

HALCROW SOUTH ASIA

Services to the Oil & Gas Industry

Halcrow's aim in providing services to the oil & gas industry is to bring together Halcrow's experience in civil engineering and environment with specialist skills in infrastructure development. Halcrow has a wealth of international experience and reputation for handling environmental issues that encompass diverse and rapidly advancing industrial sectors. We are committed to the process of continuous improvement in the management of the environmental impact of what we do and to our longer-term goal of developing a sustainable business. At Halcrow, we work in partnership with others to promote environmental care, increase understanding of environmental issues and disseminate good practice.

We integrate civil and infrastructure expertise with specialist environmental skills, bringing maximum benefits to every stage of a project that favours economic growth in an environmentally friendly manner. Much of our work is repeat work with existing clients, who are satisfied with our approach. We are also keen to share our experience with others, in new and exciting projects.



A key part of our approach is partnership. We undertake commissions to ensure that the customer gets best value for money. This involves:

- careful integration of the project programme with national, regional and local requirements;

- ensuring that it is the customer's message we respond to, and that we blend our own international experience with the specific national requirements of the commission, and
- ensuring that the host nation obtains maximum benefit from project resources, and that where possible, national or local capacity building, training and institutional development is central to project activities.

Environmental Services

Our environmental engineers and scientists are fully conversant with the requirements of national legislation and international agreements, which form the basis of producing effective environmental assessment report. Our expertise ranging everything from reconnaissance surveys, environmental and contract adjudication services.

Our experience in environment pertaining to Oil & Gas industry has enabled us to build up strength in the following key areas:

- Environmental Assessments (EIAs, IEEs) and Environmental Planning
- Strategic Environmental Assessment (SEA)
- Social Impact Assessments (SIAs)
- Baseline Environmental Studies
- HSE Monitoring
- Environmental audits (recovery and recycling of wastes)
- Containment Land Remediation
- Groundwater Studies and Hydrogeology
- Industry and Pollution Control (air, water, noise, soil, etc)
- Waste Management and treatment of disposal and Land-filling.
- Natural Resources and Ecology
- Sustainable Development
- Landscape Architecture
- Advisory Services

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Civil Infrastructure Services

In addition to the environmental services, Halcrow also provides a wide range of civil engineering solutions to the oil & gas industry including access route selection, well and camp site planning and designing, and contract preparation for civil works for various stages of the oil & gas exploration process i.e. seismic exploration, exploratory and appraisal well drilling, both at offshore in the Arabian sea, and on-shore both in the mountainous and desert terrains. Our experience in this industry has enabled us to build up strength in the following key areas.

- Reconnaissance field visit/survey
- concept design and feasibility studies
- access road and well/camp site development
- water supply options
- detailed engineering design
- tender document preparation and evaluation
- construction supervision
- contract administration
- disaster Controls
- Site Restoration



Gravel Access Road track-Mehar 2 Well, Sindh, Pakistan

Halcrow has significant experience with oil & gas industry and has completed over 200 projects within last 8 years (including EIA/IEE, HSE Monitoring & Auditing, Access Road/Camp Site layout design, supervision, tender documents).

Benefits of working with Halcrow

- Our 'one Halcrow' approach means that whatever the challenge there is a Halcrow person somewhere in the world who has the solution.
- The diversity of our people enables even large, complex projects to be resourced from a single point.
- We energetically pursue project savings – in the last two years alone we've achieved demonstrable savings for clients of many millions of pounds.

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Experience Details

Selected world-wide experience from Halcrow's environmental and civil project record, with specific reference to recent activities in the oil and gas industry, includes the following projects.



Romania: Asset register Survey Romania, Petrom SA, 2005- Ongoing.

Halcrow was appointed to undertake asset surveys at 2112 sites in a 5-month period. The work included preparing a questionnaire in MS Access, site walkover, completing a database, producing a photo-library and undertaking a risk ranking of all the sites. In addition detailed audits were undertaken at the two largest refineries, Petrobrasi and Arpechim and at Doljchim fertiliser factory. Much of the input for this is resourced from our South Asia operations.



Romania: Site investigation, contamination assessment and remediation design, Petrom SA, 2005-Ongoing.

Halcrow was appointed to undertake a fast track site investigation to evaluate hydrocarbon contamination at a 15 Ha site used for hydrocarbon processing and storage, for the last 70 years. Work included the design of remediation options taking into account the operational status of the site, preparation of outline costing, preparation of tender documents and evaluation of potential contractors. The project is on going and is also resourced from South Asia.



Barbados: Former Oil Refinery Remediation, Government of Barbados, 2003-2005

Halcrow was appointed to design a remediation programme for the clean up of a former oil refinery. The work includes a slurry cut-off wall, recovery of free product, in-situ bio-catalysis treatment of oil contamination and preparation of all necessary documentation (environmental permits, etc).



UK: Cogdean Elms - Remediation of Groundwater, Environment Agency, 1999-2004

Halcrow was commissioned by the Environment Agency to design and supervise the remediation of groundwater contaminated with chlorinated hydrocarbons. The contamination is a result of many years of site use as a solvent reprocessing yard. The site lies over a Chalk aquifer. The key aim of the project was source reduction along with the remediation of the local watercourse, which is currently contaminated with chlorinated hydrocarbons.



Bermuda: Morgans Harbour Development, Morgan's Harbour Investments Ltd, 1997

Halcrow was commissioned, as part of a larger involvement, to investigate, assess the risks to the development posed by contamination at the former US Naval Base, and produce an environmental baseline report. Various site investigation techniques were used including; geophysical methods; boreholes; trial pits; and soil and groundwater sampling and analysis. The Naval Base was mainly used as a re-fuelling station and the main contamination was oil and fuels from large storage tanks.

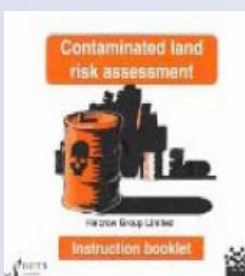
HALCROW SOUTH ASIA

Experience Details



Qatar: Qatar Petroleum - Ras Abu Aboud Development Project, Qatar Petroleum, 2003-2006

Qatar Petroleum is currently relocating some operations away from the RAA complex and will be left with several unutilised / under-utilised facilities on site. In view of this Qatar Petroleum have decided to relocate all Doha based staff to RAA. Consequently a major project called Ras Abu Aboud Development Project (RAADP) was launched. Halcrow has been awarded the contract to develop the master plan, undertake detailed design, draw up contracts and supervise construction for the entire site.



CIRIA Research Project RP599 Contaminated Land Risk Assessment, Construction Industry Research and Information, 1999-2004

Halcrow were commissioned by CIRIA (Construction Industry Research and Information Association) to write good practice guidance for contaminated land risk assessment. Following this Halcrow were then commissioned to produce good practice guidance for the selection of remediation techniques. We have also undertaken over 15 training seminars associated with these publications.



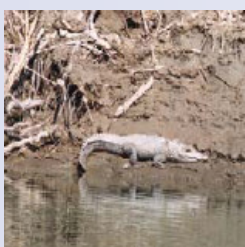
Pakistan: Environmental Impact Assessment for drilling in the Dumbar E.L. Zirkani-1, Benir-2 & Chung-1 Exploration Wells, Premier Kifpec, 2002-2003

Halcrow Pakistan conducted EIAs for each well and examined the impacts of oil and gas exploration activities on the physical, biological and socioeconomic environment of the area. Halcrow Pakistan conducted each of the three EIAs upon the invitation of PKPEL to ensure that only appropriately planned and designed operations are performed, and that cumulative impacts are fully analysed so as not to impair resources.



Pakistan: Initial Environmental Examination for Offshore Seismic Operation in Indus-C, Indus-D and Indus-Delta Blocks, BG International, 1999

Halcrow Pakistan carried the IEE for the seismic operations of Indus D & Delta and Indus-C blocks and determined any potential significant impacts from these offshore seismic operations on Noise and sound impacts upon marine mammals and Interference with fishing activity. The seismic operation was undertaken by using specially equipped seismic vessel with conventional airgun arrays and sensors towed behind the survey boat.



Pakistan: Baseline Environmental Study for Nara Game Reserve, OMV Pakistan, 2002

Halcrow Pakistan carried baseline study of the game reserve to appraise the company, the regulatory bodies and the stakeholders about the environment of the game reserve and its sensitive receptors so that only appropriately planned and controlled projects can be implemented by the company and approved by the regulators. The game reserve occupies an area of approximately 105,228 hectares.



Pakistan: Independent Environmental Monitoring of Drilling Operations in the Dumbar E.L., Benir-2 & Zirkani-1 exploration wells, Premier Kufpec, 2002-03

Halcrow Pakistan conducted independent environmental monitoring of the operations beginning at the construction phase, through drilling and till completion of the site restoration phase. Monitoring was conducted with the objectives of ensuring compliance of the actual project with the EIA and EMP, and also to monitor the actual impacts of the operation on selected environmental receptors through specially designed surveys.



Pakistan: Initial Environmental Examination for 2D Offshore Seismic Exploration in Indus-E Block, Shell Pakistan, 1998

Halcrow Pakistan carried IEE for the seismic operations of Indus E block to determine if there are any potentially significant impacts from the offshore seismic exploration activities proposed by Shell. The planned seismic survey will involve acquisition of seismic data by a specialised seismic vessel the "R/W Western Wave", which will be acquired using sleeve airgun as energy sources and streamer cables equipped with hydrophones as received lines.



Pakistan: Environmental Impact Assessment (EIA) for Exploration activities in South West Miano-II concession, OMV Pakistan, 2002-03

Halcrow Pakistan carried EIA ensuring that appropriate planned and designed operations are performed and that cumulative impacts are fully analysed so that resources are not impaired for the planned hydrocarbon exploration activities including acquisition of 1,000 km of 2D seismic data, and drilling three exploratory/appraisal wells over a period of three years in the South West Miano –II Concession, Sindh.



Pakistan: Environmental Audit of Liquefied Petroleum Gas (LPG) facilities of Lifeline (Private) Limited, 1996-97

Halcrow Pakistan undertook due-diligence environmental audits of two Liquefied Petroleum Gas (LPG) filling plants: Dhurnal and Meyal near Rawalpindi, a virgin land at Pindi Bhattian and a LPG transfer station near Quetta. These facilities are owned and managed by Lifeline Private Limited. All associated risks were determined to compliance with the National Environmental Quality Standards (NEQS).



Pakistan: Feasibility study for the Land Treatment Oil Based Mud (OBM) Cuttings, Lasmo Oil, 2002

Halcrow Pakistan carried out a feasibility study for the land treatment OBM cuttings which was generated during the drilling of well site Mughal Kot –1. A feasibility report was prepared that discusses expected characteristics of the OBM cuttings, applicable national legislation for its disposal, characteristics of the cuttings and site conditions, investigation and evaluation of identified options, and recommended option.

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Experience Details



Pakistan, Initial Environmental Examination for 2D Seismic Survey in Gorakh Block, ENI Pakistan, 2004

Halcrow Pakistan prepared IEE report for 2D seismic survey in the Gorakh Block, for seeking regulatory approval from the Sindh Environment Protection Agency (SEPA) as per the requirements of the IEE and EIA Review Regulations, 2000. The IEE included within its scope the 2D seismic operation (minimum 40 km upto 80 km) within the approximate confines of a "project area" located in the Dadu District of Sindh Province and covers two talukas: Johi and Khairpur Nathan Shah.



Pakistan: Initial Environmental Examination for Offshore Seismic Operation in Indus-G & H Blocks, Total Pakistan, 2002

Halcrow Pakistan carried out Initial Environmental Examination (IEE) for the 2D seismic operations of Indus G & H blocks to determine if there are any potentially significant impacts from the offshore seismic exploration activities proposed by TEPP. The planned seismic survey involved acquisition of seismic data by a specialised seismic vessel the "R/V Geo Baltic", which will be acquired using sleeve airgun as energy sources and streamer cables equipped with hydrophones as received lines.



Environmental Impact Assessment FOR Hydrocarbon Exploration activities in the Nara Game Reserve, OMV Pakistan, 2000-2003

Over the period of 03 years OMV Pakistan conducted hydrocarbon exploration activities in their Sawan, SW Miano II and Gambat concessions. These areas all had the NGR in common and cover significant portions of this protected area. Halcrow Pakistan conducted EIAs and IEEs in order to obtain environmental NOC to operate there and in addition to ensure that only appropriately planned and designed operations are performed and that cumulative impacts were fully analysed so that resources are not impaired.



Assessment of Material Releases in Badin Concession, BP Pakistan, 2006

Halcrow Pakistan conducted assessment of material releases (Oil, Brine, Oil & Water and Gaseous Emissions) in Badin Concession for BP Pakistan. The purpose of this assessment was to provide a review of reported material releases and to identify their causes, spill trends, gaps associated mainly with institutional capacity, BPPs procedures and systems, and resource availability to deal with accidental material releases.



Syria: Engineering Design and Supervision Services for Dublin International Petroleum (Syria) Limited, 2005

Halcrow Pakistan carried out engineering services and construction supervision of the exploratory activities. Services include Concept Design, preparation of Scope of Works, Review of Bill of Quantities, advising on Bid evaluation and reviewing (if required) Formulation of HSE guidelines for road and site construction projects, advising on Top Construction Supervision monitoring and control.



Pakistan: Construction Supervision Services for Maliri -1 Well Site and Access Road, Premier Oil Pakistan, 2005

Halcrow Pakistan carried out construction supervision services of civil construction works carried out by the Contractor for the access road and well site development and other associated works under the exploration activities.



Pakistan: Engineering services, HSE and construction supervision for Mehar North, Petronas Carigali, 2004

Halcrow Pakistan was appointed to conduct Construction Supervision, site visit, design & preparation of site and access road tender drawings, developing construction specifications, preparation of Tender & contract documents, HSE compliances, preparation of bill of quantities and bid evaluation.



Pakistan: Engineering Services for Access Road & Well Site Construction at Dumbar EL in SPA Concession, Premier Kufpec, 2002

Halcrow Pakistan carried the engineering services for the Access road and well site development in Dumbar EL in SPA concession. The scope of engineering services includes site visit, design & preparation of site and access road tender drawings, developing construction specifications, preparation of Tender & contract documents, preparation of bill of quantities and bid evaluation.



Pakistan: Engineering Services for Manzali-1 Well Site Access Road Designing and Construction Supervision Project at Tal Block, MOL Pakistan, 2001

Carried the engineering and supervision services for its Manzali-1 well field at Tal block near Kohat. Services includes site visit, design & preparation of site and access road tender drawings, developing construction specifications, preparation of Tender & contract documents, preparation of bill of quantities and bid evaluation. The supervision services includes site construction supervision of the access road, well site overall supervision, contract administration as per specifications and drawings, liaison with contractor, reporting.



Pakistan: Kushbakht-1 Access Road and Well Site Construction & Supervision Project at Mubarak-2 Block, Petronas Carigali, 2000-01

Carried out engineering and cost assessment of various access routes to a drilling Mubarak-2 well located in Mubarak block. Work included assessment and design of water supply options, identification of most suitable route, cost estimate for engineering works and tenders. Also performed the site construction supervision services included site construction supervision of the access road, well site overall supervision, contract administration as per specifications and drawings, HSE monitoring, liaison with contractor, reporting.



Pakistan: Zarghun North-1 Access Road and Well Site Construction Supervision Project, 2000-2001

Work program involved site construction supervision of the access road, well site overall supervision as per specifications and drawings; liaison with contractor and client on construction and design issues; reporting, cost and compliance with HSE; contractor contract adjudication, issue variation orders; site instructions and day work Orders and liaison with Security officers. Halcrow Pakistan also developed a Management Plan for the protection of 140 Juniper trees and 30 seedlings in close proximity to the access road and managed to avoid any permanent damage to the trees or seedlings occurs during the construction activities.



Pakistan: Andhar-1 Access Road and Well Site Construction Supervision in hirthar West Block, Lasmo Oil, 1999-2000

Halcrow Pakistan was appointed by Lasmo Oil Pakistan Ltd to carry out route selection and provide engineering services for Andhar Well Site in Khirthar West Block. The work program involved site construction supervision of the access road, well site overall supervision and contract administration, liaison with contractor and client on construction and design issues, monitoring contractor's progress and cost, accessing & evaluating contractor's claim and variation orders.

UAE: La Ville Contemporaine, Dubai International Properties; Dubai Properties, January 2005, Ongoing.

Halcrow undertook an environmental scoping study and part of the EIA for the La Ville Contemporaine (LVC) Project in Dubai that involves three mixed residential and commercial developments surrounding the Ras Al Khor Wildlife Sanctuary ('sanctuary') in Dubai. Halcrow undertook various environmental surveys to establish the baseline conditions for flora/fauna and archaeology, and socio-economic. In addition, an initial construction related Environmental Management Plan (EMP) was reviewed and implemented, along with the preparation of various environmental monitoring plans.



UAE: Mangrove Island Development, RAK Properties, September 2005, Ongoing.

EIA related to proposed coastal and inland residential and commercial development adjacent to a sizeable mangrove forest. It involved extensive consultation with Government agencies, Ministries and professional bodies. Halcrow's environmental team defined and completed the preliminary marine and terrestrial (including bird) surveys and assisted in the preparation of presentations.



UAE: Noor City Development, Ministry of Public Works, June 2005, Ongoing.

EIA related to proposed offshore residential and commercial development facing the city of Ras Al Khaimah. Extensive consultations with Government agencies, Ministries and professional bodies were held during the course. The team defined and completed preliminary marine and terrestrial (including bird) surveys and assisted in the preparation of presentations.



UAE: Review of Dust Control Measures at Mina Saqr Port, Saqr Port Authority, Complete.

Mina Saqr port handles approximately 10 million tons of bulk shipments of mineral materials per annum, including: bauxite, iron ore, kaolin, silica, gypsum, clinker, ball clay, copper slag and blast furnace slag, and also semi-finished Portland Cement. According to SPA, ambient PM10 levels in the area exceed the UAE air quality standard for 24-hour mean PM10 of 150 micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) and may be substantially affected by dust sources at the port. Halcrow provided its services to SPA in two phases: Phase 1: Independently advise SPA on the proposed design of the dust suppression system. A report covering the above and also highlighting potential limitations of the system and, where appropriate, recommendations for enhancements. Phase 2: Review the performance of the dust suppression system following installation with reference to site specific data on ambient PM10 to be provided to Halcrow by SPA. The review would include recommendations for refinements to the system where appropriate.



Qatar: Al Khor Port and Channel Site, MMAA, November 2005, Ongoing

The project entails undertaking a preliminary baseline environmental assessment of the study area. This includes Water and sediment quality of the sub-tidal area; Assessment of benthic invertebrates; and underwater video imagery of the area concerned. The above surveys have been completed and the results of sampling are awaited before the report is drafted.



Qatar: New Doha International Airport – Waste Tip and Landfill Project, Bechtel Inc., Complete

The project involved a specialised waste management scoping study that served as a precursor to a detailed EIA. The study identified the history of the site in order to determine the characteristics of waste materials.

Halcrow evaluated the potential environmental issues and provided detailed contents, including a scope and methodology (flora and fauna survey) for an EIA and Environmental Management Plan (EMP).

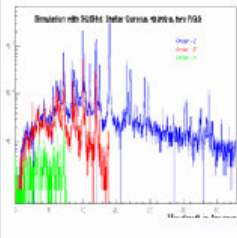


Ecuador: Esmeraldas Maritime Terminal, Corporation Estatal Petrolera Ecuatoriana

Halcrow was appointed for the design and supervision of construction of a maritime terminal Esmeraldas. The project involved the design and supervision of construction of two offshore berths, Ship loading equipment, Onshore water treatment plant, ballast lines, treated water discharge line and 11.5km of pipeline between the berths and the refinery, Corrosion protection, Fire fighting and Services.

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Experience Details



China: China LOG Simulation Study, BP International Limited, 1996.

Halcrow carried out the Simulation study for a new LPG Bulk Breaking Terminal in China. The project involves the analysis and interpretation of data supplied by BP, configuration of the HE35 program to model a storage terminal, definition of weather conditions and pilot age restrictions, execution of some 50 scenarios to investigate the influence of various design parameters on the throughput capacity of the terminal, interpretation of the results and presentation of conclusions regarding the throughput capacity of the terminal and recommended storage capacity.



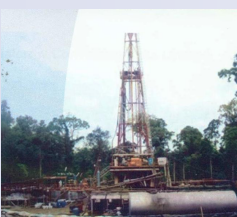
UK: Humber International Terminal, Edmund Nuttall Limited, 1999 to 2000

HIT is a major river terminal at the Port of Immingham on the Humber, constructed for Associated British Ports under a Design & Build contract. Halcrow was invited to conduct Structural analysis and design of suspended quay, design of earth bund on soft soils with rock-armored slopes, design of approach roads, and all services. Furthermore Halcrow carried out the services of dredging, Earthwork bunds on soft subsoil and Precast concrete on tubular steel piles.



Egypt: Damietta LNG/NGL Marine Facilities, Egypt, Bp/United Gas Derivatives Co, 2000 – Ongoing

Halcrow undertook a marine/civil feasibility study for a proposed LNG/NGL export facility at Damietta on Egypt's Mediterranean coast, prepared marine EPC tender documents and acted as client technical advisor. The study involves the Data collection & analysis, options evaluation, Geotechnical investigation & interpretation, LNG/NGL combined marine facilities planning, Preliminary design, cost estimates, risk analysis, EPC document preparation and Ongoing client advisor role. A detailed site investigation for marine and on-land facilities is being undertaken.



India: Engineering and Supervision services for road and Site Works for Drill Site Masimpur-3 At Silchar, Assam, Premier Oil –May 2005- 2006

The project was to develop the existing road, including the culverts by strengthening, widening, up-grading and elevating it to the required levels so as to enhance its suitability for the vehicular movement related to drilling operations and construction of a new access road with necessary cross drainage works, drilling pad and an elevated rig campsite area, as described herein and in the Drawings and Specifications. The new access road was intended to be branching out of the existing road and shall meet the drilling pad.



Bangladesh: Tullow Oil's Bangora Gas Processing Facility in Bangladesh –Sep 2005-Mar 2006

Tullow Bangladesh Limited has been engaged by the Bangladesh Petroleum Limited to extract gas from the Bangora site, under Kompanyganj Thana of Comilla District. The extracted gas will then be supplied to the national grid system. Tullow Bangladesh Limited has appointed Halcrow Bangladesh Limited to carry out the design and the supervision of civil works construction. The Civil works started on September 2005 and finished by March 2006.