

ECI Briefing Note: Planning for Work on Brownfield Sites



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*ECI Safety, Health and Environment
Task Force Briefing Note
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Planning for work on Brownfield Sites

(Projects on previously developed land)

Introduction

This guidance note relates to the planning of work on Brownfield sites, information which should be sought through this phase and the key stages that should be considered prior to construction work commencing.

The guidance relates specifically to onshore projects yet some of the principles, advice and best practice within the document can be transferred to the offshore sector.

This document gives ECI members guidance on

- Site History/Previous Use
- Potential Impact on and from surroundings
- Environmental Assessment
- Ground Investigation
- Remediation
- Preparation for Construction
- Security

Throughout the document we will refer to specialist contractors, surveyors, organisations etc. These specialists should be competent and experienced to undertake the work.

Previous experience of working within a Brownfield site environment should be considered when appointing such competent contractors.

A Brownfield Site can be defined as "previously developed land" that has the potential for being redeveloped. It is often (but not always) land that has been used for industrial and/or commercial purposes and is now derelict and possibly contaminated.

"Brownfield Sites are all about the unknown"

A ground investigation that was carried out on a Brownfield Site in Scotland revealed some underground voids that had been created during previous mining work which had taken place over a hundred years ago. There were no records of this. Before construction could commence the voids had to be filled with 100,000 cubic metres of concrete.

Apart from the Safety, Health and Environmental (SHE) implications, there may be significant commercial considerations associated with developing Brownfield Sites requiring careful project risk assessment and management.

This note should be used in conjunction with the Safety, Health & Environment (SHE) Management Guide and the ECI SHE Guidance Note 001 – SHE Leadership and Motivation. The aim is that it can be used by all levels of management, supervision or individuals in an organisational context, or on an individual project.

Brownfield Site History/Previous Use

At the detailed planning stage ensure all hazards and risks are considered prior to remediation on a Brownfield Site. It is important that information from the landowner, occupier, previous occupiers, tenant or client is obtained, verified and reviewed and any information gaps identified.

Many clients undertake due diligence exercises before purchase, lease or signing of contracts. These usually contain information on historical issues, post operational hazards, environmental hazards (e.g. contaminated land) and may signpost to registers that can be useful at the initial review stage of a project.

When establishing the site history, sufficient time and resources should be allocated to ensure that all relevant information is collated to get a full understanding of the site's previous uses to determine potential health, safety and environmental hazards.

Examples include asbestos, toxic chemicals, lead and methane.

Asbestos

Asbestos was widely used as a building material throughout the 20th Century when the risks associated with the material were not fully appreciated prior to the banning of its use as a construction material in most countries. It is therefore essential to understand the previous use of asbestos within specific regions/countries. It is worth considering that asbestos can also be found buried in the ground and in many cases this may not have been recorded.

Where it is suspected that asbestos may be present then an asbestos survey will need to be carried out by a specialist contractor.

Much guidance exists on dealing with asbestos and readers of this guidance are encouraged to look at other regulatory and industry information sources.

It is important to appreciate that persons who are exposed to the inhalation of asbestos fibres are at risk of contracting asbestos-related diseases. These diseases are currently responsible for around 4,000 deaths a year, in the UK alone.

During the initial review stage a thorough survey/assessment should be undertaken across the area of site which will be remediated to determine the extent, type, condition and spread (if ground or loose contamination) of asbestos.

Toxic Chemicals and Hydrocarbon vapours

A chemical plant, for instance, could have residual contamination, which may or may not be known. Disturbance of the ground could result in the release of contaminated airborne dust. The processing and crushing of rubble can also release dust. The disposal or the re-use of crushed material needs to be considered as it may still be contaminated even after being treated.

A process plant could have residual Hydrocarbons, flammable and toxic gasses which if ignited following a release have the potential to cause a major fire or explosion.

Typical examples of contamination could include solvents, acids, alkalis, metals, phenols, hydrocarbons, cyanides, Poly chlorinated Biphenyls (PCB's). Each of the examples identified will require different control measures in accordance with available guidance.

Pipe work, ductwork and other plant & equipment may also be contaminated requiring special measures – this may have very significant commercial implications.

Lead

Where buildings are being dismantled there is a significant risk that hot cutting of steel structures coated with lead paint or contaminated with lead compounds in a dust form will give off lead fume which can be inhaled and could result in elevated levels of lead in blood. Similar risks arise when hot cutting steel or equipment which has been galvanised or coated with special paints.

Portable isotopic X-ray fluorescent (XRF-i) testing is a cost effective method for determining the presence and concentration of lead. Once identified If removal has been specified, infrared stripping is preferable to abrasive, blast or solvent techniques that produce hard-to-contain residues

Lead contaminated waste (including soil) needs special consideration. To avoid time and cost implications, disposal should be discussed with all relevant parties at an early stage

Prior to the demolition of a former chemical production building the paint was sampled and did not contain lead, however the dust on all the steelwork was lead stearate, a waste product of the former process. This produced fume when cut with a high temperature torch. Four workers had elevated lead blood levels which produced various symptoms of lead poisoning. The client and the contractor were prosecuted and fined several thousand Euro..

In some instances there may be less common hazards including but not limited to:

- Anthrax, if the site had previously been used to keep livestock / cattle. Fortunately anthrax is now a rare bacterial infection. Anthrax spores can arise during work on land previous used cattle or where anthrax contaminated carcasses may have been buried.
- Leptospirosis (Weil's disease) may be present in stagnant water.
- Unexploded bombs could remain in the ground from previous conflicts and exercises. Previous ordnance/munitions factories would present specific hazards.
- Radioactive contamination and man-made radioactive sources (common on chemical and production plant) may also need to be considered as would the potential for exposure to naturally occurring radon gas.

The location of any underground or overhead services should be established by studying existing drawings/plot plans or by using specialist surveyors.

- Water, electricity, gas, telecoms, drains, ducting, culverts, voids
- Overhead electric cables
- Overhead pipe-bridges
- Nearby railways with high voltage overhead electric cables

Previous mining activities or waste disposal sites should also be identified and considered. Local knowledge can also be useful in identifying potential hazards.

A contractor in a major capital city was undertaking excavation operations close to a main railway facility with a significant number of underground tunnels and facilities. Whilst a lot of information had been gathered and collected from a large number of sources, too much trust had been placed on what was assumed as factual documentation rather than undertaking a detailed assessment and test of that information.

Because of this the contractor caused major disruption to the local population and commuters around the area when it struck a major high pressurised gas utility line and broke into a operating rail tunnel a number of metres below ground.

The impact and delay this caused the project was only equal to the reputational impact and adverse publicity for this significant project.

Impact on and from surroundings

Consideration should be given to surrounding infrastructure, the local community and environment as well as potential impacts from remediation/construction activities. There may also be a need to consider nearby local housing and schools, etc.

A Brownfield Site development may be within or adjacent to the boundary/footprint of an operational facility and in this case co-operation and co-ordination with the existing operator will play a major factor.

It is good practise to undertake sampling at man-made waterbodies such as site drainage systems and natural waterbodies such as local streams, etc before, during &

after work to establish baseline measurements and subsequent results.

These results can be to prove that no pollution has been caused during this phase of the project.

Environmental Assessment

All Brownfield Sites should be environmentally assessed by a specialist organisation before they can be redeveloped. This involves an analysis of the soil, groundwater and surface water through testing for hazardous compounds, and ensures that appropriate measures are taken to reduce identified risks and liabilities. Any development plans must be compliant with local regulations.

A contractor had undertaken a very detailed analysis of site environment and ecological conditions but had failed to fully assess the impact on local and adjacent surroundings.

When the contractor moved an amount of site spoil to a temporary lay-down area they failed to acknowledge the behaviour of the natural habitat, and when actual work was scheduled to be executed they were immediately halted when it was identified that a clan of badgers (a threatened and protected species in the United Kingdom), had made home in the mound of soil to breed.

The impact to the project was that this forced an unplanned delay of over six months onto the project schedule with subsequent costs, production impact, public interest, and loss of reputation.

Ground Investigation

If the information is not readily available in the form of site history it would be advisable that contractors who carry out initial surveys and ground investigations should consider the precautions they need to take, bearing in mind that at this stage they may not know the level and extent of any contamination.

A suitable and sufficient risk assessment should be produced for all ground investigations, remediation and potential impacts on construction and decommissioning work.

Aspects such as the provision of protective clothing, washing and changing facilities, gas detection and entry into confined spaces in these circumstances need to be considered.

Soil samples for contamination should be taken in order to establish the presence of any heavy metals, hydrocarbons, asbestos, etc.

Remediation work on a housing estate, built on the site of a former gas works did not commence until two years after the original contamination was discovered due to ongoing legal proceedings. This resulted in a settlement of approximately €150,000 from the original owner to the client in order to remediate the land.

It was found the site was contaminated with benzene, naphthalene, petroleum hydrocarbons and cyanide. This highlights the need for robust previous use checks.

Remediation

Remediation of a Brownfield Site is the removal, containment or treatment of all known contaminants to levels prescribed safe for human health and the environment. Redevelopment can only occur after all environmental health risks have been assessed and mitigated.

A specialist company undertook testing on two former coal mining sites in the UK. The assessment enabled the re-use of existing site materials as part of the land remediation process, which subsequently led to reduced costs of approximately €4,250,000. In addition, approximately 3,750 lorry trips to landfill were avoided and 105 tonnes of CO₂ were saved.

Where plant/vehicles are used for ground investigation or land remediation care should be taken to prevent the spread of contamination by vehicle movements creating airborne contamination (dust) or the spread of material from the site onto nearby roads (mud). Potential contamination of this nature should be controlled by water suppression and/or wheel wash facilities.

Where ground remediation is not considered necessary it is worth noting that there may still be a presence of underground services and structures that need to be identified and dealt with. Existing structures may need to be dismantled or demolished as part of the preparation of the site for future construction.

Prior to remediation the environmental aspects and impacts associated with the remediation process should be considered. These will create risks that need to be

considered and dealt with prior to construction. The disposal of any waste will also need to be managed in order to ensure that it is disposed of properly and in compliance with applicable laws/regulations. This may have significant implications for the project.

Ecological aspects such as the flora and fauna will need to be taken into account. Some flora and fauna may be protected by law (trees, plants, bats, newts, etc).

A Natterjack toad colony (a protected species in the UK) was located within the boundary of a site. As part of the planning permission procedure to enable a major construction project to be granted approval, the project had to relocate the colony to a purpose built habitat just off site, constructed and funded by the client, and now managed by a specialist society.

The removal of invasive plant species such as Japanese Knotweed/Hogweed etc. may need to be considered. It is worth noting that archaeological finds or sites of cultural heritage or scientific significance can potentially result in work being delayed. A proactive approach by engaging with heritage bodies may mitigate the effects.

Archaeology & construction don't usually mix well. A major construction project with an excavation area of 100Ha decided to face this challenge 'head-on'. Working together with 80 archaeologists they used satellite technology to map site & mark locations. The Client provided access and facilities for cleaning and sifting artefacts along with IT logging of data.

The findings revealed a Prehistoric & Roman landscape. The benefit of studying such a large area was to understand how people lived. 80,000 artefacts were found and there was a successful phased hand-over to construction.

Detailed records should be kept identifying any residual risks from contamination along with the location of any remaining services or structures. This information should be made available to stakeholder such as the land owner / construction contractor.

Preparation for Construction

There should be a final review of all documentation/information prior to construction which should involve the client, main contractor and other contractors. There may be a need for further consultation with the local community and other stakeholders before any construction work commences.

As a minimum, in addition to requirements for all projects, the pre-construction review for Brownfield Sites should consider the following:

- Information from previous use and remediation
- Processes, pipe bridges, overhead electrics
- Surrounding and site specific infrastructure
- Unstable or insecure structures
- Ground stability
- Working with local community re impacts
- Planning and environmental restrictions
- Emergency arrangements prepared for the particular risks, for example
 - Site security – local police
 - Welfare and medical facilities
- Issues and special residual hazards identified during ground investigations, surveys and remediation works

The Project's Emergency Plan should include procedures to deal effectively with any emergencies that might arise including environmental incidents.

Once all of the points above have been established the risks associated with carrying out construction work can be considered. This should be in the form of a risk assessment which would highlight any areas of significant risk to those carrying out construction.

Security & Public Safety

The site should be secured in order to prevent unauthorised access. Thought should be given to preventing children accessing the site particularly at weekends, evenings and school holidays. On a Brownfield site, the risks resulting from unauthorised access may be significantly greater than for other projects.

There may be a significant period between the completion of ground investigation and the commencement of remediation or construction, and therefore security and safety of the site should be an ongoing consideration.

In the intervening period between the sale and development of a former 19th century industrial complex there was unauthorised access and occupation which resulted in additional damage to the structures, contamination and legal costs. The consequential clean up (including major asbestos decontamination) cost approximately €400,000.

Further unanticipated costs arose due to the need for additional fencing and security to keep out children and to secure the site. There was an additional ongoing site security presence to deter occupation and vandalism which cost a further €150,000.

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For further information about the SHE task force and SHE publications please visit

<http://www.eci-online.org/task-forces/shehome.php>

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If you do this, please acknowledge the ECI SHE Task Force.



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