MGL SURVEYS
BOREHOLE & SURFACE
MICROGRAVITY SURVEYS

Energy Exploration & Production

Mining Exploration & Development

Geotechnical, Geodetic

Geophysical Research

Environmental

Micro g LaCoste

A DIVISION OF LRS

MGL SURVEYS

MGL SURVEYS, A DIVISION OF MICRO-G LACOSTE AND SCINTREX, provides the oil and gas, mining, and geotechnical industries with unique survey capabilities using our state-of-the-art microgravity instruments that are manufactured in-house.

We specialize in high-resolution surface and borehole gravity surveys using the following instruments:

- Micro-G LaCoste A-10 and FG5-X absolute meters.
- Scintrex CG-5 relative gravity meter.
- Bluecap™ and Gravilog™ borehole gravity meters.

FIELD SURVEY INSTRUMENTS

Our precision instrument capabilities allow MGL Surveys to provide the most efficient and accurate microgravity surveys available worldwide and in a wealth of extreme environments.

- A-10 provides absolute gravity measurements without the need for external reference stations.
- Hybrid Gravity® system surveys utilize absolute A-10 and relative CG-5 measurements for extremely fast and efficient surveys that minimize time-consuming base ties.
- Geodetic grade GPS provides cm-level surface station positioning.
- Gravilog™ and Bluecap™ tools provide highly accurate borehole gravity measurements with typical repeatability of 7 microGal, including positioning errors.
- High-resolution Casing Collar Location tools provide cm-level borehole station positioning.

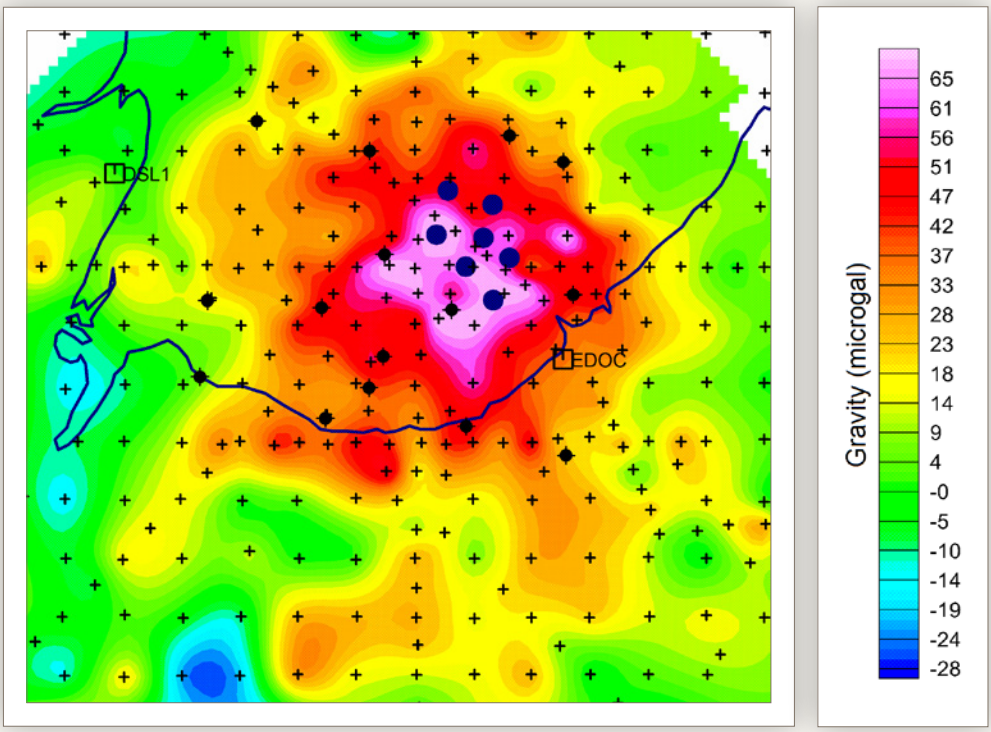
Gravilog borehole gravity survey - Canada.

SURVEY APPLICATIONS

Microgravity has been used effectively for widespread applications. In addition to classic geodetic and exploration applications, the microgravity method has been successfully used for time-lapse (4D) monitoring of subsurface changes related to reservoir production, gas sequestration, enhanced hydrocarbon recovery and aquifer storage and recovery.

Typical applications that use microgravity in an absolute, relative, or Hybrid Gravity® system survey include:

- Monitoring of reservoir fluid movements.
- Monitoring of CO_2 sequestration.
- Mapping porosity distribution within heterogeneous carbonate reservoirs.
- Monitoring aquifer storage and recovery operations.
- Aquifer dewatering and subsidence studies.
- Overburden pressure measurement for reservoir development and gas storage.
- Establishing country-wide absolute gravity networks.
- Geoid definition and refinement.
- Geothermal monitoring and exploration



Time-lapse Absolute Gravity - Prudhoe Bay, Alaska.

A-10 FEATURES & SPECIFICATIONS

- Field-proven operations from harsh arctic to harsh desert environments.
- Data acquisition system controls measurements, evaluates quality, and applies corrections in real-time.
- Typical accuracy < 7 microGal and GPS positions and elevations to 1–2 cm.
- Operating temperature -40˚C to +38˚C

A-10 Survey - Middle East.

FEASIBILITY STUDIES

MGL performs pre-survey feasibility studies using state-of-the-art forward and inversion modeling techniques for surface and borehole surveys.

Reservoir properties and simulation data from 4D seismic and well log data are used to generate forward response models, add realistic noise estimates and invert, to provide a realistic forecast of the interpreted survey response.

Our expert feasibility studies guide management in making decisions for cost-effective, value-added survey solutions for their project goals.

SURVEY INTERPRETATION

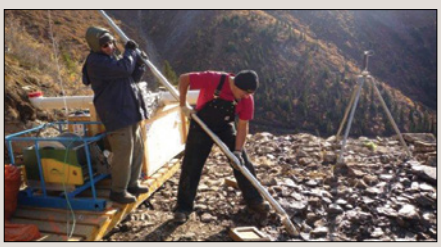
Modeling techniques used for feasibility studies can be applied to interpretation of survey results, in conjunction with monitor well data, 4D seismic, and reservoir geometry and property constraints, by our experienced geophysical staff.

BOREHOLE GRAVITY SURVEYS

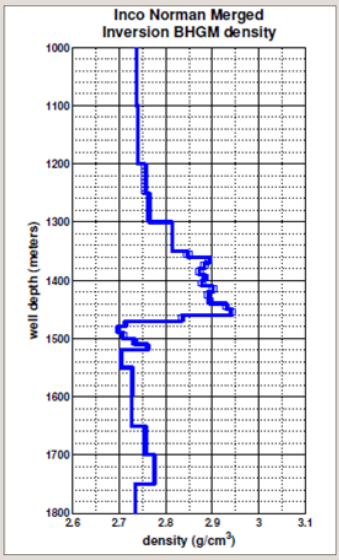
MINING & GEOTECHNICAL -

Gravilog℠ Surveys

- Large volume bulk density in homogeneous, heterogeneous and heavily fractured rock units.
- Remote sensing of massive sulphide deposits and 3D inversion with multiple wells and surface gravity.
- Identification of conductors as graphitic or metallic.
- Ore grade delineation with multiple wells & surface gravity.
- Overburden density determination.
- Void detection.



Gravilog™ tool in rugged terrain - Yukon Territory, Canada.



Density Log from Gravilog℠ Surveys

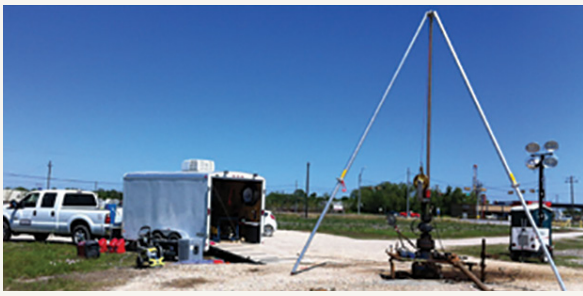
GRAVILOG™ GRAVITY TOOL
FEATURES & SPECIFICATIONS

MAXIMUM TEMPERATURE	70°C (158°F)
MAXIMUM PRESSURE	25,500 kPa (3,700 psi)
INCLINATION	Vertical to 60 degrees
OUTSIDE DIAMETER	48.3 mm (1.9 inches)
LENGTH	3.43m (134.9 inches)
WEIGHT	55 kg (85 lb)
REPEATABILITY	< 7 microGal
TOOL INCORPORATES	Gamma, pressure & tilt sensors
CABLES	Operates on 4 or 7 conductor cables

PETROLEUM & CO_2 -

Bluecap℠ Surveys

- Time lapse monitoring.
- CO_2 sequestration, gas water and steam oil.
- Large volume density through casing.
- Overburden pressure: offshore and gas storage.
- Mapping remote structures.
- Carbonate porosity.



Borehole gravity survey for CO_2 enhanced production.

BLUECAP™ GRAVITY METER FEATURES & SPECIFICATIONS

MAXIMUM TEMPERATURE	150°C (300°F)
MAXIMUM PRESSURE	103,000 kPa (15,000 psi)
INCLINATION	vertical (0 degrees) to > horizontal (95 degrees)
OUTSIDE DIAMETER	60.3 mm (2 3/8")
LENGTH	4.3m (14.1 feet)
WEIGHT	55 kg (120 lb)
REPEATABILITY	< 7 microGal
TOOL INCORPORATES	Natural Gamma and high resolution CCL tools
CABLES	Operates from single or multi-conductor cables

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