



Remediation Techniques

CHURNGOLD
your remediation partners

The following techniques could all be used to treat hydrocarbons and have been used by CRL during recent contracts

- Physical
- Biological
- Chemical
- Thermal

Remediation Techniques



- PHYSICAL
- Pump and treat
- Vacuum extraction

Remediation Techniques



BIOLOGICAL

- ex-situ - windrows
biopiles
- In-situ - air sparging
direct oxygen infusion
electrolytic oxygen addition
oxygen release compounds

Remediation Techniques



CHEMICAL – Oxidants

- Sodium Persulphate
- Sodium Percarbonate
- Potassium Permanganate
- Activated hydrogen peroxide
- Chelated Iron Catalysts (Activator)
- Ozone

Remediation Techniques



THERMAL

- Steam Enhanced Remediation
- Used with air sparging, dual phase vacuum extraction, soil vapour extraction, hydrous pyrolysis
- Rapid (and high level) treatment of compounds such as xylene, chlorinated solvents, chlorobenzene and dichlorobenzene, creosote and other VOC and SVOC compounds

Technology Acceptance



- What is unique about all these technologies
- We have used them all in the last 4 years to remediate sites across the UK !!
- Poorly presented technology selection is no different to a refused planning permission based on lack of information and clarity of proposal
- Make the case – they cannot reject it without good sound technical reason

Technology Selection



- Do we have numerous case studies for each technology – NO
- WHY?
- Because every site is unique and Client demands are unique for each site
- Present the Options and let the Client decide what time and cost option suits them best
- Present a single strategy to the EA and EHO for approval (unless you are unsure of time frame to start in which case you may want to identify more than one to provide you flexibility)

Ex-Situ Bioremediation



- **Cardiff International Sports Village**
- 27,000m³ of hydrocarbon (mainly diesel) impacted silty soils
- Mixed use development on prominent development site

- **Halesowen for Kendrick Homes**
- Housing development site
- 4,000m³ of heavy end TPH impacted mixed soils
- Overall saving against dig and dump of £50k

In-situ Bioremediation



Direct Oxygen Infusion - Purley Way, Croydon

- Installed beneath a well known computer store during construction of extension
- Treating benzene plume from adjacent benzol plant

- Induced dissolved oxygen levels of 30-40ppm
- Almost immediate increase in bacteria count confirming suitable conditions for bioremediation

In-situ Bioremediation



Electrolytic Oxygen Addition – CISV, Nottingham and SA

- 68,000m³ of hydrocarbon impacted groundwater
- Bio-electrolysis – split H₂O into H₂ and O₂
- Induced dissolved oxygen levels of 10-20ppm
- Draws in contaminated water hence impacted groundwater is oxygenated directly
- Achieved clean up within required timeframe

Steam Injection



- Steam generally enhances physical recovery techniques such as DPVE by making the contaminants more available for capture while at the same time desorbing contaminants off the soils thus achieving a higher level of clean up
- It is also rapid generally halving (or better) the time to achieve regulatory sign off
- It does not have rebound issues

Steam Injection



- West Drayton – xylene impacted clay soils
Former industrial site going for housing
- Manchester – complex mix of VOC's
(chlorobenzene and toluene)
Former industrial site going for housing
- Burton-Upon-Trent – creosote
Former wood preservative yard being developed for retail

Chemical Oxidation



Like steam, chemical oxidation is a relatively rapid technique that can treat a number of contaminants but can struggle with high levels of free product
CRL have now used a range of oxidants for various sites for various end uses eg

- Industrial Site in West London – COC was TCA and TCE
- Oxidant used was pH activated sodium persulphate
- Treatment targets achieved in 3 months
- Building was still up so was completed prior to demolition

Chemical Oxidation



Former PFS – West London

- Dissolved phase benzene impacted clayey sand
- Oxidant used was hydrogen peroxide (quick) and sodium persulphate (persistent) activated with iron citrate
- Targets achieved after one round of injection
- Awaiting sign off (3 months)

Former Chemical Works NW England

- VOC's such as chlorobenzene, dichlorobenzene and chlorinated solvents
- Oxidants are lime activated sodium persulphate and sodium percarbonate
- Treatment of 50,000m³ in 6 months

Conclusion



Many options for treatment with ever growing list of successful applications

There are alternatives to DIG AND DUMP