p> | Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | Further ground investigation and risk assessment to define risks. Remediation / removal of existing contamination if risk assessments deem necessary. | Low likelihood | Medium | Moderate / low risk | Low likelihood | Medium | Moderate / low risk |
| | | Migration of contaminants via preferential pathways | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Low likelihood | Medium | Moderate / low risk |
| | | Lateral migration of contaminants in groundwater. | Low likelihood | Medium | Moderate / low risk | Likely | Medium | Moderate risk | | Low likelihood | Medium | Moderate / low risk | Low likelihood | Medium | Moderate / low risk |
| | <p>Controlled Waters</p> <p>Various on-site unnamed streams and drainage networks.</p> | Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | |
| | | Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | |
| | | Migration of contaminants via preferential pathways | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | |
| | | Lateral migration of contaminants in groundwater with discharge to surface water as base flow. | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | Unlikely | Mild | Very low risk | |
| | <p>Property (on-site)</p> <p>Existing structures and services</p> | Direct contact of new and existing structures with contaminants in groundwater | Unlikely | Minor | Very low risk | Unlikely | Minor | Very low risk | N/A | Unlikely | Minor | Very low risk | Unlikely | Minor | Very low risk |
| | | 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 | Unlikely | Minor | Very low risk | Unlikely | Minor | Very low risk | | Unlikely | Minor | Very low risk | Unlikely | Minor | Very low risk |

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|--|---|--|--|----|----------|-------|----------------------|--|----------|-------|----------------------|----------|-------|----------------------|
| | | buildings, service ducts or access points | | | | | | | | | | | | |
| | 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 | -- | Unlikely | Minor | Very low risk | | Unlikely | Minor | Very low risk | Unlikely | Minor | Very low risk |
| | | 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 | -- | Unlikely | Minor | Very low risk | | Unlikely | Minor | Very low risk | Unlikely | Minor | Very low risk |