Title	South Hook LNG - Soil and Groundwater
Company	WSP Remediation
Date	March 2007

Report Summary

The South Hook Liquefied Natural Gas (SHLNG) terminal is located on the west coast of Wales, and covers an area of approximately 210 hectares. The site is a former oil refinery, with previous ground investigation works undertaken between 1993 and 2003, by Dames & Moore and RPS consultants. The following investigations were conducted:

- Dames and Moore 'Environmental Assessment – Milford Haven', 1993;
- RPS Geo-environmental Investigation Report, 2002;
- RPS Factual Geotechnical Investigation Report, 2003;
- RPS Geo-Environmental Investigation and Risk Assessment Report 203/40/45/CI/RP/NA/102, January 2004.

These investigations identified that the site had been affected by contaminants, predominantly petroleum hydrocarbons, especially in the vicinity of the former main refinery process area and areas associated with skimming pond sediments and disposal of tank sludges. RPS went on to undertake human health and groundwater risk assessments, with regard to the proposed development works, details of which are provided within the following report:

- RPS Quantitative Risk Assessment (QRA), endorsed by the Environment Agency (EA) ref. GW/CL/SW/78SouthHookLNG dated 2nd June 2004.

The objectives of these assessments were:

- to derive remedial targets for soils in hydraulic continuity with the perimeter drain around the main excavation for the LNG tanks;
- to derive maximum soil concentrations of contaminants of concern that can be present within landscape bunds;
- to evaluate the risk posed by elevated contaminants of concern within the skimming pond sediments; and
- to evaluate the risk posed by elevated contaminants of concern not in hydraulic continuity with the perimeter drain around the main excavation.

A groundwater model was used to support the conceptual understanding of the hydrogeological regime, and to assess the potential impacts to environmental receptors, perceived to be at risk from contaminants migrating from the affected soils at the site. It was concluded that discretionary remediation was necessary within specific CAA's, to ensure soil and groundwater remedial targets would be achieved to mitigate potential environmental and human health risks associated with the re-development of the site.

Planning applications had already been submitted by the developer, and consent conditions set by Pembrokeshire Coast National Park Authority (PCNPA) and Pembrokeshire County Council (PCC). These included the need for a 'Method Statement detailing the remediation requirements, using the information obtained from the site investigation' (Planning Condition 8 d). A set of specifications and drawings were then produced to document the contractor's responsibilities during the works.

In 2004, SHLNG commissioned Edmund Nuttall Ltd (ENL) to prepare the 'Site Remediation Plan', to satisfy planning condition 8 d, detailing the method statements to be used during the site preparation works:

- Site Remediation Plan – BAR1150/MS031, November 2004.

Following approval of the submitted plans, ENL then commenced site preparation works, and commissioned WSP to manage the testing, monitoring and remediation activities. The site preparation remediation works comprised an initial delineation of the identified CAA's, which included the excavation of 364 trial pits across the identified CAA's and the retrieval of 489 soil samples. The establishment of a treatment process area and stockpiling area was then undertaken to accommodate excavated materials during the remediation of CAA's. CAA excavations were then undertaken in the order of their specified priority, and excavated materials and excavation extents were assessed using visual, olfactory and test-kit assessments.

Site preparation works comprising the remediation of the identified CAA's, together with the excavation, deposition and testing of some 1.2 million cubic metres of material, has been undertaken at the South Hook LNG Terminal construction site. During the period between September 2004 and June 2005, approximately 130,037 cubic metres

of suspected hydrocarbon contaminated soil was excavated from the CAA's, of which approximately 19,297 cubic metres required on-site treatment and 40 cubic metres required off site disposal due to its lead content. With the exception of this 40 cubic metres of soil, which was removed from site, due to the elevated lead content above site criteria, all soils excavated during the site preparation works have been retained on-site. The works have been undertaken in line with specifications and methods, as described within the 'Site Remediation Plan'.

To comply with Planning Consent conditions, SHLNG commissioned WSP Remediation (WSPR) to monitor the South Hook LNG terminal groundwater quality and flow regime in January 2005. A monthly monitoring and sampling programme began in January 2005, designed to establish conditions during and post-completion of excavation works, to the scope previously agreed with the Environment Agency.

WSPR have since been commissioned by SHLNG to provide a report detailing trend analysis of collected data, which has compiled chemical analysis and elevation data from the SHLNG terminal since 2002. RPS consultants had previously undertaken a groundwater monitoring programme between 2002 and 2004 which was used to establish baseline conditions at the site.

Data was managed and analysed using a site-specific Geographical Information System programme (GIS). Of the 67 contaminants analysed, the only current typical detections were realised in Gasoline Range Organics (GRO) and Diesel Range Organics (DRO), and the detections were limited in their location.

The data referred to above will be used to develop a revised monitoring programme, which will then be reviewed and agreed with the relevant Authorities prior to implementation.