



World War II legacy and the challenges of managing LNAPL and DNAPL contamination of ground and surface waters

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Pembrokeshire County Council

Site Location



The legacy of WWII

- August 18th 1940 – 3 German bombers attacked the Llanreath naval fuel depot
- Destroyed 8 fuel tanks, burnt for 22 days – thought to be the biggest fire since the great fire of London
- 5 fire fighters lost their lives, 650 men involved



Photos from People's Collection Wales

Legacy cont.

- The oil was drained into 2 large unlined moats (approx. 2ha) which were excavated into the underlying Old Red Sandstone
- Current estimates of 80,000m³ of naval fuel oil lost
- Following the war the site was left enclosed until 1985



Early remediation and conversion to a golf course

- Thought that the oil would act like a DNAPL
- 1st remediation began in 1985 when the land was passed on from the MOD
- Oil in the moats was mixed with the crushed tank bases – when this material ran out material was brought onto site to level the moats to create the fairways
- Drainage system installed in the early 1990's and improvements made to moat wall



2005-2007 investigations

- Several phases, predominantly targeting the former moats and down gradient towards to stream to the north
- Free phase had both LNAPL and DNAPL components, fingerprint analysis confirmed it was heavily degraded marine oil with no volatile component and low leachability potential
 - Frequent 'daylighting' of oil at surface
 - Oil mixed with soils, no consistent body located



DAYLIGHTING



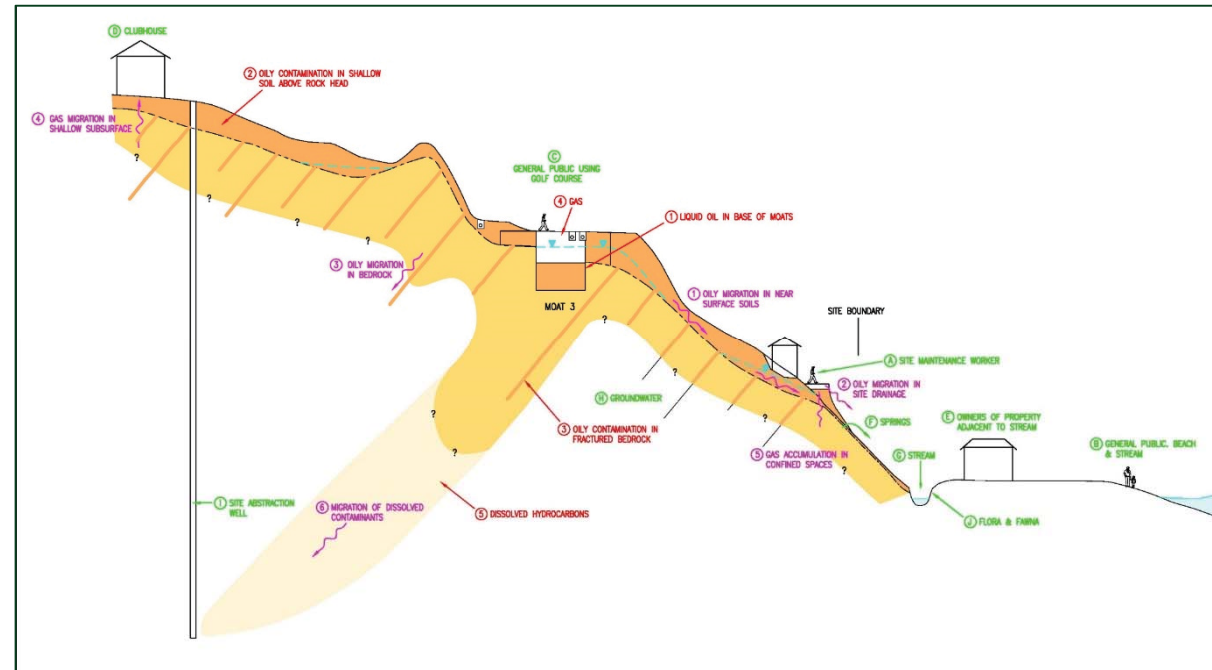
MOATS



BEDROCK



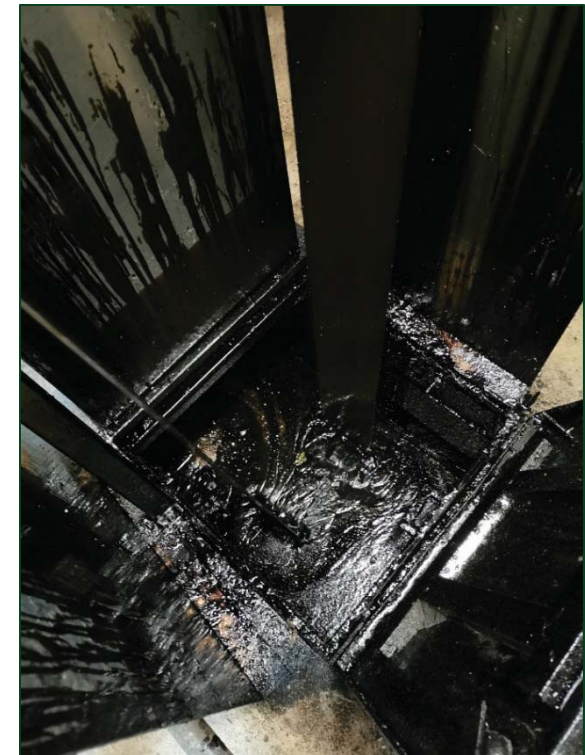
CSM and outcomes



- Due to nature of oil and limited exposure risk to human health was considered low
- Gas risk posed – further monitoring undertaken to calculate site specific H&S exposure limits
- Considered that the site would meet the definition of Contaminated Land due to SPOSH to controlled waters (groundwater and surface waters)

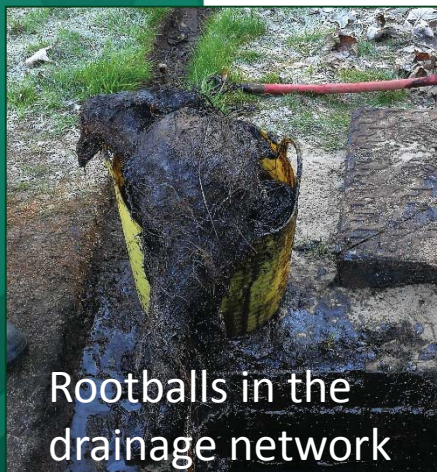
Skimmer installation

- Skimmer installed in 2007 in 1st interceptor chamber to help alleviate oil release into the stream
- Run intermittently depending on build up
- Over 40,500l of oil / water mix has been removed to date – all sent for disposal as hazardous waste to Avonmouth
- Oil recovery is however limited when the oil becomes more viscous in winter



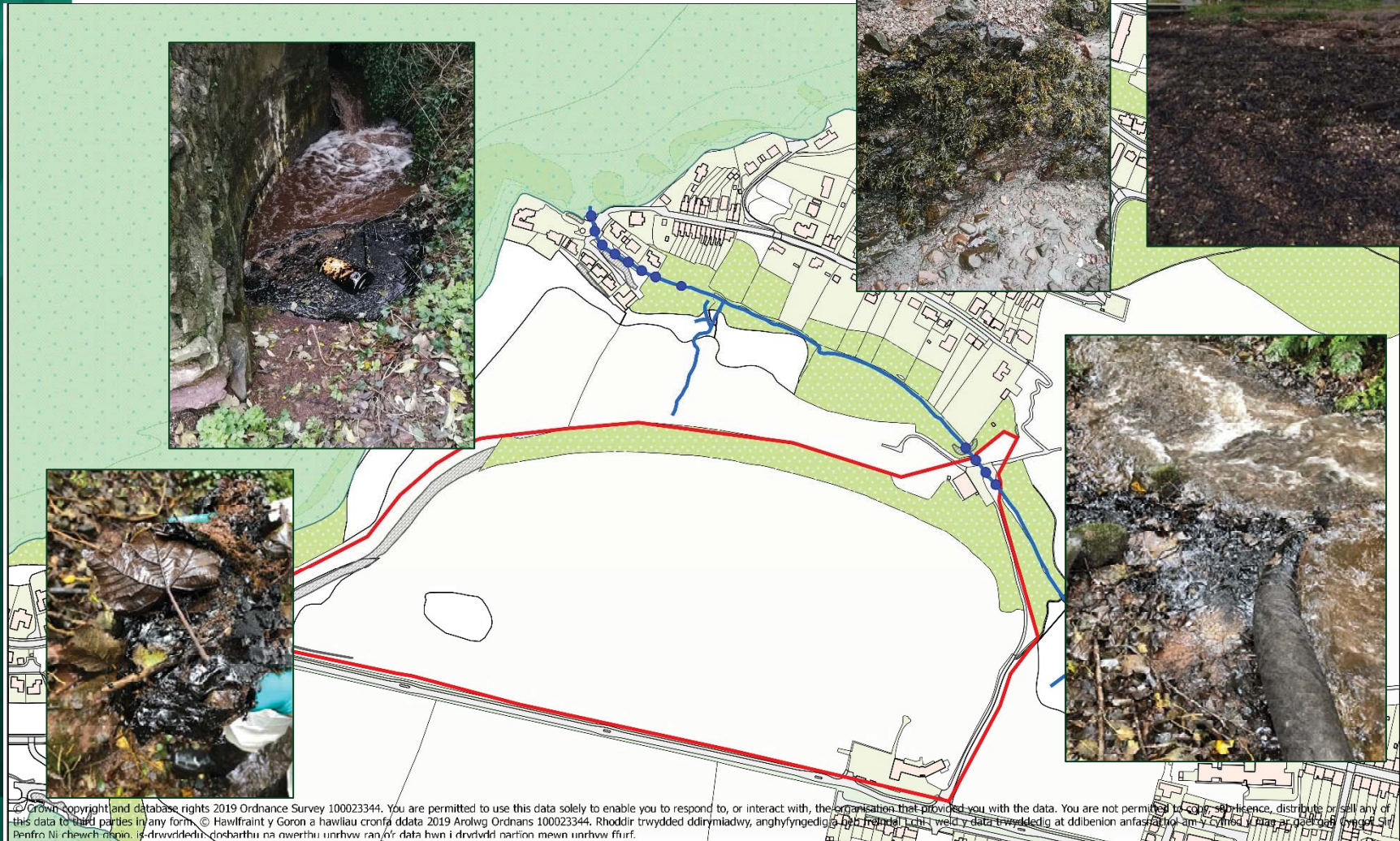
Current issues

- Oil does not act as expected, doesn't act as the dense liquid anticipated during the initial remediation
- 'Daylighting' on fairways
- Labour intensive management



Pollution Incidents

During periods of heavy rain the system is overwhelmed – oil gets into the stream and heads the 500m downstream to the beach and marine SAC




Negative Press...

Managing public perception can be difficult and is a key driver for short term maintenance of the site

NEWS
8th November 2018

Updated: Pollution at Pembroke Dock beach leaves dogs covered in oil

By Bruce Sinclair | @WTBruceS
Reporter



Dogs were left covered in oil following oil pollution at a Pembroke Dock beach.

1 comment

THE public is being advised to avoid a beach and footpath at Pembroke Dock, following the discovery of oil along the shoreline.

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Pembrokeshire beach oil slick 'caused by WW2 bombing'

16 September 2015



World War Two

DAVID LUTHER THOMAS/GEORAPH

Oil pollution which prompted a "stay away" warning at a Pembrokeshire beach was caused by land contaminated in a World War Two bombing.

Pembrokeshire council issued the warning after oil was found on seaweed on the beaches at Fort Road and Llanreath in Pembroke Dock.

World War Two German air raid sees oil slick hitting Welsh beach 75 years on

It is believed the pollution, which had been contained since 1940, spilled onto the beach as a result of heavy rain

By Agency Staff
13:21, 16 SEP 2015



MailOnline

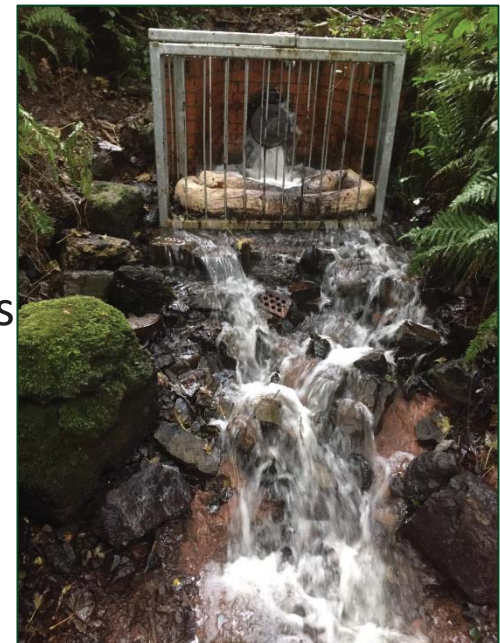
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Oil slick on Welsh beach is blamed on the Nazis - 75 YEARS after Hitler's Luftwaffe bombed coastal refineries

- Oil slick was discovered earlier this week on beaches in Pembrokeshire
- Officials have said it is the result of destruction caused by air raid in 1940
- Hitler ordered Luftwaffe planes to target oil refineries on the Welsh coast
- Damage was so severe that contaminated land was contained behind walls

Where we are at now

- The site has just been determined as Contaminated Land under Part 2A – making it Wales' only currently contaminated land site – SPOSH for controlled waters
- Ongoing discussions with NRW about short term management and remediation
- Current Management – much more proactive than in the past. However it's labour intensive full system checks, check length of stream, the skimmer – every 2 weeks and further visits when wet weather warning issued by the Met Office



The future

Aims:

- Limit pollution of the watercourse;
- Increase sustainability; and
- Be able to revoke the determination as Contaminated Land.

Remediation Options Appraisal identified the only realistic option is to upgrade / improve drainage, due to the mixing of the oil with the soil in the 1980's removal costs could be as high as £48m and makes it difficult to treat due to small pockets.



© Can Stock Photo

Long term solution – the site will always have long term disposal and maintenance costs but the aim is to reduce these by looking at more sustainable ways to treat oil to save on removal off site. These include a custom design interceptor and to provide attenuation in system to prevent overwhelming of the interceptor during intense rainfall events.



NAPL in the UK context, does it matter?

From a LA perspective and this site – Yes

The potentially prohibitive costs associated with managing large-scale contamination at sensitive sites raises important questions as to how best to achieve a proportionate balance between the requirements for defining land under Part 2A and meeting the objects of the Wellbeing of Future Generations Act, together with the associated management of regulatory requirements and public expectations with respect to NAPL contamination.



Thank you

Pembrokeshire County Council would like to thank the following key teams for their support throughout this long term project:

- Parsons Brinckerhoff (for the Part 2A site investigations);
- Abanaki – for the oil skimmer support; and
- Our current partners White Young Green who are looking at the remediation options with us.

Thank you for listening!

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