

Statement of Qualifications
Cuttings Re-Injection (CRI) Service

**Terralog Group of Companies:
Terralog Technologies Inc.
PT Terralog Teknologi Indonesia**

Submitted by



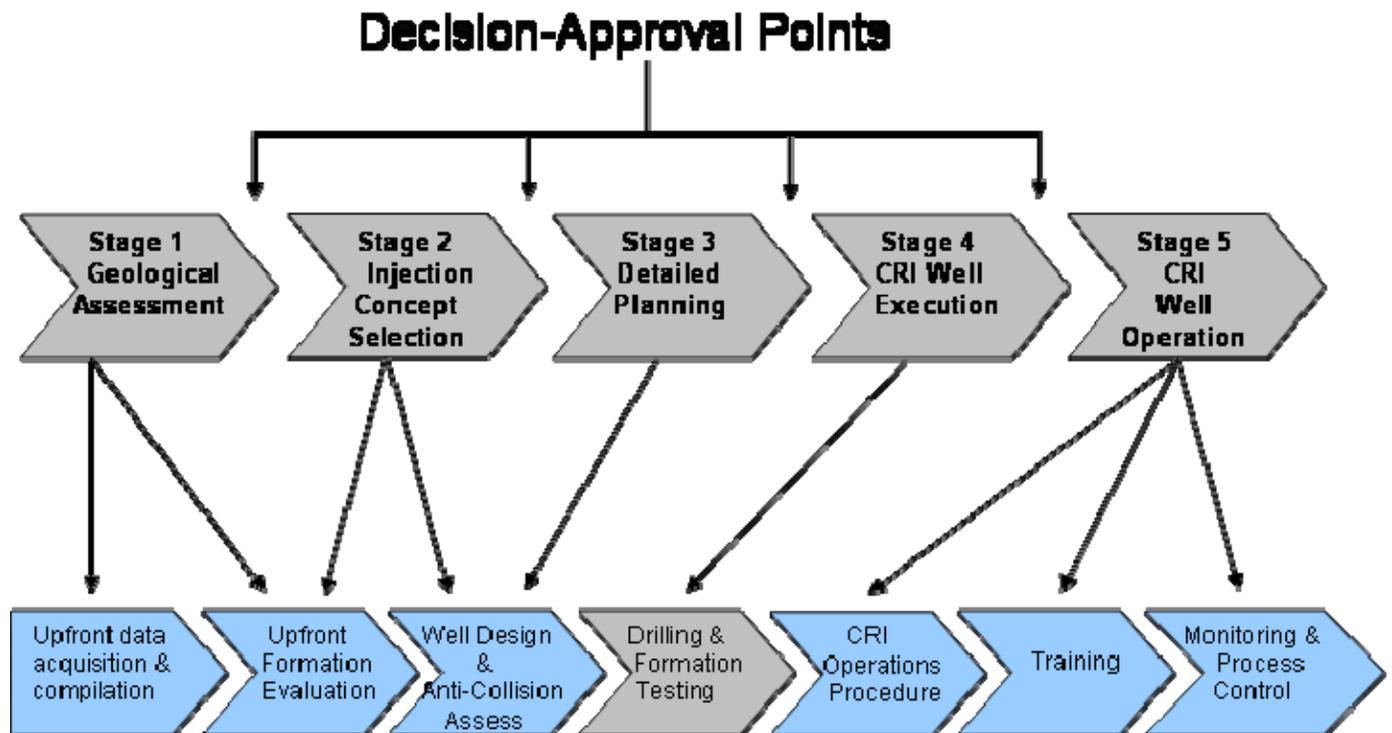
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TERRALOG STATEMENT OF QUALIFICATIONS

Since 1996, Terralog Technologies Inc. has been the industry leader in the design, operation and management of large volume, deep well disposal of various wastes. Terralog provides project management & technical support services for injection of petroleum industry drill cuttings & waste fluids/muds using the Cutting Re-Injection (CRI) process. Terralog's technical services group combines expertise in geomechanics, geology, rock mechanics, reservoir engineering, and environmental management with practical field experience in deep well disposal-injection operations.

Terralog's **CRI Project Management Service** is built on our extensive experience in deep well disposal of upstream oil production wastes (e.g. produced sands, oily viscous fluids, contaminated soils and tank bottoms) using the Slurry Fracture Injection (SFI)TM deep well disposal process. Terralog is a service company active in Canada, Norway, UAE, Saudi Arabia and Indonesia. *Terralog has developed 'Best Practices' for CRI operations that are being accepted by major operators as the 'industry standard'.*

With a strong staff of earth scientists and engineers, Terralog's expertise and focus are on the formation mechanics of slurry injection for deep well waste disposal. Special emphasis is placed on design, equipment selection, and operating specifications to maintain waste containment in the target interval, to reduce operating costs, optimize injection operations, and to maximize formation storage capacity and injection well life. With offices in Calgary and Jakarta, Terralog provides clients with a unique combination of geomechanics expertise, regulatory experience, and extensive waste injection design and operations experience.



Terralog Best Practices Work Flow for CRI Operations

*The Terralog **CRI Project Management Service** is a unique combination of fully integrated project management and technical support to properly resolve the many technical and injection issues that can occur with CRI operations. Terralog has a proven record of ensuring that the operational-drilling objectives of Drilling Groups are met by ensuring successful, reliable CRI operations.*

Terralog's unique qualifications for CRI services are as follows:

1. Terralog is the only service company worldwide dedicated to providing deep well disposal services. Terralog is currently involved with projects in the Canada, Norway, UAE, Saudi Arabia, and Indonesia. We have developed an extensive technical data base and practical field operating experience with large scale injection of upstream petroleum E&P wastes. *This expertise allows us to provide a 'rapid response' capability for drilling rig/offshore platform based CRI operations.*
2. Terralog provides Project Management Consultant (PMC) and Technical Support services to active CRI operations in the Arabian Gulf and North Sea; working with major operators to ensure optimum offshore CRI well and formation performance during drilling operations, as follows:
 - Managing containment, formation injectivity, wellbore plugging, wellbore integrity, and formation storage capacity issues during CRI operations.
3. Terralog has developed 'Best Practices' for deep well disposal operations (including CRI) that have been accepted as standards for deep well waste disposal operations in the petroleum industry. These Best Practices have been 'adopted' and implemented by operators such as Chevron, Statoil and Saudi Aramco.
4. Terralog has undertaken many CRI Technical Feasibility and Design Studies worldwide, that include:
 - Geological formation evaluations
 - Well design & completion for CRI operations
 - Injection strategy design and implementation
 - Detailed area-of-review for project permitting
 - FEED for CRI facilities and related equipment.
5. Terralog has developed specialized deep well disposal project management systems, equipment, and field-operating procedures based on years of operating experience that are necessary to maintain efficient, safe and environmentally sound deep well disposal operations.
 - Terralog has specialized deep well disposal management and operational systems, related to: Technical Support, Field operations, Project Management, and HSE controls.
 - *Terralog QMS and EMS for deep well disposal operations are ISO certified (ISO 9001, 14001, OHSAS 18001).*

- Terralog provides experienced personnel for project management, subsurface technical support, administration and logistics support to ensure the reliable and safe performance of a SFI facility.
6. Terralog has specialized technical expertise in deep well disposal processes (including CRI) to monitor and control operations in order to: assure reliable performance of the disposal facility, maintain formation injectivity, reduce downtime due to wellbore plugging and formation damage, and assure containment of the waste material in the target disposal zone.
- Terralog is the industry leader in deep well disposal technical expertise relating to: geomechanics, rock fracture mechanics, formation management, well-bore design, slurry design optimization, and Process Control.
 - Terralog's technical support provides specialized & proprietary expertise at integrating surface injection operations, slurry design, wellbore design and maintenance, and formation Process Control.
 - Terralog has designed and implemented dedicated process monitoring systems for *insitu* Process Control during deep well injection-disposal field operations.
 - Terralog provides data management systems for deep well disposal operations, using specialized database applications and data management processes.
 - Terralog provides experienced personnel for CRI field operations (HSE, field supervisors, field crews) and Technical Support (Engineers).
 - 'Process Control' during deep well disposal/SFI operations refers to:
 - Ensuring formation containment of injected slurry.
 - Ensuring optimal formation injectivity and geomechanics response to injected slurry.
 - Assessing and ensuring hydraulic integrity of the disposal well.
 - Maximizing formation storage capacity.
7. Terralog personnel are experienced with regulatory issues related to deep well injection processes, providing clients with support necessary for obtaining consent and approval from in-country regulatory agencies; including:
- Liaison with regulatory agencies for project permitting
 - Preparation of applications for regulatory approvals
- Terralog has successfully assisted operators with obtaining regulatory approvals for CRI operations in both onshore and offshore applications; in jurisdictions that include Saudi Arabia, UAE, Indonesia and W. Africa.
8. Terralog has demonstrated project delivery capability.

Terralog principals have authored many technical papers on slurry injection mechanics and field operations, and have been active researchers in this topic for more than ten years (see attached references). In recognition of this expertise, Terralog was awarded a research contract by The US Department of Energy (DE-AC26-99BC15222) for the project "Development of Improved Oilfield Waste Injection Disposal Techniques: Database Assembly, Model Development, and Field Verification". In this project Terralog compiled and analyzed detailed formation response data from more than 800 slurry waste injection episodes in the US and Canada (Bruno et al, 2001), and developed optimum design and operating guidelines. Dr. Maurice Dusseault (Terralog Senior Technical Advisor) and Mr. Roman Bilak (President Terralog Technologies Inc; President Director of PT Terralog) have consulted to industry operators and regulatory agencies for various international waste disposal-injection operations. Mr. Bilak participated on a panel of industry and regulatory personnel that drafted new regulations for dedicated waste injection operations in Indonesia. Dr. Dusseault and Mr Bilak have participated on various industry panels and in conferences related to deep well waste disposal.

Terralog CRI operational milestones can be summarized as follows:

- Terralog's 'Best Practices' for deep well disposal technology has been adopted as the CRI operating standard by Statoil and Saudi Aramco.
 - Terralog implemented its 'Best Practices' for deep well disposal technology for CRI operations in the Arabian Gulf with Saudi Aramco.
 - Terralog implemented its 'Best Practices' for deep well disposal technology for CRI operations in the North Sea with Statoil.
 - Terralog is providing CRI PMC and Technical Support services to Statoil and Saudi Aramco.
- Terralog had a primary role with the design and permitting of the first dedicated slurry injection (SFI & CRI) projects for oil production waste in SE Asia and the GCC region (Middle East).
- Terralog currently operates the world's largest deep well disposal project, the Duri SFI project in Sumatra, Indonesia; to dispose of upstream petroleum related waste streams, including drilling wastes. Terralog developed, obtained regulatory approval, and currently operates for Chevron Pacific Indonesia; a multi-well dedicated SFI facility to handle these production & drilling wastes at the Duri oilfield.
- Terralog has designed, permitted and operated more than half a dozen large volume slurry fracture injection projects for various clients in Western Canada (Srinivasan et al, 1997).
- Terralog designed, permitted and operated the first and only crude-oil contaminated soil injection project in California (Srinivasan et al, 1998).
- Terralog designed and permitted the first offshore cuttings injection project in California.

- Terralog is considered a vendor of choice by regulatory agencies around the world (e.g. US-Environmental Protection Agency, California Division of Oil & Gas, Alberta Energy Regulator, Indonesia State Ministry of Environment)

Finally, Terralog has completed technical feasibility and FEED studies for CRI projects for clients around the world, including:

- Arabian Gulf, KSA (Saudi Aramco)
- The North Sea (Statoil and BP Norge)
- Abu Dhabi (ZADCO)
- MacKenzie Delta, Canada (ExxonMobil, ConocoPhillips)
- Indonesia (BP Indonesia)
- West Africa (Chevron Nigeria, Chevron Angola)
- California (Chevron, Tidelands Oil, Southern California Gas Co., Venoco)
- Russian Federation - Sakhalin Island (BP)

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