# Contaminated Land:The Regulatory Process


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# EPA: Who are we?

- Office of Climate Licensing and Resource Use (OCLR)
  - Licence public authority and private sector waste facilties
    - 3rd and 4th schedules of WMA
    - Make decisions in the waste area – Artilcle 11s, etc.
    - Advice and guidance
  - Licence IPPC operations
- Office of Environmental Enforcement (OEE)
  - Enforcement of Licences
    - Oversee day to day issues of sites – within scope of licence
    - Work with licensees to ensure environmental compliance
    - Take enforcement action including prosecution when necessary
  - Public Authority Enforcement
    - Ensure Local Authorities meet their legislataive obligations
- Office of Environmental Assessment (OEA)
  - Monitor and report on our environment
  - Assessment
    - Land Use/GIS

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# Competent Authority – The EPA's Role

- Agency deal with Waste Licensed or IPPC licensed sites
- Agency implement policy – doesn't set it
- No legal remit to set national contaminated soil standards
  - Nor does anyone else at present
- Do set cleanup targets for sites under our remit based on site specific issues
  - Several sites with contamination issues to varying extents of seriousness and risk
  - P0271-01  A.T. Cross Ballinasloe - VOC contamination
  - W0100-01 & W0108-01 Dublin Docklands - Gasworks Remediation
  - Environmental Liability Conditions of licences – OEE
- Provide information and advice
  - Informal
  - Sometimes as expert witness/adjudicator

# Competent Authority – The EPA's Role……contd

- *Do I need a licence?…..Article 11 Declarations*

  *of the Waste Management (Facility Permit and Registration) Regulations, S.I. No. 821 of 2007.*
  - *Determine whether: Cert of Registration/Permit/Waste Licence required*
  - *15 working days*
  - *Final binding decision*
  - *Involves waste/not waste decisions*
- *EPA Viewpoint* (September 2006)
  - *Brownfield sites context*
  - *EPA's Role*
  - *Local Authorities Role*
- *2020 Vision - Protecting and Improving Ireland's Environment*
  - *Protected Soil and Biodiversity – one of key goals*
  - *A National Soil Protection Strategy, including the identification of soils at risk and addressing the need to establish a soil monitoring network, must be prepared and implemented.*

# Competent Authority: Local Authorities

- Local Authorities' Roles
  - Planning Authority
  - Environmental Protection
  - Smaller Contaminated Land projects outside Agency remit
  - Protection of public health during land remediation
  - WMA Section 22 inventory of historic landfill sites
  - Vast majority of sites
  - Different approaches taken by different Local Authorities – consultants beware

# Contaminated Land/Brownfield: What is it?

- *There is NO definition in Irish Legislation*
- *'Land that contains substances which, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, the environment, or on occasion to other targets' (Harris & Herbert, 1994).*
- Land with concentrations of substances above natural background values:
  - Natural background for Pb/Zn naturally higher in Silvermines. Prospecting soil/stream surveys.
  - Chloride levels: Midlands vs Coast (20 vs 700 kg/Ha/annum UK Average/Shetland Islands)
- Land which poses a risk to our environment
  - What is risk…..what's acceptable…who bears it……..
- Brownfield Sites:
  - *"real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."*, US EPA
  - *"site with environmental personality",* US National Brownfield Association
  - Previosuly Developed Sites (PDL): UK target 60% of new houses on PDL
  - e.g. Dublin Docklands redevelopment

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# Extent in Ireland: Where is it?

- Historical Sites
  - Old Gas Works — 50-80
  - Closed Landfills — 265 (OEE figures?)
  - Closed Mine sites — 128 (38 with Tailings Ponds, 11 recent/large present highest risk)
  - Old Fertiliser Plants — 4-6
  - Closed Tanneries — 10 -12

- Current Operational Sites
  - Existing Landfills — 76 LA  50 Private (Registration ongoing)
  - Mining/Minerals site in operation — ca. 7 (MWD)
  - Chemical Industry — 150 – 160
  - Petroleum import terminals (IPIA) — 22
  - Petrol Stations — 900 – 1200
  - Tanneries — 3
  - Dockyards — 14-16
  - Military Sites — 1
  - Railways Depots — 80-100
  - Scrap yards/dismantlers — 180 – 200
  - Airports with maintenance — 2

*Estimated Total* *2,000 - 2,500 sites*

*Ireland's very limited industrial history*

*UK between 5,000 and 20,000 "problem sites".*

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# Legislation: How do we deal with it (National).

- Legislative vacuum on contaminated land in Ireland
- Some tools we can use:
  - **Waste Management Act 1996-2008**
    - (CL as a result of Waste Activities)
  - **EPA Acts 1992-2008**
    - (various powers)
  - **IPPC licensing regs**
    - (waste handling/historical waste issues on-site)
  - **Local Government (Water Pollution) Acts**
    - (CL may result in water pollution)
  - **Planning and Development Acts**
    - (Drives development/LA can condition cleanup)
  - **Building Control Act 1990**
    - *"avoid danger from substances including contaminants on or in ground covered by a building"…..* likely contaminants, requirements for investigation, remedial measures.
  - **Derelict Sites Act**
    - Local Authorities obliged to take all measures to prevent dereliction – often CL
  - **The Air pollution Act**
    - (dust/VOCs during unlicensed activity or remediation)

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# Legislation: How do we deal with it (EU).

- Environmental Liabilities Directive (2004/35/EC)
  - Land Damage
- Mine Waste Directive (2006/21/EC)
  - risk posed for 1000's of years
  - Inventories of Historical Sites – Action plans down the road?
  - Long term management of tailings dams
- Soils Directive (R.I.P. 2007) – inventory of sites
- ECJ Judgements
- New Waste Framework Directive

# ECJ: Van de Walle C1/03[2004]* ……..**Now Defunct?**

- Intention “to discard” = waste
- ECJ: Overturned need for “guilty mind” aspect “to discard” where a waste was generated.
- Petrol Station manager and Texaco were in possession of product that caused contamination and the waste contaminated soil that resulted
- ECJ: Contaminated Soil is Waste.
  - Concurs with EPA Silvermines position – soil mixed with waste is waste, grass above is not/uncontaminated soil below is not
- Those reponsible are holders or former “holders” of waste and are financially liable.
- Legally robust but impractical judgement that has very serious practical issues for all Member States
- Any manipulation of contaminated soil apart from “dig and dump” required licence/permit.

*Law and Environment 2005 “How policy considerations impact judge-made environmental law Deborah Spence, Arthur Cox

# Directive 2008/98/EC
## *The new Waste Framework Directive*

- ***Published 19/11/2008***
- ***Into force 12/12/2008***
- ***Old Directives (75/439/EEC, 91/689/EEC and 2006/12/EC) repealed 12/12/2010***
- ***Old Directive and all associated case law is <u>still in force</u>***
- ***But newer Directive would probably trump the old in court***

***Article 2: Exclusions***

- *"land (in situ) including unexcavated contaminated soil and buildings permanently connected with land".*
- *Appears to repeal Van de Walle*
  - *Mention of soil but not water (or other liquid phases)*
  - *"in situ" – what about a mobile contaminant*
  - *"unexcavated" – no definition*

# Directive 2008/98/EC
## *The new Waste Framework Directive*

***Article 5: By-Products***

- ***Never was a waste e.g. Cut and Fill balance (project curtelage)***

***Article 6: End of Waste***

- ***Waste transformed into product e.g. mixed C&D waste crushed to generate an engineering grade fill***

***Article 11: Recycling***

- *By 2020 re-use of non-hazardous C&D waste to be 70% by weight.*
  - *Implications for precautionary dig & dump*
  - *Force developers to re-use materials that are low grade (non-hazardous)*
  - *Effort in sorting/segregating/testing*
  - *BAT – "available" in terms of financially viable*

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# Your Obligations:
# Local Government (Water Pollution) Act, 1977

***Notification of accidental discharges.***

***14.***—*(1) As soon as practicable after the occurrence of an accidental discharge, spillage or deposit of any polluting matter which enters or is likely to enter any waters or a sewer, the person responsible shall notify the local authority in whose functional area the discharge, spillage or deposit occurs or, in the case of a sewer, the sanitary authority in which the sewer is vested or by which it is controlled.*

*(2) A person who fails to comply with subsection (1) shall be guilty of an offence and shall be liable on summary conviction to a fine not exceeding £250.*

*(3) A prosecution for an offence under this section may be taken by a local authority or a sanitary authority.*

*If you find contamination on your site it is <u>your</u> responsibility to notify the Local Authority*

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# Your obligations:
# Waste Management Act 1996-2008

**Section 39: Requirement to hold a licence to undertake a waste activity**

**Definitions:**

**"Hazardous waste" means any waste, which is covered by Article 1 (4) of Council Directive 91/689/EEC of 12 December 1991 on hazardous waste.**

**"Non hazardous waste" means waste, which is not covered by hazardous waste definition above.**

**"Inert waste" means waste that does not undergo any significant physical, chemical and biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health.**

# Contaminated Site: What you should do

- Contamination suspected
- Start liaising with Local Authority Environment Directorate ASAP
  - Section 14 of Water Pollution Act requirements
  - May be able to provide background history for site
  - May be able to recommend a suitably qualified consultant – approved list
- Scope the investigation with the Local Authority
  - Ultimately they'll have to be satisfied with approach
  - Address concerns identified by them
  - Cost:Benefit (data need versus data wants)
  - Appropriate study always cheaper in the long run
- Undertake Investigation
  - Identify Liabilities
  - Identify course of action to be taken
  - Agree cleanup targets and aims

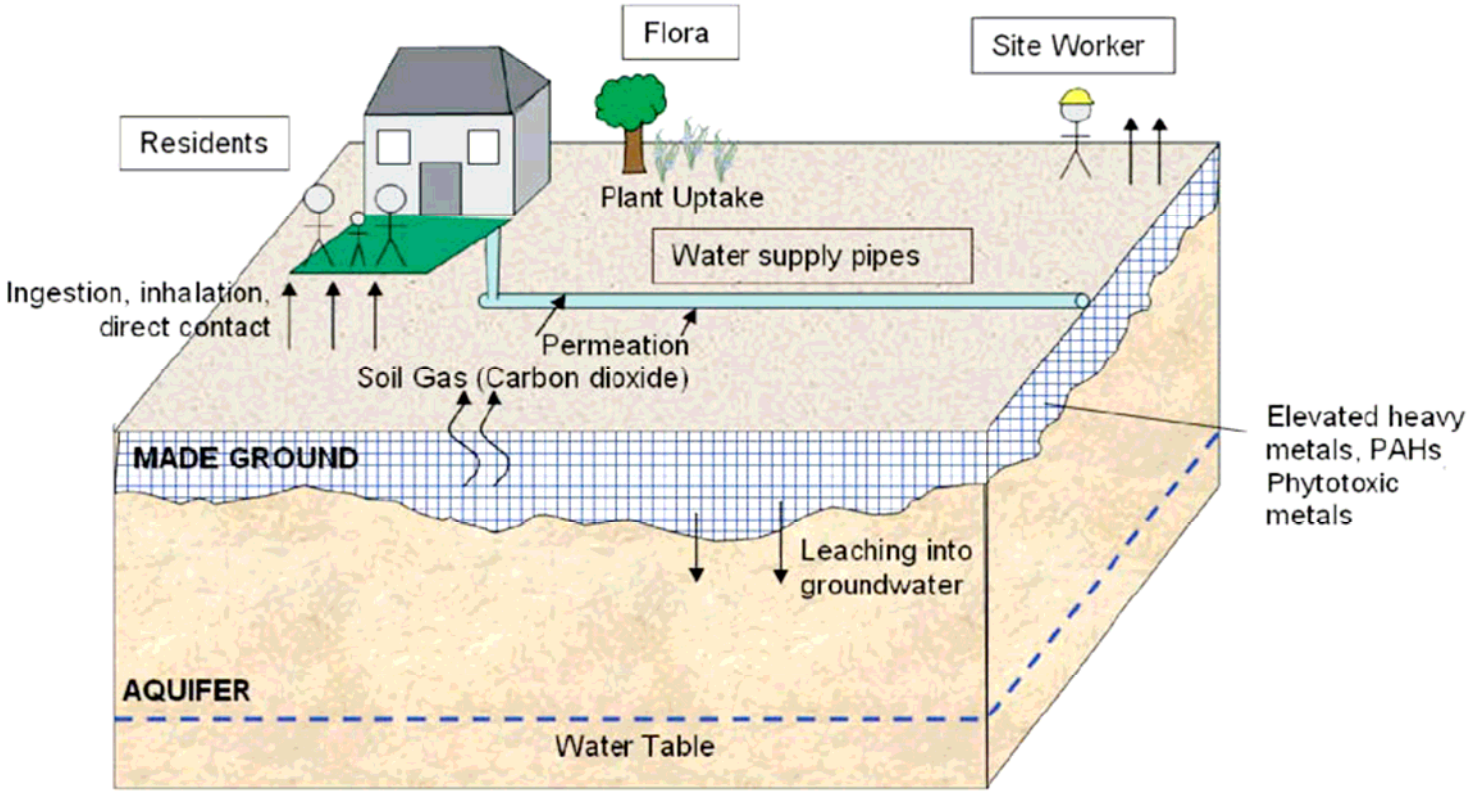
# Legislation: Every site is different

- Example of Port Tunnel /Fairview Park
  - PAH contaminated soil with some rare pockets of medical “risk waste”
  - Looked bad but in fact was simply domestic coal ash
  - Suitability for re-use tests:
    - Engineering grade material (met a standard for fill)
    - Engineering need (there was a void space to be filled)
    - No special environmental measures needed
    - Unsuitable waste could be easily removed
    - No import of unconnected waste
  - Contaminated material but not polluting material (no pathway)
  - Contaminated Land issue ending up as a recovery operation, pragmatic interpretation of the legislation

# Key Concepts – Source Pathway Target

- Source Pathway Target (or Source Pathway Receptor)
- Must have all 3 to result in an exposure to a contaminant
- If one is missing the chain is broken.
- In remediating or abating you're trying to break that chain
- Remove the Source (dig out the contamination)
- Close off the pathway (Cap the waste/Cut off wall)
- Protect the receptor (Iodine Tablets)

# Key Concepts – Source Pathway Target (SPT)

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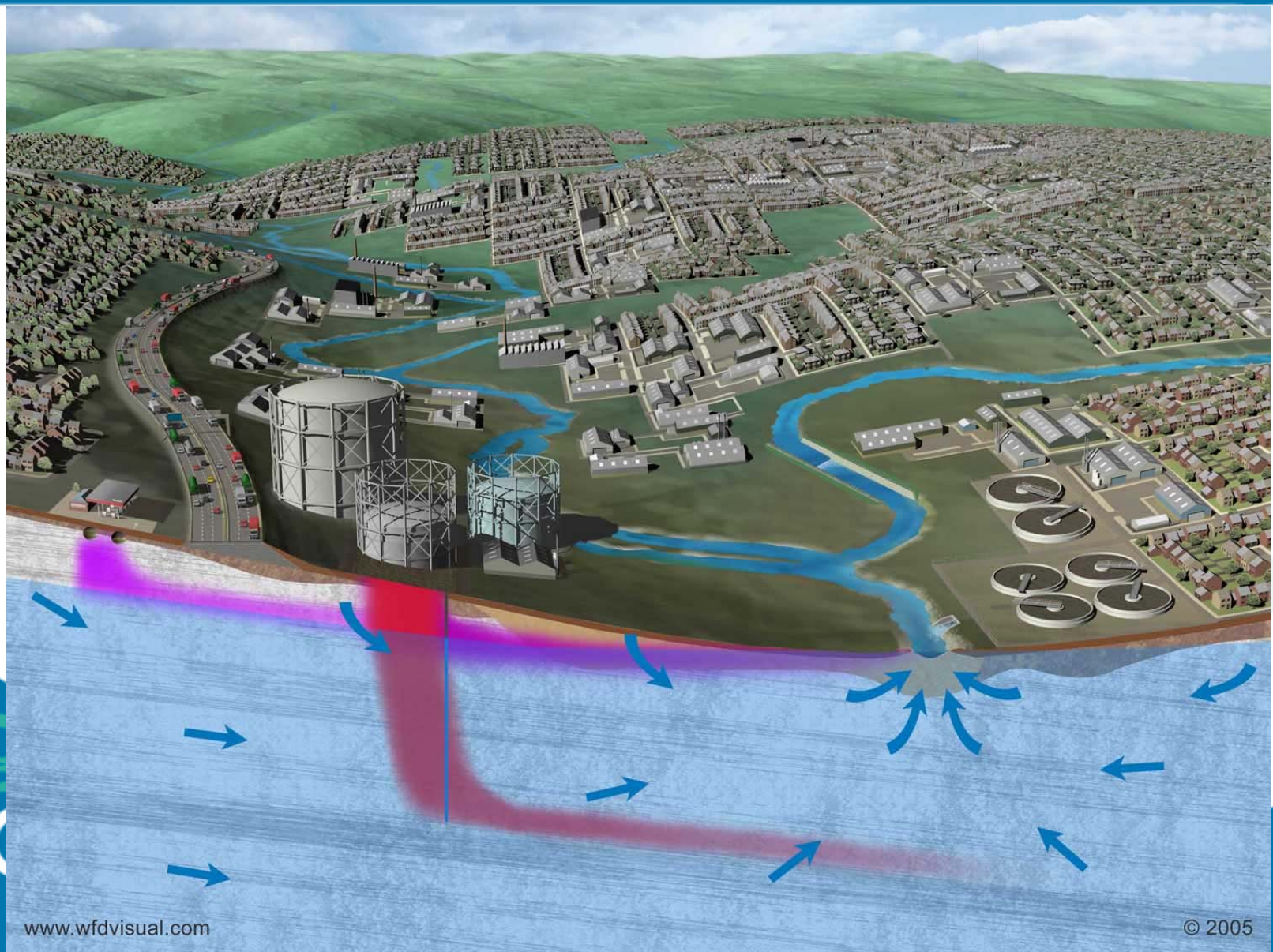
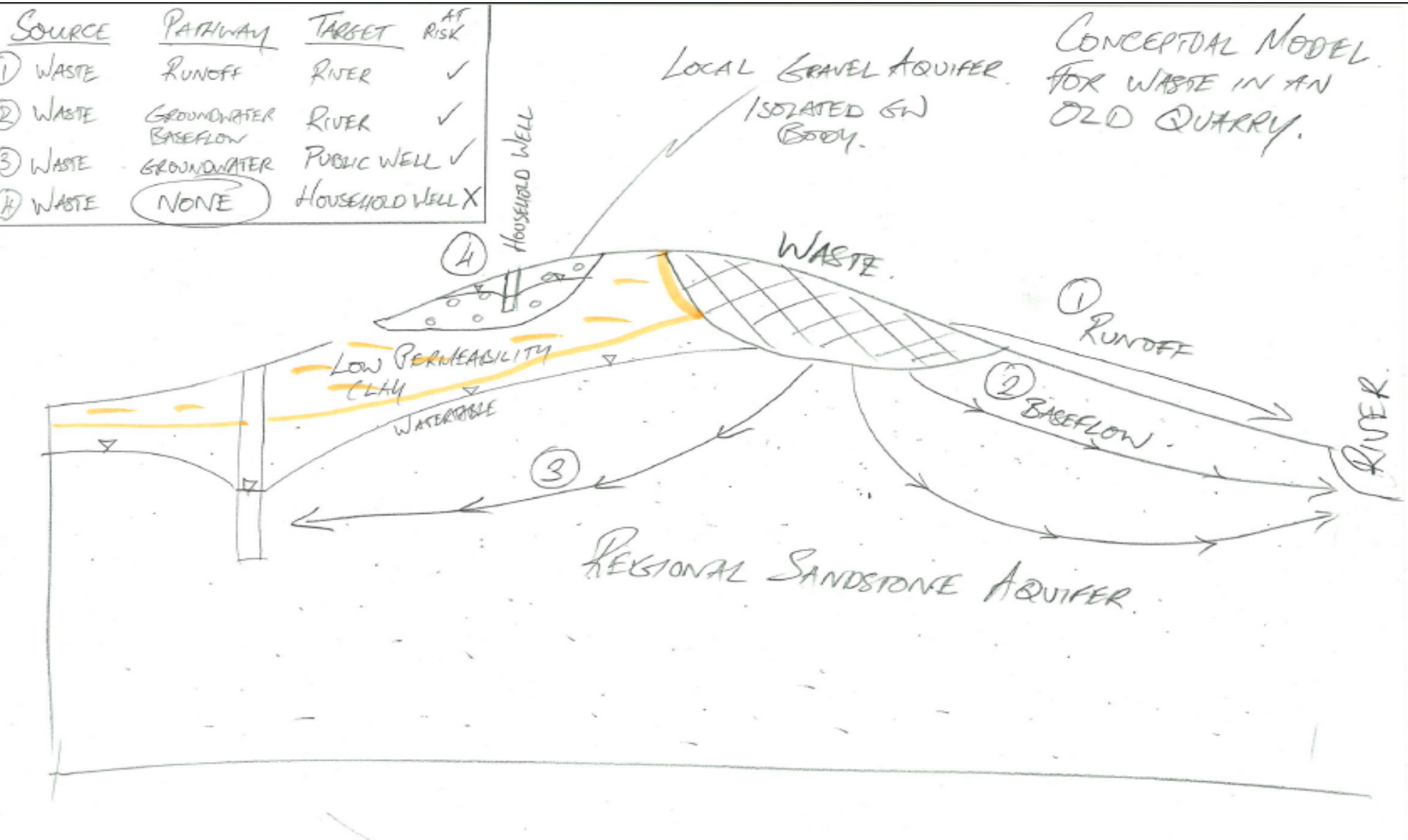
# SPT: Complete link needed to present a risk

| *SOURCE* | *PATHWAY* | *TARGET* | *COMPLETED CHAIN* |
|---|---|---|---|
| **Toxic waste in quarry** | **Dust blow: prevailing wind to school** | **Playground** | **YES** |
| **Toxic waste in quarry** | **Groundwater flow – gradient to pumping well** | **Public Water Supply** | **YES** |
| **Toxic waste in quarry** | **Overland Flow: Quarry lowest point in catchment** | **Salmonid River on low permeablily clay** | **NO** |

# Conceptual Site Models: www.wfdvisual .com



# Conceptual Site Models: Without a clear basic understanding, high tech models are a waste of money



# Some Standards

- UK DEFRA Contaminated Land Exposure Assessment (CLEA Model updated 2008)
- Dutch Target and Intervention Values (Ministry of Housing VROM 1997-2000)
- ATSDR Minimum Risk Levels (MRL)
- Tolerable Daily Intake – WHO
- Numerous other national standards

# Dutch Target and Intervention Values

| | **Soil** mg/kg dry matter | |
|---|---|---|
| **Compound** | Target | Intervention |
| | Value | Value |
| I Metals | | |
| (* note soil type correction formula) | | |
| | | |
| arsenic | 29 | 55 |
| barium | 200 | 625 |
| cadmium | 0.8 | 12 |
| chromium | 100 | 380 |
| cobalt | 20 | 240 |
| copper | 36 | 190 |
| mercury | 0.3 | 10 |
| lead | 85 | 530 |
| molybdenum | 10 | 200 |
| nickel | 35 | 210 |
| zinc | 140 | 720 |

# Our Own “Dutch” Standards ?

- Dutch standards already widely used by Local Authorities/consultants
- Were Ireland to consider adapting the Dutch TV and IV system
  - Would need to tailor for our soils (do we have the right soil data?)
  - Would need to fully understand toxicology behind it – same for Irish people?
  - Would need to understand the background doses of all the toxins in Irish environment – data for this?
  - Would need to weed out Dutch political fudges (to make room for our own?)
  - Would need to re-calibrate and re-run all models feeding into values
  - Public Consultation (similar to BAT or wider?)
  - Mammoth task in terms of time and resources
- How often would it be really used?
- Can we just use other standards with caution?

# Remediation Options: Break the S-P-T Chain (I)

- Source
  - Remove it: “Dig and Dump”
    - Dig out any contaminated material and send to landfill/contractor
  - Clean it up
    - Clean/treat it to reduce/remove the contaminant load
    - What’s your target clean up: Dutch TV, InV, IV? Clean enough to go to the landfill (PAHs 100 mg/kg Murphy's Inert Landfill)
    - Insurance company: Domestic oil tank leak. They’d pay to get Mineral Oil down to 250 mg/kg. But that was above acceptance criteria for local landfill. Any future extension on house waste might have to go for export.
- Pathway
  - Isolate the hazard – Cut off walls/Capping/lining
  - Dust suppression (working practices, planting trees)
  - Immobilise – manage land (e.g. control pH of soil – can mobilise metals in ecosystem- with soil conditioners vegetation management)

# Remediation Options: Break the S-P-T Chain (II)

- Target
  - Move the Target/Receptor:
    - **High Nitrates in East Anglia** ***Target = Public Supply Wells***
    - Diffuse pollutant source (*can't change S*)
    - Pathway – High vulnerability permeable aquifer over large region (*can't change P*)
    - Moved target to naturally attenuated area. Relocated public supply wells to deeper anoxic part of aquifer where nitrate reduction had occurred.
- CAVEAT
  - We're also protecting the environment – Ecosystems
  - Risk Assessment does not stop with the human aspect
  - Example Co. Meath Petrol Station – Local Authority Competent Authority
    - Mobile plume of hydrocarbons – no attempt to recover/treatment made.
    - Consultant ran RBCA model: No private wells = low risk
    - Argued for monitored natural attenuation (MNA) as they gave too little weight to natural environment vs human health
    - Agency position. All practicable measures to recover the pollutant should be considered before MNA considered as an option. An offence had been committed under the water pollution act and no attempt made to prevent further damage to the environment, yet consultant tried to justify their approach to do nothing using modelling

# Clean-up Options: Disposal/Remove Source

- Dig and dump
  - Low tech
  - Removes future liability
  - No need to monitor on an on-going basis to see it's worked
  - Landfill becoming ever more expensive
  - Landfill Acceptance criteria
  - Suitable landfill available?
  - Don't need licence/permit
  - But must use appropriately licensed contractor

# Clean-up Options – Treatment (I)

Treatment

- Pump and treat
  - Abstract groundwater
  - Filter/Clean it
  - Discharge it (ELVs) or re-inject it
  - Are you pulling clean water in through contaminated material – generating contaminated water?
  - **Water discharge licence needed**
- Air Sparging
  - Inject compressred air – aerate the system
  - Volatilise contaminants (if suitably volatile)
  - Air emissions – (Dublin Docklands – odour issues)
  - **Air pollution licence needed**
- Monitored Natural attenuation (MNA) feed for microbes ?
  - Allow contaminant to break down naturally
  - Always get some bugs that'll thrive on the contaminant – feed these
  - What daughter product are you getting? TCE  breaks down to Vinyl Chloride
  - **No discharges – may not need any permit to clean up**

# Clean-up Options – Treatment (II)

- Soil washing
  - Based on mineral processing techniques
  - Dig up the soil
  - Remove Contaminants by:
    - Dissolving or suspending in a wash solution (pH, leaching agents etc)
    - Concentrate the contaminant by particle size (e.g. separate out the clay particles and left with clean aggregate).
  - Reuse on site or export offsite for use
  - Waste licence required
- Wide variety of treatments
  - New methods coming on the scene all the time
  - Fact that “dig and dump “ still so widely used shows how expensive remediation options still are
  - Chosen method very dependant on site characteristics, contaminants involved (e.g. DNAPL or LNAPL) and the desired clean-up level (Dutch IV vs what the insurance company will pay for)

# Scenario: Old Lead/Zinc ore storage depot

- Former distribution deport for lead/zinc ore
- High levels of lead and zinc in fill all around the site
  - Above Dutch TV in top 3m.  Above Dutch IV in top 1.7 m
- Site in context
  - Reclaimed ground in an industrial sector of the docks
  - Contaminants not mobile – dust /sediment monitoring
  - No volatile compounds
  - ACTUAL RISK low
- Developer planned use as a tarmac covered car park and eventual use as an apartment complex.
- No complete SPT chain – no exposure
  - Apart from construction phase there would be no on-going human-soil interaction (imported clean fill, concrete hardstanding, imported topsoil for limited landscaping)
- Sulphide ores would not be exposed to air (No acid drainage)
- Cap waste and leave *in situ* (with special working method for foundations work/dusts suppression etc)
- Planning permission covered all necessary aspects

# Scenario: Dublin Docklands

- Old gasworks Highly contaminated with As, Ni, Cu, Zn, Phenols, Polyaromatic Hydrocarbons (PAHs) and BTEX (Benzene Toluene, Ethylbenzene , Xylene)
- Installed 2 km long cut-off wall to isolate site – prevent recontamination and structural containment
- Excavated and temporarily stored on-site.
- Some soil washing by jetting
- Exported 121,000 tonnes hazardous and 72,000 tonnes non-hazardous to landfill at W0100-01
- Exported 39,000 $m^3$ hazardous material and 42,000 $m^3$ of non-hazardous material to landfill at W0108-01
- Imported clean materials to restore levels
- Pumped and treated groundwater and discharged to sewer
- Massive expenditure
- Required Waste Licence from EPA

# Summary

- Legislative vacuum
- Liaise early with the competent authority
- Be aware of your legal obligations (Water Pollution Act)
- Article 11 process to determine what permit you need (if any)
- Set clear objectives for investigations and clean ups
- Get appropriate expertise to help you
- Conceptual models – if you can't understand it there's a problem
- Agency can provide informal advice
- Due diligence before you buy – money well spent