

Integrated Reservoir Solutions Ltd

geological and mineralogical consultancy



Service Schedule 2006



Geological Services

Sedimentology

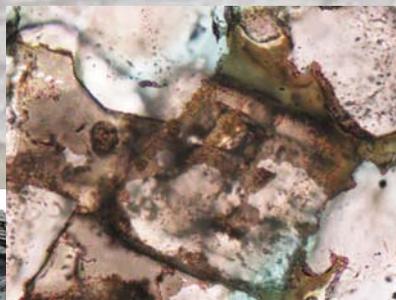
Description:

G01001: Sedimentological core description at 1:50 scale, including sedimentary, biogenic and tectonic structures, and provision of 150 and 1:200 scale core logs, the latter plotted with appropriate core analysis and wireline data. (Drafting not included). Price per foot

G01002: Sedimentological core description at 1:20 scale, including sedimentary, biogenic and tectonic structures, and provision of 1:20 and 1:200 scale core logs, the latter plotted with appropriate core analysis and wireline data. (Drafting not included). Price per foot

G01003: Core goniometry and fracture measurement. Recording of fracture density, orientation and dimensions, and description of fracture filling phases. 1:50 or 1:200 fracture logs related to wireline logs can also be supplied. (Drafting not included). Price per foot

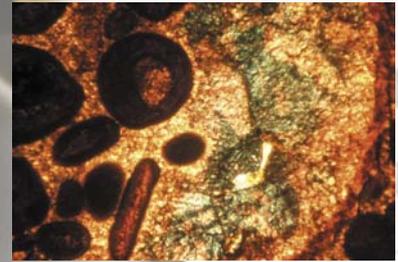
G02001: Basic sample handling, description or preparation, lithological picking, on washed and dried SWC or ditch cuttings. Price per sample



Petrography

Description

G03001: Standard thin section preparation. 30 micron thickness, mounted on 3"x1" glass slide. Includes impregnation with blue epoxy resin, and staining for carbonates and feldspars



G03002: Polished thin section preparation. 30 micron thickness, mounted on 3"x1" glass slide. Includes impregnation with epoxy resin

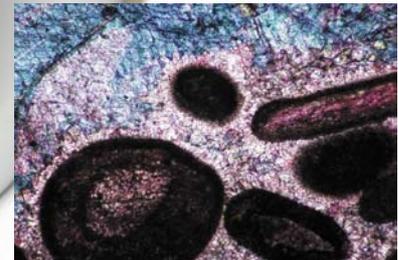
G03003: Standard petrographic description, inclusive of description of interstitial/pore filling phases, controls on reservoir properties and diagenesis, plus two photomicrographs. Includes thin section preparation

G03004: Detailed petrographic description, inclusive of description of detrital and authigenic phases, controls on reservoir properties and diagenesis, plus five photomicrographs. Includes thin section preparation

G03005: Additional cost for 200 point modal analysis if required

G03006: Additional cost for 300 point modal analysis if required

G03007: Grain size analysis based on thin section (exclusive of thin section preparation), using 100 grain long diameter measurements per sample, with basic statistical appraisal and determination of sorting and grain size characteristics



G03008: SEM/EDS analysis. Description of rock fabrics, pore geometry, diagenetic features and controls on reservoir quality, includes provision of up to six plates/EDS traces. Inclusive of sample preparation and coating

G03009: XRD analysis of whole rock sample, inclusive of full peak identification and mineral quantification

G03010: XRD analysis of clay fraction sample, inclusive of full peak identification and mineral quantification

G03011: XRD analysis of whole rock and clay fraction sample, inclusive of full peak identification and mineral quantification

G03012: Cathodoluminescence microscopy, including description and provision of two large paired and four thumbnail polarised and cathodoluminescence images, description of phases and integration with diagenetic history. Inclusive of polished thin section preparation

G03013: Ultraviolet Fluorescence microscopy including description and provision of 2 large paired images and 4 thumbnail photographs. Inclusive of thin section preparation.

G03014: Fluid inclusion analysis per sample. A preliminary standard petrographic description is required to complete this service

G03015: Radiometric dating (K-Ar, Ar-Ar, Pb-Pb, Sm-Nd, etc)

Isotopic Analysis

Description

04001: ICP-AES-MS chemical analysis of rock samples. 42 element analysis

05001: $\delta^{18}\text{O}$ + $\delta^{13}\text{C}$ on carbonates LASER METHOD. This price includes: standard petrographic description, wafer preparation, CL mapping and 6 spot analysis

05002: $\delta^{18}\text{O}$ + $\delta^{13}\text{C}$ on Carbonates (SEPARATION TECHNIQUE). This price includes: mineral separation and isotopic analysis. Assumes one phase for analysis

05003: $\delta^{34}\text{S}$ on Sulphides (SEPARATION TECHNIQUE). This price includes: mineral separation and isotopic analysis. Assumes one phase for analysis

05004: $\delta^{34}\text{S}$ on Sulphates (SEPARATION TECHNIQUE). This price includes: mineral separation and isotopic analysis. Assumes one phase for analysis

05005: δD and $\delta^{18}\text{O}$ on Clays (SEPARATION TECHNIQUE). This price includes: mineral separation and isotopic analysis. Assumes one phase for analysis

05006: SIMS $\delta^{18}\text{O}$ on Quartz. This price includes: standard petrographic description, wafer preparation, CL mapping and SIMS analysis. Assumes one phase for analysis

05007: $^{87}\text{Rb}/^{86}\text{Sr}$ on Carbonates and Sulphates. This price includes: mineral separation and isotopic analysis. Assumes one phase for analysis

06001: Secondment of Consultant to work in clients' offices within the U.K. (exclusive of travel and accommodation expenses). Price per day

06002: Secondment of Consultant to work in clients' offices overseas (exclusive of travel and accommodation expenses). Price per day

06003: Travel, accommodation, subsistence and incidental expenses incurred whilst performing analysis, interpretation or consultancy at cost

07001: Interpretation, consultancy, data evaluation and report writing. Per day

07002: Drafting per day

07003: Duplication of reports etc., by quotation dependent upon content

08001: Sample storage. Per pallet up to 1 cubic metre per week

08002: Sample storage, per box up to 0.25 cubic metre per week

08003: Return of samples/materials at cost + 10% handling

Chemical Stratigraphy

Mobilisation of E5 unit, for transportation to/from wellsite

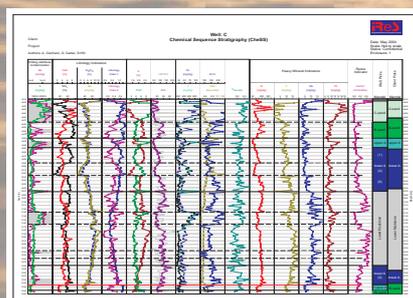
Mobilisation of staff to wellsite (travel and subsistence)

Costing for unit and staffing at wellsite (this includes unit and equipment hire, provision of 1 geologist and 2 technicians)

Provision of liquid nitrogen source (if possible)

Cost breakdown for the offshore day rates

- E5 unit hire
- Equipment
- Geologist
- Technician



iResTM
Integrated reservoir solutions

Organic Geochemical Services

Sample Preparation Services

09001: Washing of cuttings to remove drilling mud and any other drilling introduced contamination. Clean samples are then air dried, bagged and labelled with well name, depth and laboratory code.

09002: Lithological Description / Sample Selection. A basic lithological description listing major and minor lithologies in each cuttings sample. Includes hand picking of selected lithologies and crushing and homogenisation for geochemical analysis

09003: Removal of Oil Based Mud. An extra clean-up step designed to remove, where necessary, oil based contaminants by solvent soxhlet extraction

09004: Bulk Extraction (no recovery of extract)

09005: "Mini Extraction" for GC Analysis Ultrasonic extraction of reservoir rocks to yield oil fraction for GC characterisation

09006: Kerogen Isolation

Screening Analyses

09007: Airspace Gas Analysis ($C_1 - C_5$ & C_{6+}) Chromatographic analysis of headspace gas from canned cuttings samples

09008: Total Organic Carbon Content

09009: Total Carbon Content

09010: Total Inorganic Carbon Content

09011: Rock Eval Pyrolysis (S_1, S_2, S_3 & T_{max})

Microscopy

09012: Vitrinite Reflectance (includes sample preparation)

09013: Visual Kerogen and Spore Colour Analysis

Solvent Extraction

09014: Soxhlet Extraction Solvent extraction of ground and homogenised sediment samples using re-distilled organic solvent systems.

09015: Sonic extraction Cold ultrasonic extraction for reservoir rocks

09016: Liquid Chromatography Packed column liquid chromatography with quantification



Organic Geochemical Services (continued)

Gas Chromatography

09017: Whole Oil Gas Chromatography Gas chromatography of total oil from nC3 to approximately nC35.

09018: Gasoline Range Hydrocarbons Very high resolution gas chromatography of light components (C1-C8) of crude oil.

09019: Saturate Gas Chromatography

09020: Aromatic Gas Chromatography

09021: High Temperature GC Analysis: Wax analysis: C70 + gas chromatography analysis

09022: Thermal Extraction (S1) GC-MSSV

09023: Pyrolysis GC (S2)-Curie Point

09024: Programmed Pyrolysis-GC (S2)

09025: Programmed Pyrolysis-GC-MSSV

09026: Reservoir Fingerprinting of Oils. A powerful technique for assessing if different reservoirs are in fluid communication. High resolution GC analysis of oils compares the relative abundances of approximately one hundred relevant minor components. Typically, the C₆-C₁₃ range is used. Cost includes duplicate analysis and full interpretation

Gas Chromatography-Mass Spectrometry

09027: Low Resolution SIR Biological Marker Analysis –Aliphatics Single Ion Recording of specific biomarker compounds. Ions monitored are m/z 123, 125, 127, 217, 218, 231, 253, 259, 177,191,205. Analysis price includes A4 mass chromatograms of all ions over all relevant scan ranges, a print out of peak height/areas and a table of the main biological marker ratios. Performed on saturate or branched chain fractions

09028: Low resolution SIR Biological Marker Analysis –Aromatics Single Ion Recording of specific biological marker compounds. Ions targeted are m/z 128, 142, 156, 170, 178, 184, 192, 198, 206, 212, 216, 220, 228, 230, 242, 252, 256, 266, 276, 280, 290 and 304. Analysis price includes all mass chromatograms and tabulated peak areas/heights

09029: High Resolution SIR Biological Marker Analysis – Oils /Extracts Accurate mass SIR analysis of oils or source rock extracts (after removal of asphaltenes). Ions normally monitored are: 177.1642, 178.0782, 191.1798, 192.0928, 198.0501, 205.1956, 206.1088, 217.1956, 218.2034, 231.1174, 231.2133, 253.1956, 259.2427. Analysis price includes all mass chromatograms and tabulated peak heights/areas

09030: MRM Analysis Analysis monitors parent–daughter transitions and is designed to solve particular problems, such as marine vs. non-marine (C30 steranes) and confirming the presence of certain biological markers (oleanane, gammacerane in the presence of abundant tricyclics). Analysis format by client request

09031: Full Scan GC-MS Full scan GC-MS of unknown mixtures. Analysis price includes TIC mass chromatogram, spectra on all peaks and library results on all peaks.

09032: "Geokleen" Analysis Separation of branched chain fractions from saturate or oil fractions.

Isotope Analyses

09033: Oil, saturate, aromatic, NSO, asphaltene and extracts Price per fraction

09034: Kerogen Isotope Analysis performed on isolated kerogen Price per sample

09035: Kerogen Pyrolysate Analysis Price per sample

09036: δ¹³C-Hydrocarbon Gases Price per gaseous component Analysis performed on methane, ethane, propane and butanes

09037: δ¹³C - Carbon Dioxide Analysis performed on CO₂ in gas samples. Price per sample



Organic Geochemical Services (continued)

09038: $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ on Carbonates Price per sample

09039: Deuterium Analysis of Gases Methane only

09040: Deuterium Analyses of Oils

09041: Sulphur Isotope Analysis of Oils

09042: Deuterium Analysis of Water

09043: Oxygen Isotope Analysis of Water

09044: Deuterium and Oxygen in Water

09045: Nitrogen Isotopic Analysis of Organic Matter

09046: Carbon and Nitrogen in Organic Matter

09047: Carbon and Oxygen Isotope Microanalysis of Carbonate by in situ Laser Pyrolysis Preparation of Double polished 100 micron wafer

09048: Carbon and Oxygen Isotope Microanalysis of Carbonate by in situ Laser Pyrolysis Analysis



Miscellaneous Tests

09049: API Gravity ($^{\circ}\text{API}$)

09050: Pour Point

09051: % Sulphur

09052: Nickel and Vanadium

09053: Wax Content

09054: Asphaltene Content

09055: Oil Field Water Analysis

09056: Gas Compositional Analysis Composition of gases C_1 through C_4 + N_2 , O_2 , and CO_2

09057: Gas Analysis, as above but hydrocarbons out to nC_{13} and calorific value and compressibility data

Biostratigraphy Services

Description

B10001: Palynological and palynofacies analysis. Quantitative, inclusive of preparation

B10002: Palynological analysis. Quantitative, inclusive of preparation

B10003: Palynological and palynofacies analysis only

B10004: Palynological analysis only

B10005: Palynological / palynofacies sample preparation

B10006: Palynological sample preparation

B10007: Palynofacies sample preparation

B10008: Micropalaeontology analysis. Quantitative, inclusive of preparation

B10009: Micropalaeontological analysis only

B10010: Micropalaeontology, microfossil extraction

B10011: Micropalaeontology, microfossil picking and mounting

B10012: Micropalaeontological picking only

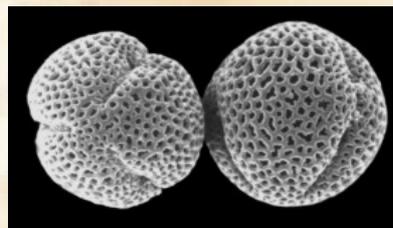
B10013: Micropalaeontological thin section analysis, inclusive of preparation

B10014: Micropalaeontological thin section analysis only

B10015: Micropalaeontological thin section preparation

B10016: Nannoplankton sample preparation

B10017: Nannoplankton analysis. Quantitative, inclusive of preparation



Biostratigraphy Services (continued)

B10018: Nannoplankton analysis only

B10019: Provision of wellsite palynologist, micropalaeontologist or nannoplankton specialist. Price per day

B10020: Travel and standby days for wellsite palynologist, micropalaeontologist or nannoplankton specialist. Price per day

B10021: Provision of wellsite technician. Price per day

B10022: Standby and travel days for provision of wellsite technician. Price per day

B10023: Provision of wellsite processing unit. Price per day

B10024: Mobilisation of wellsite processing unit for travel to wellsite. Price per trip

B10025: Kerogen typing and spore colour determination

B10026: Chitinozoa reflectivity and determination

B10027: Hotshot analysis, 3 sample minimum - results within 24hrs. Analysis performed in N. Wales, Cheshire or Aberdeen laboratories

B10028: Interpretation, consultancy, data evaluation and report writing. Price per day

B10029: Secondment of Consultant to work in clients' offices within the U.K. (exclusive of travel and accommodation expenses). Price per day

B10030: Secondment of Consultant to work in clients' offices overseas (exclusive of travel and accommodation expenses). Price per day

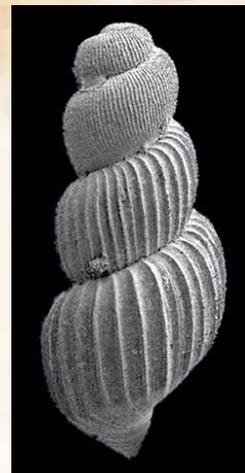
B10031: Travel, accommodation, subsistence and incidental expenses incurred whilst performing analysis, interpretation or consultancy away from office

B10032: Drafting

B10033: Duplication of reports etc.

B10034: Sample storage. Per pallet up to 1 cubic metre. Price per month

B10035: Sample storage, per box up to 0.25 cubic metre. Price per month



Core Analysis Services

Technical/Analytical Services

Core Preparation

- Handling 30ft barrel (per foot)
- Core Slabbing unsleeved and cut (per foot)
- Core Resination (per foot)
- (a) Mounting/labeling core in clear resin and inclusive of wooden storage trays
- (b) Cost for additional labeling (per item)
- Provision of core boxes



Sample preparation

- Thin section preparation (with impregnation and staining)
- Polishing
- Washing and drying
- Plastic slide box, 25
- Plastic slide box, 50
- Presentation slide box, 50
- Presentation slide box, 100
- Sample splitting (per split) 1-4 splits
- Sample splitting (per split) 5+ splits

Wellsite Services

- Trained Technician to catch core, log, preserve and pack at wellsite
- Onshore (per day)
- Offshore (per day)
- Standby rate away from base (per day)

- Core boxes for standard core (per box)
- Consumables
- Travel/accommodation expenses



Core Photography

- Colour photographs in white light, A4 prints, 15 ft per frame
- Colour photographs in ultra violet light, A4 prints, 15ft per frame
- Colour photographs in white and UV light, A4 prints, 15ft per frame
- Photo reprints (each)

Conventional Core Analysis

Core logging

- Total and Spectral gamma ray log (per foot)

Porosity/Permeability

- Helium Porosity (ambient) per plug
- Horizontal Air Permeability (mean pressure)
- Grain density
- Cutting of plugs including Soxhlet cleaning and oven drying
- Mini-permeametry on slabbed core, calibrated against routine plugs, 12 points per foot (Per point)

- Dean Stark analysis (Per plug)

Special Core Analysis

- Preservation of whole core for SCAL (Per sample)

Routine SCAL tests and more specialised tests are available

Geological Core Analysis

It is recommended that geological core screening is done in conjunction with core analysis studies to optimize results with respect to objectives. This will include operational issues together with an understanding of the sedimentology and petrology of the sections covered.

- Thin section preparation (with impregnation and staining)
- Sedimentological core description
- Photomicrographs
- Orientation and fracture studies

Core Analysis Services

Supporting Geological Services

Fracture/Fault seal analysis

Integrated Faulting and Fault Seal Analysis

Prices for these services are quoted on an individual basis combining a daily rate and specific preparation/analytical costs.

Quality Assurance/Integrated report compilation

Preparation of short report integrating analyses and objectives
Quality Assurance of integrated results.

Prices for these services are quoted on an individual basis combining a daily rate and specific preparation/analytical costs.

