White Paper

IMSA 3 – Integrity Management System Application

Background:

IMSA is an acronym for Integrity Management System Application. It is an integrated software application which manages all aspects of the integrity management process. Although the current scope of IMSA is pipelines (offshore and onshore) and all underwater assets, it can also be used to apply the integrity management process to any static equipment classes.

IMSA 1 was prototyped as an MS Access application for (SPEX) Shell Philippines Exploration B.V. in 2002 and was later deployed to production as IMSA 2 in 2003. It was then implemented for (SMEP) Shell Malaysia Exploration and Production later in 2003 and for (SEPCo) Shell Exploration and Production Co. in the United States in 2004. The system was then implemented for (SNEPCo) Shell Nigeria Exploration and Production in 2007.

In 2007, with funding from SEPCo, the development of IMSA 3 was started. IMSA 3 was a ground-up re-development using .NET Framework 2.0 as the development platform and Oracle for the backend database.

In March 2008, IMSA 3 went live in SEPCo. This was then followed by SPEX, SMEP and SNEPCo respectively. The system has been in live use since then.

IMSA Philosophy:

IMSA was developed primarily for the management of Technical Integrity with a principal target audience of Discipline Engineers and Technical Authorities.

IMSA is designed to provide key integrity related information to the Asset Integrity Monitoring System (AIMS) and is a key element of the overall corporate Asset Integrity Management System. IMSA is intrinsically linked to the HSE Case developed for Pipelines and Underwater Assets.

Integrity threats and associated risks identified within the HSE Case, supplemented by Design, Operation and Maintenance Manuals, are used as the baseline for the integrity management process and modified as appropriate, based on the performance of the assets as measured by the prescribed inspection and monitoring activities.

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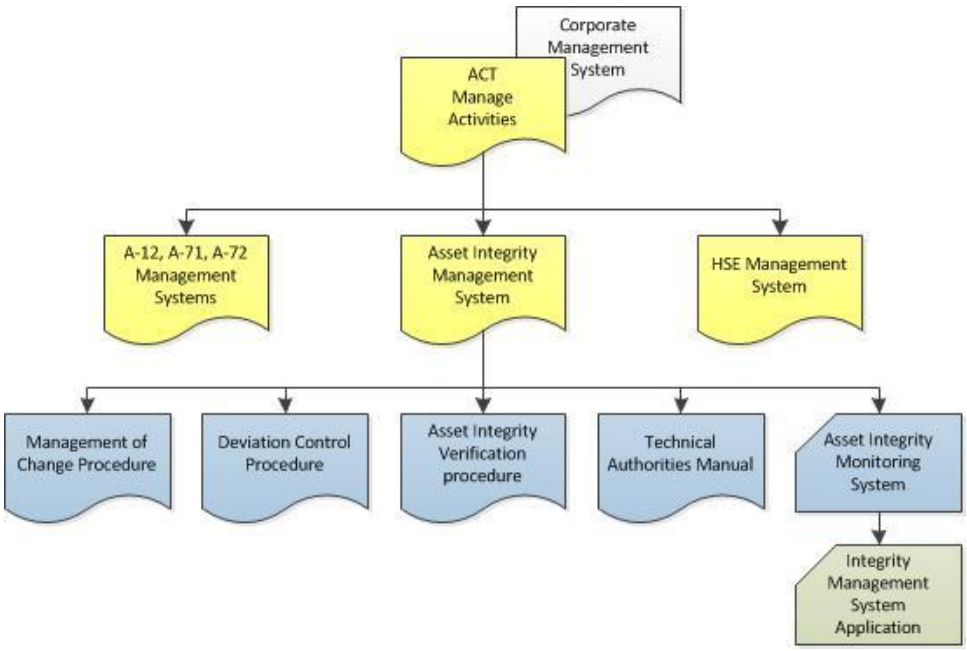

Figure 1 - Asset Integrity Management System

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This fundamental relationship enables IMSA users to confirm and demonstrate dynamically, whether integrity risks are at an acceptable level.

A key differentiator is that IMSA enables a holistic approach to integrity management; it is not designed with analytical tools for engineering analysis e.g. internal corrosion modeling, finite element analysis but imports information from such analyses, enables integrity status to be amended as appropriate and includes this information when generating risk based inspection due dates, associated work scopes and recording asset performance history.

IMSA System Summary:

Technical Integrity Management is a process, which varies in detail between operating companies and equipment classes, but is principally generic:

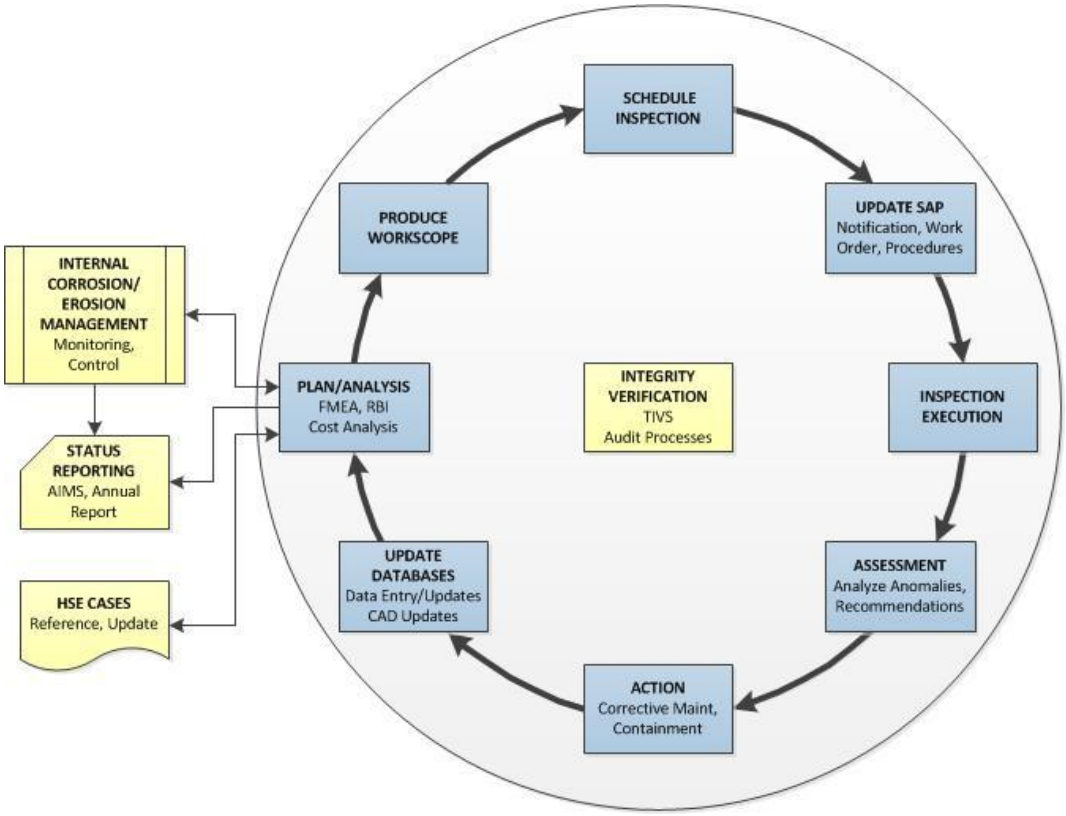

Figure 2 - Technical Integrity Management Process

IMSA has been designed to apply and manage that process by:

- Making data and multimedia easily available (*Figure 3*)
- Trending on available data (*Figure 4*)
- Applying RBI rules (*Figure 5*)
- Managing anomalies (*Figure 6*)
- Reporting integrity status and risk levels (*Figure 7*)
- Monitoring Events such as process excursions, seismic events (*Figure 8*)
- Prompting action parties
- Interfacing with other corporate databases (SAP, PAS, OmniSafe)
- Data integrity auditing and quality assurance

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Key Attributes of IMSA

- Not designed for a particular equipment class. Can be used for any equipment to which the integrity management process is applied.
- Can be used in parallel with, (feed data to and apply outputs from) analytical systems which apply detailed corrosion rate or stress analysis calculations.
- Configurable system, most settings can be updated without recoding.
- Aligned to and integrated with SAP.

Potential Cost Savings IMSA Contributes to:

- **RBI and Workscope:** Reduction in inspection costs by applying inspection effectively: *appropriate* inspection, targeted at *high risk threats*
- **Anomaly Management:** Reduction in unplanned outages due to effective management and correction of defects and degradation
- **Data Access:** Reduction in analysis costs due to quick retrieval of inspection data, documents, multimedia
- **Integrity Management:** Increased HSES confidence due to demonstrable risk reduction
- **Integrity Management:** Reduction in planned outage time due to prior identification of anomalies allowing for good shutdown planning
- **Event Monitoring:** Reduction in equipment replacement costs due to instant flagging of events potentially harmful to integrity
- **Integrity Management:** Reduction in data entry, data management, analysis and reporting manpower costs due to single application with automated processes

IMSA System Functionality Summary:

***Summarizing the main functionality of IMSA*:**

- Storage and retrieval of inspection data and multimedia for pipelines and underwater assets
- Electronic or manual inspection data uploading
- Anomaly management
- Integrity management process tracking and reporting
- Risk assessment of multiple failure threats with both time-based and non-time based degradation mechanisms
- Trending and predicted failure dates for time-based threats
- RBI analysis and workscope generation
- Reference file management (documents, drawings, photos and videos) and quick retrieval
- Design data storage and retrieval
- Quality Assurance process
- Seismic activity management and automatic webpage posting

Other key features of IMSA:

- Modular design, navigation of the application by module and sub-module
- Navigation/data filtering by asset trees, with asset coloring by integrity status, current risk or criticality
- User management and access rights allocation by user group and asset group
- Auditable event logging
- Highly configurable and flexible
- Automatic data auditing
- Event-triggered automatic email notification

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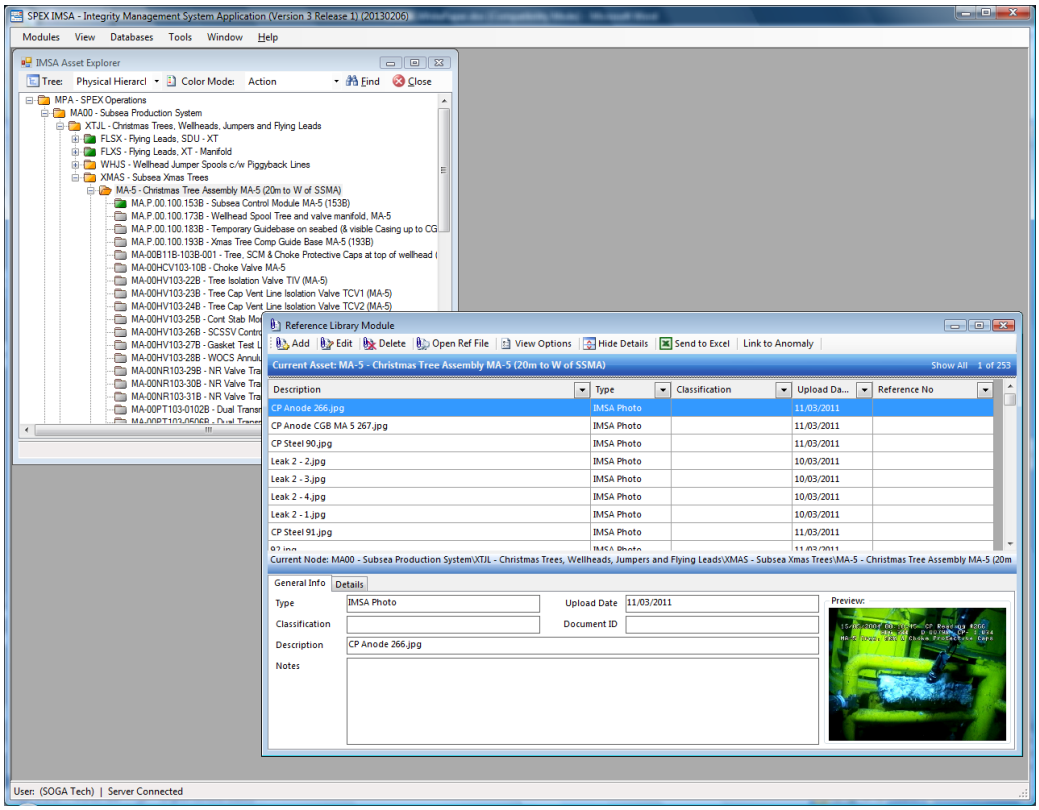

Figure 3 - Easy Access to Data and Multimedia

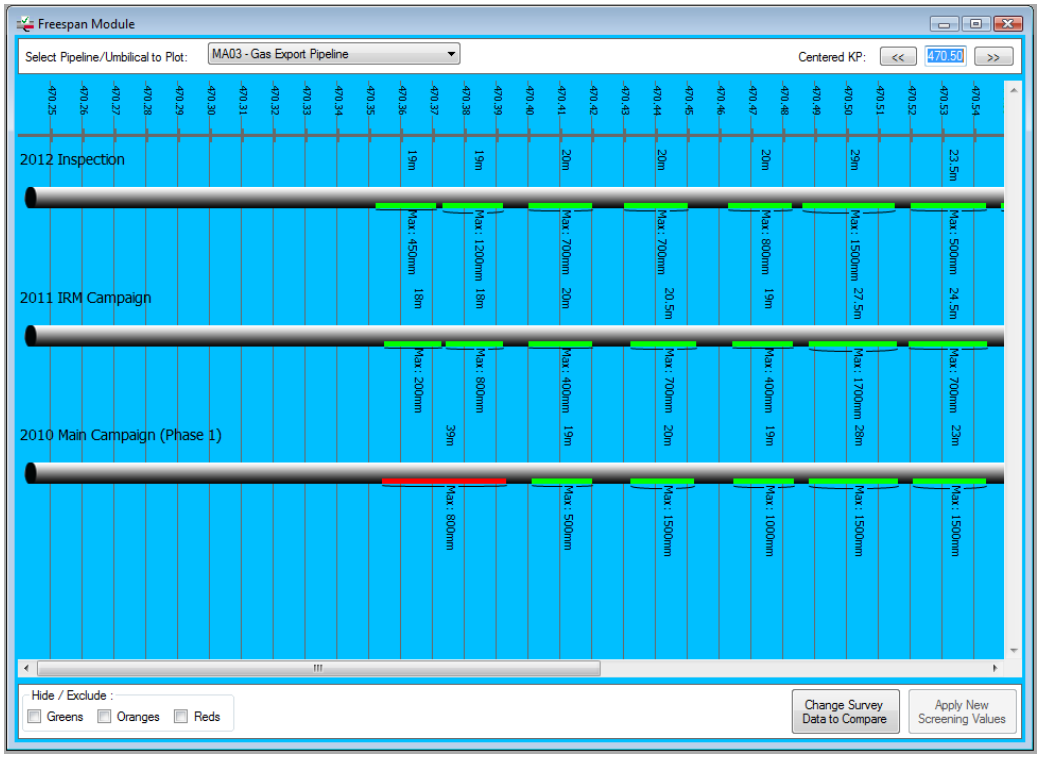

Figure 4 - Trending Functionality

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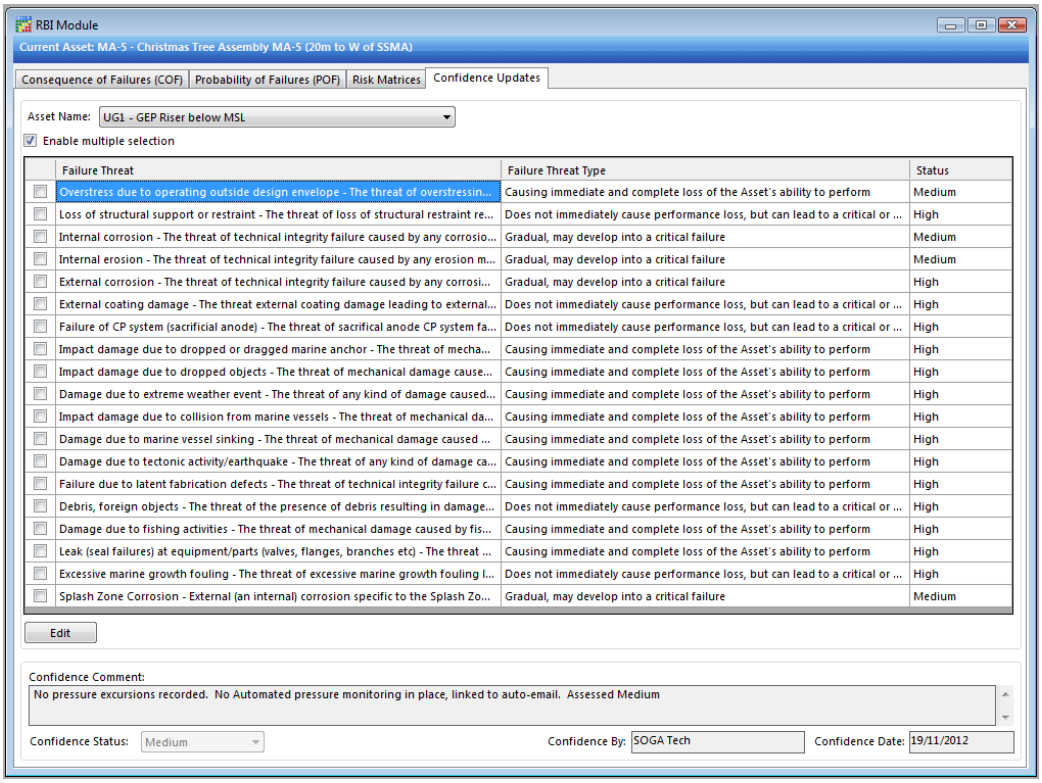

Figure 5 - Applying RBI Rules

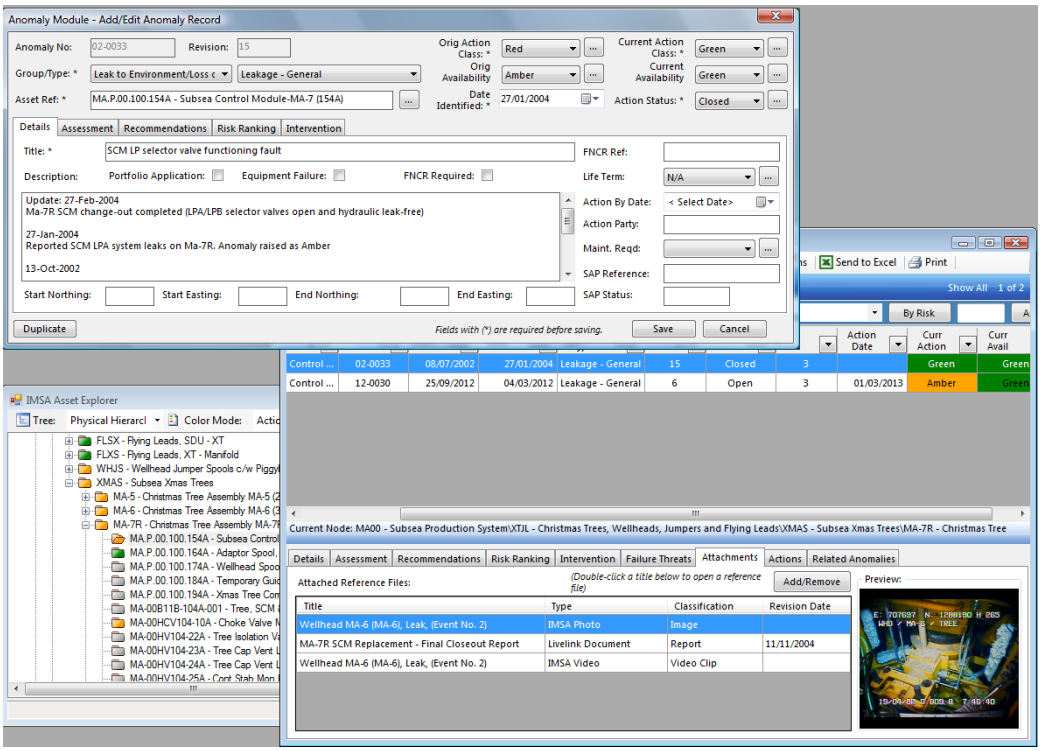

Figure 6 - Managing Anomalies

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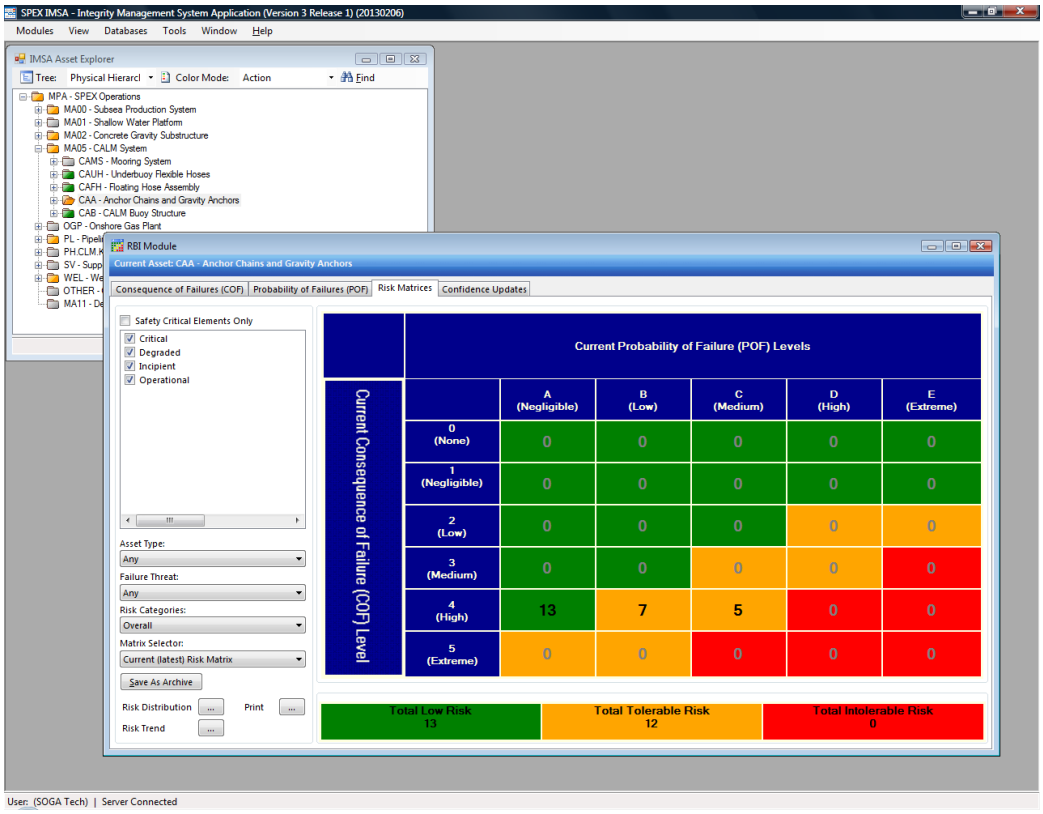

Figure 7 - Reporting Risk Levels

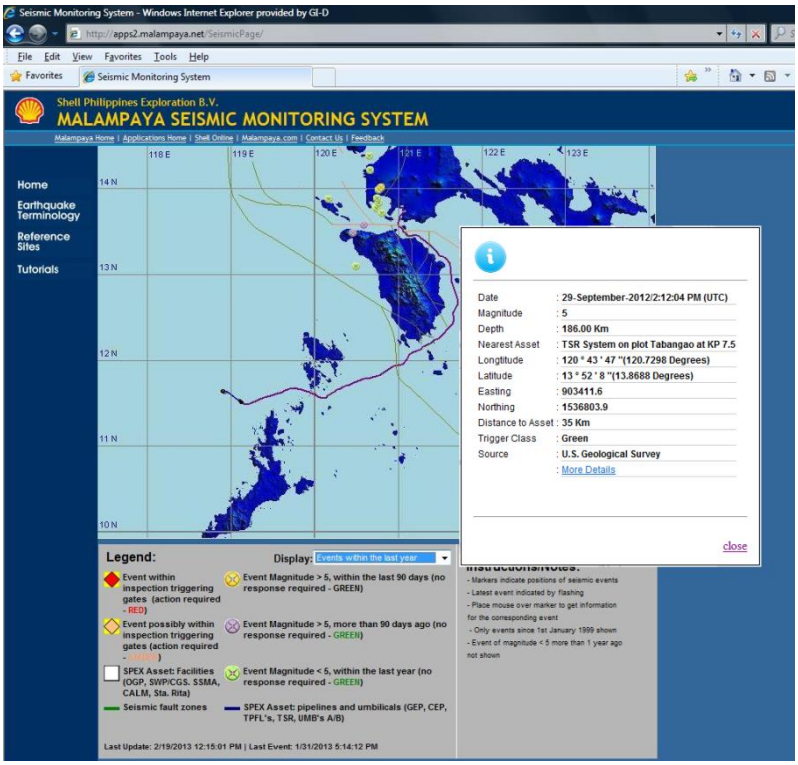

Figure 8 - Monitoring Seismic Events

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