Thyspunt Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 Workshop 2 Summary Report April 2011

REFERENCE: CGS REPORT 2012 – 0002

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CONFIDENTIAL

<table>
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<tr>
<th>AUTHORS</th>
<th>COMPILED BY</th>
<th>REVIEWED BY</th>
<th>REVIEWED BY</th>
<th>ACCEPTED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Hattingh</td>
<td>J.J. Bommer</td>
<td>K.J. Coppersmith</td>
<td>N. Keyser</td>
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AUTHORISED BY: G. Botha

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<thead>
<tr>
<th>REVISION</th>
<th>DESCRIPTION OF REVISION</th>
<th>DATE</th>
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</thead>
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1. Introduction

The selected methodology for the Thyspunt Probabilistic Seismic Hazard Analysis (PSHA) will be consistent with the requirements for a SSHAC Study Level 3 process (SSHAC, 1997). According to this process, a minimum of three workshops must be held facilitated by the Technical Integrator (TI) Leads and with the participation of the TI Teams, each with the following purposes:

- Identification of hazard-significant issues and the identification of available data or other pertinent information that could be used for the assessments;
- Alternative interpretations of available data: this workshop brings together proponents of alternative points of view in order to understand uncertainties and the range of views within the informed technical community;
- Feedback: after development of preliminary assessments, a workshop is held to present the sensitivity of the hazard results to different branches of the logic-tree; the workshop is also an opportunity for the TI Teams to discuss and debate the assessments and their associated uncertainties, and for the PPRP to question the TI Teams about the models

The Thyspunt Workshop #2 was held at Spier Hotel, Stellenbosch, South Africa from 15 – 21 January 2012.

This report is a summary of the second workshop for Thyspunt. The goals of this workshop were:

→ To review the project SSHAC Level 3 methodology, the ground rules for the conduct of the Workshops, expert roles within the project, and the participatory peer review process
→ To present to all participants an overview of the Thyspunt PSHA, and the structure and tasks of the SSC (seismic source characterisation) and GMC (ground motion characterisation) sub-projects
→ To present additional hazard sensitivity results exploring the influences on long-period spectral ordinates and the influence of the East African Rift
→ To review the progress being made on the various databases and the earthquake catalogue, and to elicit additional input, as needed, regarding these activities
→ To present, discuss and debate alternative models, methods, and viewpoints regarding key SSC and GMC issues
→ To identify the technical bases for the alternatives and to discuss the associated uncertainties
To provide a basis for the subsequent development of preliminary SSC and GMC models that consider these alternatives.

The workshop assembled the Project Management Committee, TI Leads and Teams, Proponent and Resource Experts, Speciality Contractors, Database Developers, PPRP and observers. Alternative interpretations of available data were discussed.

This report includes:

1. the meeting agenda;
2. list of participants and their contact information;
3. workshop summary;
4. the Participatory Peer Review Panel (PPRP) report;
5. the TI Leads’ response;
6. all presentations given at the workshop;
7. Safety
8. Satisfaction survey
9. Lessons learnt
2. Workshop agenda

Note: This section of the summary includes the entire workshop agenda provided to the participants. Minor revisions have been made to reflect the actual topics presented.

2.1 Goals of the Workshop:

This is the second of three Workshops that form key elements of the SSHAC Level 3 Probabilistic Seismic Hazard Analysis (PSHA) for the Thyspunt Nuclear Siting Project (TNSP). The specific goals of Workshop WS-2 are:

- To review the project SSHAC Level 3 methodology, the ground rules for the conduct of the Workshops, expert roles within the project, and the participatory peer review process
- To present to all participants an overview of the Thyspunt PSHA, and the structure and tasks of the SSC (seismic source characterisation) and GMC (ground motion characterisation) sub-projects
- To present additional hazard sensitivity results exploring the influences on long-period spectral ordinates and the influence of the East African Rift
- To review the progress being made on the various databases and the earthquake catalogue, and to elicit additional input, as needed, regarding these activities
- To present, discuss and debate alternative models, methods, and viewpoints regarding key SSC and GMC issues
- To identify the technical bases for the alternatives and to discuss the associated uncertainties
- To provide a basis for the subsequent development of preliminary SSC and GMC models that consider these alternatives

2.2 Approach:

The goals of the workshop will be accomplished by a series of presentations and discussions that update the available database and that are designed to provide the TI Teams with information they need in order to evaluate the relative merits of alternative models and methods, as well as their associated uncertainties.

Resource Experts will update the status of the various SSC and GMC databases that will be used in the development of the SSC and GMC models. Specialty Contractors and
members of the TI Teams involved in the database development will also provide overviews of the ongoing data collection activities.

Specific to the goals of this Workshop, Proponent Experts have been invited to make presentations advocating the viability of particular models, methods, or viewpoints that have potential significance to the Thyspunt PSHA. Proponent presentations may also be made by members of the TI Teams. In each case the speaker will be required to clearly present the strengths and advantages of the model or method that they propose, and explain the technical bases for the claims they make regarding the applicability of this particular tool or point of view. Ample time has been included in the schedule to allow for discussions of all proponent presentations, which will be challenged by both the TI Teams and other Proponent Experts present. The purpose of these discussions, and the technical challenge and defence, is to provide an opportunity for the TI Team to fully assess the strengths and limitations of the available candidate models and methods that could be used to build the preliminary SSC and GMC models.

All speakers are reminded of the importance of preparing presentations that focus strictly on the topics identified and which will be delivered within the allotted time without running over time. All of these presentations must be deposited with the project by the speakers, since they will form part of the project record.

At the end of each day, an opportunity will be provided for observers (including members of the PPRP and representatives of the sponsor, Eskom) to make comments and to raise questions from the floor.

2.3 Overview of the Workshop Agenda

The table below provides an overview of the full schedule for the Workshop, which is split into two separate -3 day workshops for the SSC and GMC components of the project. There is a day of rest between these two 3-day workshops, both for the benefit of those who participate in both and also to provide an opportunity for participants in the SSC workshop to depart and those coming for the GMC workshop to arrive.
In the following tables below, the draft agenda for all 6 days of the formal workshops are presented. However, it should be noted that the titles of the presentations are provisional, indicating the topics to be addressed, and may be revised prior to the workshop.
## SSC WORKSHOP AGENDA

**SSC Day 1: Sunday 15\textsuperscript{th} January**

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentations</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-08:10</td>
<td>Safety Briefing</td>
<td>Head of Security</td>
</tr>
<tr>
<td>08:10-08:20</td>
<td>Welcome</td>
<td>Erna Hattingh</td>
</tr>
<tr>
<td>08:20-09:10</td>
<td>Overview of the TNSP, SSHAC Level 3 Requirements and Workshop Rules</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>09:10-10:00</td>
<td>Objectives of SSC Workshop #2</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>10:30-11:15</td>
<td>Update on TNSP Earthquake Catalogue Development</td>
<td>Fleur Strasser</td>
</tr>
<tr>
<td>11:15-12:00</td>
<td>Update on Historical Earthquake Investigation (1850-1936)</td>
<td>Paola Albini</td>
</tr>
<tr>
<td></td>
<td>Estimating the completeness of an earthquake catalogue</td>
<td>Celine Beauval</td>
</tr>
<tr>
<td></td>
<td>Estimating earthquakes parameters from intensity data</td>
<td>Celine Beauval</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>13:00-13:30</td>
<td>Recurrence Model Options and Incorporation of Catalog-Related Uncertainties</td>
<td>Bob Youngs</td>
</tr>
<tr>
<td>13:30-14:00</td>
<td>Discussion of catalogue and analyses</td>
<td>TI Team</td>
</tr>
<tr>
<td>14:00-14:30</td>
<td>$M_{\text{max}}$ and its estimation</td>
<td>Andrzej Kijko</td>
</tr>
<tr>
<td>14:30-15:00</td>
<td>Bayesian Approach to Assessing Maximum Magnitude for PSHA</td>
<td>Bob Youngs</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:30-16:30</td>
<td>Discussion of approaches to $M_{\text{max}}$ assessment and uncertainty treatment</td>
<td>TI Team</td>
</tr>
<tr>
<td>16:30-17:30</td>
<td>DISCUSSION and Summary of Day 1</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:30-17:45</td>
<td>Floor open to observers</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:45</td>
<td><strong>End of formal Workshop Proceedings</strong></td>
<td></td>
</tr>
<tr>
<td>18:15-18:45</td>
<td>Closed meeting: PPRP, sponsor, PM, TI Leads</td>
<td></td>
</tr>
<tr>
<td>19:00</td>
<td><strong>Dinner</strong></td>
<td></td>
</tr>
</tbody>
</table>
### SSC Day 2: Monday 16th January

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentations</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:00</td>
<td>Constraints on the processes giving rise to the African Superswell</td>
<td>Martin Brandt</td>
</tr>
<tr>
<td>09:00-10:00</td>
<td>Regional crustal studies and implications for seismotectonic models</td>
<td>Ray Durrheim</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>10:30-11:30</td>
<td>Seismotectonic model for southern Africa and implications of tectonic features to seismic hazard</td>
<td>Chris Hartnady</td>
</tr>
<tr>
<td>11:30-12:00</td>
<td>Discussion of implications of seismotectonic models to seismic source characterization</td>
<td>TI Team</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>13:00-14:15</td>
<td>Tectonic interpretation of the Ceres earthquake area and implications to the locations of future seismicity</td>
<td>Coenie de Beer</td>
</tr>
<tr>
<td>14:15-15:00</td>
<td>Implications of Neotectonic Evidence in the Eastern Cape Region</td>
<td>Marco Andreoli</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:30-16:30</td>
<td>Depositional and erosional processes occurring on the continental shelf and slope: Implications to causative mechanisms and origins of seafloor features</td>
<td>Hayley Cawthra</td>
</tr>
<tr>
<td>16:30-17:30</td>
<td>DISCUSSION and Summary of Day 2</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:30-17:45</td>
<td>Floor open to observers</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:45</td>
<td><strong>End of formal Workshop Proceedings</strong></td>
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<tr>
<td>18:15-18:45</td>
<td>Closed meeting: PPRP, sponsor, PM, TI Leads</td>
<td></td>
</tr>
<tr>
<td>19:00</td>
<td><strong>Dinner</strong></td>
<td></td>
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</table>
## SSC Day 3: Tuesday 17th January

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentations</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:00</td>
<td>Ongoing Marine Terrace Investigations</td>
<td>Laura Glaser</td>
</tr>
<tr>
<td>09:00-10:00</td>
<td>Update on Geological Investigations for TNSP: Fault Corridor Studies</td>
<td>Ryan Coppersmith</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>10:30-11:30</td>
<td>Cosmogenic geochronology investigations for uplift rates and ages of surfaces: Implications for the tectonic stability and geomorphic evolution of Southern Africa.</td>
<td>Paul Bierman</td>
</tr>
<tr>
<td>11:30-12:00</td>
<td><em>Discussion of uplift and implications to seismic source characterization</em></td>
<td>TI Team</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>13:00-14:15</td>
<td>Palaeoseismic characteristics of the Kango fault and associated uncertainties, Coega fault style &amp; potential CFB SSZs</td>
<td>Marc Goedhart</td>
</tr>
<tr>
<td>14:15-15:00</td>
<td>Characterization of Seismogenic SCR Faults – Kango Fault Update</td>
<td>Kathryn Hanson</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:30-17:00</td>
<td>DISCUSSION and Summary of Day 3</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:00-17:15</td>
<td>Achieving of SSC Workshop 2 Goals</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:15-17:45</td>
<td>Floor open to observers</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:45</td>
<td><strong>End of formal Workshop Proceedings</strong></td>
<td></td>
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<tr>
<td>18:15-18:45</td>
<td>Closed meeting: PPRP, sponsor, PM, TI Leads</td>
<td></td>
</tr>
<tr>
<td>19:00</td>
<td><strong>Dinner</strong></td>
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## GMC WORKSHOP AGENDA

### GMC Day 1: Thursday 19th January

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentations</th>
<th>Speaker</th>
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</thead>
<tbody>
<tr>
<td>08:00-08:10</td>
<td>Safety Briefing</td>
<td>Head of Security</td>
</tr>
<tr>
<td>08:10-08:20</td>
<td>Welcome</td>
<td>Erna Hattingh</td>
</tr>
<tr>
<td>08:20-09:10</td>
<td>Overview of the TNSP, SSHAC Level 3 Requirements and Workshop Rules</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>09:10-10:00</td>
<td>Objectives of the GMC Workshop #2</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>10:30-11:15</td>
<td>Current Approach to Building the GMC Logic-Tree</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>11:15-12:00</td>
<td>Overview of the Intensity Database</td>
<td>Vunganai Midzi</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>13:00-15:00</td>
<td>Weak motion data and inversions</td>
<td>Andreas Rietbrock, Stéphane Drouet</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:30-16:30</td>
<td>Pre-selected GMPEs, and long-distance &amp; small-magnitude extensions</td>
<td>Pete Stafford</td>
</tr>
<tr>
<td>16:30-17:30</td>
<td>DISCUSSION and Summary of Day 1</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:30-17:45</td>
<td>Floor open to observers</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:45</td>
<td><strong>End of formal Workshop Proceedings</strong></td>
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<tr>
<td>18:15-18:45</td>
<td>Closed meeting: PPRP, sponsor, PM, TI Leads</td>
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<tr>
<td>19:00</td>
<td><strong>Dinner</strong></td>
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### GMC Day 2: Friday 20th January

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentations</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:00</td>
<td>Vs Characterization and Site Response Approach</td>
<td>Ellen Rathje</td>
</tr>
<tr>
<td>09:00-10:00</td>
<td>Vs-kappa adjustments to GMPEs</td>
<td>Frank Scherbaum</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>10:30-11:30</td>
<td>Scaling of ground motions and stress drop with magnitude; regional variations of stress drop</td>
<td>Peter Stafford</td>
</tr>
<tr>
<td>11:30-12:00</td>
<td>Stress drop adjustments to GMPEs</td>
<td>Frank Scherbaum</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>13:00-14:00</td>
<td>Evaluation of Vs-Kappa Scaling Using RVT &amp; Empirical Ground Motion Data</td>
<td>Linda Al Atik</td>
</tr>
<tr>
<td>14:00-15:00</td>
<td>The Hybrid Empirical Method</td>
<td>Ken Campbell</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:30-16:15</td>
<td>GMPE for PSHA in South Africa</td>
<td>Andrzej Kijko</td>
</tr>
<tr>
<td>16:15-17:30</td>
<td>DISCUSSION and Summary of Day 2</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:30-17:45</td>
<td>Floor open to observers</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:45</td>
<td><strong>End of formal Workshop Proceedings</strong></td>
<td></td>
</tr>
<tr>
<td>18:15-18:45</td>
<td>Closed meeting: PPRP, sponsor, PM, TI Leads</td>
<td></td>
</tr>
<tr>
<td>19:00</td>
<td><strong>Dinner</strong></td>
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</tbody>
</table>
GMC Day 3: Saturday 21st January

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentations</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00-09:00</td>
<td>Inferring geometrical spreading from the attenuation of Macroseismic Intensity with distance</td>
<td>Oona Scotti</td>
</tr>
<tr>
<td>09:00-10:00</td>
<td>Similarities and differences in SCR ground motions inferred from instrumental recordings</td>
<td>Trevor Allen</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>10:30-12:00</td>
<td>Considerations for Building a Sigma Logic-Tree</td>
<td>Adrian Rodriguez-M.</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>13:00-15:00</td>
<td>Discussion of GMC logic-tree for medians and sigma</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>15:00-15:30</td>
<td><strong>Coffee Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:30-17:00</td>
<td>Discussion of Way Forward for GMC and Summary</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:00-17:20</td>
<td>Achieving of GMC Workshop 2 Goals</td>
<td>Kevin Coppersmith</td>
</tr>
<tr>
<td>17:20-17:45</td>
<td>Floor open to observers</td>
<td>Julian Bommer</td>
</tr>
<tr>
<td>17:45</td>
<td><strong>End of formal Workshop Proceedings</strong></td>
<td></td>
</tr>
<tr>
<td>18:15-18:45</td>
<td>Closed meeting: PPRP, sponsor, PM, TI Leads</td>
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</tr>
<tr>
<td>19:00</td>
<td><strong>Dinner</strong></td>
<td></td>
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</tbody>
</table>

GUIDELINES for WORKSHOP PRESENTATIONS:

PowerPoints should be prepared using the template SSHAC template.ppt, which can be downloaded from the project portal (General → Templates → Presentations). Please note that the file should be saved with an appropriate name in .ppt format (i.e., compatibility mode).

Attention should also be paid to the Guidelines for SSHAC Level 3 Workshop PowerPoint Presentation (Ref. CGS/TNSP-GL01); this document is within a larger CGS Report (2010-0171) that can also be accessed on the portal (General → Safety & Quality Documents → Processes & Technical Procedures).

Presentations should be prepared to be delivered within the time slots indicated; it is not acceptable to run over time, and preferably leave time in the slot for questions (the indicative figure of 20 minutes in the Guidelines is generally applicable but not for those presentations assigned slots longer than 30 minutes).

Presentation files must be provided to Annabel Graham (via memory stick) before dinner on the evening before the presentation is to be given.

Presentations should be prepared in a format that they can be made from the PC used in the Workshop; it will not be possible to link up different computers for presentations. Presenters should provide the original PowerPoint presentation as part of the Workshop.
record; if an alternative software is employed and the presentation must be saved as PDF, ensure that all animations are shown as sequential images.

THE FINAL SLIDES OF PRESENTATIONS SHOULD LIST ALL CITED REFERENCES IN FULL, AND WHERE POSSIBLE THESE SHOULD ALSO BE PROVIDED IN PDF FORMAT ON A CD-ROM TO FORM PART OF THE WORKSHOP RECORD.
3. Attendance list

<table>
<thead>
<tr>
<th>PROJECT MANAGEMENT COMMITTEE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Graham, Gerhard</td>
<td><a href="mailto:gerhardg@geoscience.org.za">gerhardg@geoscience.org.za</a></td>
</tr>
<tr>
<td>Greg Botha</td>
<td><a href="mailto:gbotha@geoscience.org.za">gbotha@geoscience.org.za</a></td>
</tr>
<tr>
<td>Hatting, Erna</td>
<td><a href="mailto:emah@geoscience.org.za">emah@geoscience.org.za</a></td>
</tr>
<tr>
<td>Keyser, Nico</td>
<td><a href="mailto:nkeyser@geoscience.org.za">nkeyser@geoscience.org.za</a></td>
</tr>
<tr>
<td>Neveling, Johann</td>
<td><a href="mailto:jneveling@geoscience.org.za">jneveling@geoscience.org.za</a></td>
</tr>
<tr>
<td>Flint, Nicky</td>
<td><a href="mailto:nflint@geoscience.org.za">nflint@geoscience.org.za</a></td>
</tr>
<tr>
<td>Delport, Francois</td>
<td><a href="mailto:fdelport@geoscience.org.za">fdelport@geoscience.org.za</a></td>
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<table>
<thead>
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<th>PPRP</th>
<th></th>
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<tr>
<td>Bungum, Hilmar - Chair</td>
<td><a href="mailto:Hilmar.Bungum@norsar.no">Hilmar.Bungum@norsar.no</a></td>
</tr>
<tr>
<td>Richard Quittmeyer</td>
<td><a href="mailto:Richard.Quittmeyer@rizzoassoc.com">Richard.Quittmeyer@rizzoassoc.com</a></td>
</tr>
<tr>
<td>Kammerer, Annie</td>
<td><a href="mailto:annie.kammerer@googlemail.com">annie.kammerer@googlemail.com</a></td>
</tr>
<tr>
<td>Musson, Roger</td>
<td><a href="mailto:rmwm@bgs.ac.uk">rmwm@bgs.ac.uk</a></td>
</tr>
<tr>
<td>Toro, Gabriel</td>
<td><a href="mailto:toro@lettisci.com">toro@lettisci.com</a></td>
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</table>

<table>
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</tr>
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<tbody>
<tr>
<td>Bommer, Julian</td>
<td><a href="mailto:j.bommer@imperial.ac.uk">j.bommer@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Coppersmith, Kevin</td>
<td><a href="mailto:kcoppersmith@earthlink.net">kcoppersmith@earthlink.net</a></td>
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<table>
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<tr>
<td>Coppersmith, Ryan</td>
<td><a href="mailto:Ryan.Coppersmith@amec.com">Ryan.Coppersmith@amec.com</a></td>
</tr>
<tr>
<td>Glaser, Laura</td>
<td><a href="mailto:Laura.Glaser@amec.com">Laura.Glaser@amec.com</a></td>
</tr>
<tr>
<td>Hanson, Kathryn</td>
<td><a href="mailto:Kathryn.Hanson@amec.com">Kathryn.Hanson@amec.com</a></td>
</tr>
<tr>
<td>Mangongolo, Azangi</td>
<td><a href="mailto:amangongolo@geoscience.org">amangongolo@geoscience.org</a></td>
</tr>
<tr>
<td>Neveling, Johann</td>
<td><a href="mailto:jneveling@geoscience.org.za">jneveling@geoscience.org.za</a></td>
</tr>
<tr>
<td>Rodriguez-Marek, Adrian</td>
<td><a href="mailto:adrianrm@vt.edu">adrianrm@vt.edu</a></td>
</tr>
<tr>
<td>Rathje, Ellen</td>
<td><a href="mailto:e.rathje@mail.utexas.edu">e.rathje@mail.utexas.edu</a></td>
</tr>
<tr>
<td>Scherbaum, Frank</td>
<td><a href="mailto:Frank.Scherbaum@geo.uni-potsdam.de">Frank.Scherbaum@geo.uni-potsdam.de</a></td>
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<tr>
<td>Shelembe, Refilwe</td>
<td><a href="mailto:rshelembe@geoscience.org.za">rshelembe@geoscience.org.za</a></td>
</tr>
<tr>
<td>Stafford, Peter</td>
<td><a href="mailto:p.stafford@imperial.ac.uk">p.stafford@imperial.ac.uk</a></td>
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<td>Strasser, Fleur</td>
<td><a href="mailto:f.strasser@geoscience.org.gza">f.strasser@geoscience.org.gza</a></td>
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<tr>
<td>Midzi, Vunganai</td>
<td><a href="mailto:vmidzi@geoscience.org.za">vmidzi@geoscience.org.za</a></td>
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<table>
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<tbody>
<tr>
<td>Albini, Paolo</td>
<td><a href="mailto:albini@mi.ingv.it">albini@mi.ingv.it</a></td>
</tr>
<tr>
<td>Beauval, Celine</td>
<td><a href="mailto:Celine.beauval@obs.ujf-grenoble.fr">Celine.beauval@obs.ujf-grenoble.fr</a></td>
</tr>
<tr>
<td>Drouet, Stephane</td>
<td><a href="mailto:stephane.drouet@geoter.fr">stephane.drouet@geoter.fr</a></td>
</tr>
<tr>
<td>Rietbrock, Andreas</td>
<td><a href="mailto:ariet@liv.ac.uk">ariet@liv.ac.uk</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATABASE DEVELOPERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brandt, Martin</td>
<td><a href="mailto:martinb@geoscience.org.za">martinb@geoscience.org.za</a></td>
</tr>
<tr>
<td>Birch, Denver</td>
<td><a href="mailto:dbirch@geoscience.org.za">dbirch@geoscience.org.za</a></td>
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<tr>
<td>de Beer, Coenie</td>
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</table>
A number of International, national, sponsor and CGS observers also attended.
4. Summary of Workshop

4.1 SSC Sub-Projects

4.1.1 Day 1

Maximum Magnitude (Mmax)

- Follow up with R. Wheeler (USGS) on his work regarding inclusion or exclusion of eastern China within the global SCR dataset (per pre-publication preprint). This has implications for the prior distribution in the Bayesian Mmax approach.

- Explore the sensitivity alternative priors to the assessment of Mmax: consider imposing alternative priors, such as one with an upper magnitude cut-off related to physical constraints of rupture dimensions.

- Retrieve papers from Andrzej regarding ways to modify the maximum likelihood distribution; need to consider if those approaches are defensible for purposes of Mmax assessment.

- Explore the adjustments with simulations to see how well they perform and whether they add stability.

- Consider the true or preferred Mmax value as something other than the mean; may want to explore the upper part of the distribution as well as the variance.

- Simulate catalogues with few events to look at the stability of the Kijko approach, also simulations of expected catalogues can be used to evaluate the appropriateness of Mmax estimates.

- Explore other constraints on the prior, such as rupture dimensions.

- Consider whether or not multiple approaches to Mmax are needed to express epistemic uncertainties.

Earthquake Catalogue

- Explore three approaches to assessing completeness.

- Completeness of the historical record is being assessed at five sites with records, or perhaps more to get the history; consider how this might be used to assist in the
evaluation of completeness over regions the dimensions of source zone, once the catalogue is assembled

- Will be comparing the historical completeness with those developed for entire zone using the entire catalogue

- For events with pairs of size measures, compare with other conversion relationships

- Consideration of three intensity approaches; we will like have differential weights and we should explore the implications of the weights;
  - Regarding the intensity attenuation database, coordinate with the GMC use of the data to reject models

- Need to develop a system for tracking the uncertainties in recurrence-related assessments

- High-quality instrumental data were recorded on a temporary network during 1997-99 (South African Seismic Experiment); consider these data to supplement the SANSN data

- Strategy for assessing focal depth and seismogenic crustal thickness; use of analogue regions and comparing with local data; will be using SCR relationships and perhaps physical constraints

- Consider the spatial applicability of Mmax approaches v. the original SCR (EPRI 1994) database; could be a function of how and why the source was identified in the first place, also the dimensions of the domains should be considered relative to the scale of seismic sources being characterized

- Explore the implications of alternative approaches to smoothing recurrence parameters

- Rather than chose a priority approach to selecting a magnitude for each event, consider a weighted combination of magnitude based on variances, as was done for the CEUS catalogue

4.1.2 Day 2

Seismotectonic Models and Modeling Seismic Sources

- Research the issue of SCR seismogenic thickness and relation to EAR; rheological controls (e.g., heat flow) may be difficult to apply
• Consider how much detail is needed in the SSC model spatially; what is the balance between representing the spatial distribution of future seismicity and the scale of seismotectonic evidence

• Consider the spatial extent of the EAR and potential influence on the style of faulting (this includes the African superplume)

• Consider whether we will be using Mmax to define zones, also relates to the spatial model of recurrence rates; use of zones versus spatial smoothing

• Uplift rates along the margin and differential uplift will be important to consider

• Review the studies related to crustal thickness in Southern Africa to see if there is a relation with seismogenic thickness

• Do we need a seismic source that captures structures without evidence of young faulting

• Consider whether the syntaxis area represents a seismic source zone; what is the relation to Mesozoic extension and the associated basins along the CKBC fault zone; to the basins have an influence

• Superpose the bathymetric map with structure; consider mechanisms and analogues for erosional features; consider the onshore analogues for these geologic units

4.1.3 Day 3

Marine Terraces, Fault Behaviour, and Uplift Rates

• Consider analogues for SCR faults, such as the Meers, Cheraw, and Australian faults

• Review methods for use of fault-specific paleoseismic data for constraining recurrence (e.g., slip rate, interval data) and associated uncertainties

• Consider approaches to capturing the conceptual model of ruptures occurring elsewhere within a region (e.g., CEUS SSC model for Meers)

• Assess all Kango fault parameters: slip rate, displacement per event, rupture length, rupture area, timing of events, longer term slip rates, cumulative slip, etc.

• Consider how to handle the minimum ages of unfaulted units (e.g., resolution slip rate), as well as faulted units relative to developing slip rates from only one or two events
• Consider the resolution of displacements and ages with the available approaches (e.g., marine terrace shoreline angles)

• Consider the subsurface data to the east of the Coega; correlations with higher terraces

• For the Gamtoos fault, consider the morphology of dune cardons and their potential ages

• Consider the potential for automatic ways of using LiDAR to draw terraces/shoreline angles; might assist with longitudinal profile data distribution; consider second derivative maps to suppress high-frequency signal

• Review onshore stress measurements; spring pressures\ water resources report (C. Hartnady to provide some documents regarding water resource work in the Oudtshoorn region)

4.2 GMC Sub-Project  (also see presentation on CD)

• Long-period ordinates / EAR hazard
  – Look at CB07 for Hanks proposal re: PGD
  – Consider Cauzzi & Faccioli for long-period shape
  – EAR hazard depends on long-distance decay model
  – Consider making a case for not including the EAR SSC model in the hazard calculations at shorter response periods; currently in because of 10x extrapolation of Abrahamson & Silva (2008)

• Vs-kappa adjustments
  – How to sequence given dependence on M-R scenario?
  – Consider calculating kappa from Q-Vs model

• GMC logic-tree approach
  – Consider correlations between adjustment parameters
  – Consider the sequencing of adjustments

• Intensity database
  – Database for soil thicknesses (land type soil mapping for South Africa)
  – Keshav/Vunganai to explore refinement of site classifications using this resource
  – Using intensities (from NEHRP B sites) to test GMPEs adjusted to Vs30 3 km/s (Keshav to re-assess possible NEHRP classifications)

• Weak-motion inversions
  – Independent estimate of seismic moment for one or more larger events
  – Consider alternative near-source attenuation rates? (the trade-offs in terms of moments, stress drop, etc)
  – Provide seismic moment estimates (and variabilities) to the EQ catalogue team (Fleur Strasser)
• Site Kappa?
  – Look for upper bounds on kappa in terms of maximum usable frequency (what’s the largest kappa that could be being missed?)
  – Consider being informed by Vs30-kappa relationships
  – Take account of highly-fractured nature of bedrock in assigning ranges of kappa values? Detailed logs of cores, including second logging focused on joint descriptions [info in appendix of SSR]
  – Look for kappa from recordings at KROM and ROSN stations (near Thyspunt)

• Long-distance decay characteristics
  – Explore the RMS decay for Mozambique aftershock
  – Look for macroseismic reports from South Africa for the 2006 Machaze main shock (esp. in Port Elizabeth) including DYFI metadata; caution about interpreting ‘negative evidence’
  – Ask Marc Goedhart about 2006 Machaze earthquake effects in Port Elizabeth
  – Search for non-triggered instruments for 2006 Mozambique earthquake, and other instrumental insights
  – Literature review of published Lg decay rates around the world (including Frankel paper) for non-geometrical spreading factor with distance; may inform long-period decay rates
  – Consider waveform modelling for insights on long-period / long-distance decay?
  – If EAR not included, do we need to worry about long-distance extrapolation of GMPEs?
  – Look at Frankel et al paper comparing Q in South Africa and NY

• GMC logic-tree approach
  – Consider correlations between adjustment parameters
  – Consider the sequencing of adjustments
  – Testing Vs30 3 km/s GMPEs with NEHRP B intensity?

• Intensity database
  – Database for soil thicknesses (land type soil mapping for South Africa)
  – Keshav Prasad/Vunganai Midzi to explore refinement of site classifications using this resource

• Profile for Thyspunt site
  – Target Vs30 will be 3,000 m/s
  – Johann Neveling to provide additional GI borehole logs from the site to Ellen Rathje
  – Is the ‘soft’ (Vs30 1 km/s) layer pervasive on the Goudini?
  – If the rocks are not going to behave non-linearly, do we need to use NRC Approach 3? Yes, because of the variability
  – Compare results for site using QWL and SHW approaches (Ellen Rathje)

• Vs-kappa adjustments
  – How to sequence given dependence on M-R scenario?
  – Consider calculating kappa from Q-Vs model
  – To be re-visited on Day 2
  – Add classification of short response period coefficient treatments in GMPE white paper
Explore similarities/differences between current PRP and IRVT approaches (Frank Scherbaum-Linda AlAtik)

- Stress Drop Scaling
  - Must consider both constant and magnitude-dependent models for stress drop
  - After Vs-kappa adjustments, extrapolate adjusted GMPEs to small magnitudes and compare with South Africa motions (generate median targets for M-R combinations requested by TI Team)
  - How to develop scaling factors on adjusted median models in order to capture epistemic uncertainty, including larger stress drops in SCRs vv. Active regions

- Hybrid Empirical GMPEs
  - Need to consider possible differences/effects of near-source geometrical spreading
  - Extreme caution in isolating and applying individual parameters from stochastic sets
  - Need to explore how to obtain kappa estimates independently from the full stochastic inversions; upper limit, may, however be informed by the inversions (recall that we are using site kappa, k0)
  - Need to think about absence of Moho bounce in empirical GMPEs

- South African GMPEs
  - Proponent does not propose use of these equations
5. Participatory Peer Review Panel (PPRP) report

The PPRP met on 22 January 2012 at Spier Hotel, Stellenbosch, to finalize their report, as the Panel is composed of individuals from several different countries (Appendix A).

6. TI Leads' response

The TI Leads compiled a response to the PPRP report (Appendix B).

7. Presentations

All presentations from the workshop are available on the CD at the back of this report.

8. Safety

To adhere to a Safety Culture, all international participants arrived at least by lunchtime on the day before their participation. Safety checklists for choosing the venue and safety during the venue as well as the hotel’s safety information follow:
## 8.1 Pre-workshop safety Checklist

### PRE-EVENT SAFETY CHECKLIST

| Event Name: | A CEAHRAM |
| Date of Assessment: | 11 & 12 August 2011 |
| Assessed By: | A CEAHRAM |

- **Indoor Event**
- **Outdoor Event**

### Checked (Ticked)

<table>
<thead>
<tr>
<th>Event Safety Item</th>
<th>Comment / Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access and Egress</strong></td>
<td></td>
</tr>
<tr>
<td>Entry / Exit areas are clear and accessible for staff and expected attendees</td>
<td>Yes</td>
</tr>
<tr>
<td>Entry / Exit areas are adequate for emergency exit and emergency services</td>
<td>Yes</td>
</tr>
<tr>
<td>Thoroughfares are well defined and clearly marked</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Traffic Flow</strong></td>
<td></td>
</tr>
<tr>
<td>Clearly defined areas for traffic - separate from pedestrian traffic</td>
<td>Yes - clearly separate</td>
</tr>
<tr>
<td>Provisions for safe passage of emergency / other vehicles through pedestrian traffic</td>
<td>Yes</td>
</tr>
<tr>
<td>Controlled traffic flow and adequate signage for traffic erected</td>
<td>Yes</td>
</tr>
<tr>
<td>Adequate parking areas to cater for the expected vehicle numbers attending the event</td>
<td>Yes at hotel &amp; conference venue, guests stationed at venue</td>
</tr>
<tr>
<td>Adequate parking supervision</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Amenities</strong></td>
<td></td>
</tr>
<tr>
<td>Adequate provision of toilets and hand washing facilities</td>
<td>Yes, at hotel &amp; venue</td>
</tr>
<tr>
<td>Availability of clean fresh water for staff and attendees</td>
<td>Yes, in rooms &amp; filtered water at venue</td>
</tr>
<tr>
<td>Adequate catering facilities for food preparation and clean up</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Signage</strong></td>
<td></td>
</tr>
<tr>
<td>Adequate signage for entries, exits, toilet facilities, etc.</td>
<td>Yes</td>
</tr>
<tr>
<td>Adequate signage for any hazardous areas or substances</td>
<td>No hazards at time of visit</td>
</tr>
<tr>
<td>Clearly signed First Aid and fire extinguisher locations</td>
<td>First aid not clearly visible for visitors - contact reception</td>
</tr>
<tr>
<td><strong>Fire Prevention</strong></td>
<td></td>
</tr>
<tr>
<td>Suitable fire extinguishers (e.g. CO, water, chemical) and blankets are in appropriate areas, tested and in date</td>
<td>Hydrants extinguishers at every block of rooms</td>
</tr>
<tr>
<td>Personnel are trained in extinguisher and blanket use</td>
<td>Tuatara roofs have sprinkler system</td>
</tr>
<tr>
<td>Ignition source areas are kept clear at all times and easily accessible</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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The downloaded document is uncontrolled; therefore the user must ensure that it conforms to the authorised database version
### Emergency Procedures

- [ ] Emergency response plan in place
  - Yes, assembly point clearly marked
  - Yes, did not witness

- [ ] Emergency response team trained to carry out plan
  - Yes, all first aiders have 11 in total
  - Yes, did not witness

- [ ] Current site maps available to all staff, emergency services and other relevant parties
  - Yes, did not witness

### First Aid

- [ ] First aid stations are suitably located, clearly signed and easily accessible for everyone
  - Yes, maintenance list kept

- [ ] First aid facilities are adequate for the type of event being held

- [ ] Good means of communication provided between personnel and first aid stations

### Electrical / Backup Power

- [ ] All portable electrical equipment including leads are tested
  - Yes, did not witness

- [ ] Adequate protection of the public from electrical shock and any trip hazards from cords are minimised
  - Yes, did not witness

- [ ] All leads, lugs, etc. are protected from weather and other environmental conditions (e.g. water)

- [ ] Evidence of electrical safety can be provided upon request from an authorised person

- [ ] Backup power is available in venue

### Lighting

- [ ] Adequate natural light or artificial lighting provided for setting
  - Yes, lighting between bays

- [ ] Portable lighting is tested and in date
  - N/A

- [ ] Suitable emergency lighting is in place
  - Yes, did not witness

### Manual Handling

- [ ] All staff and volunteers are trained to assess each task and use safe technique when lifting or carrying
  - Yes, safety induction training is given to all new employees and annually

- [ ] Loads are delivered as close as possible to area using vehicle or mechanical aid (e.g. trolleys)

- [ ] Light, small loads and physical aids (assistance from second person or team lift where needed) are used

- [ ] Staff and volunteers are trained in and used the S-M-A-R-T Lifting technique where possible and appropriate
  - S - size up the load
  - M - move in close
  - A - always bend the knees
  - R - raise object using your legs
  - T - turn using your feet

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Weather Conditions

- Weather conditions planned for and monitored e.g. partitions, displays and signage well secured for windy conditions, and shade and sunscreen and water provisions for heat

<table>
<thead>
<tr>
<th>Security</th>
<th>Yes, did not witness umbrellas available &amp; rests to transport guests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate security is available at the venue</td>
<td>Yes, a number of guards patrolling the area</td>
</tr>
</tbody>
</table>

Accessibility

- Ramps are in place to provide access to buildings
- Parking is available close to the event
- The event is easily accessible (e.g. for patrons in wheelchairs, with prams, using walking aids, etc.)
- Entry / Exit area is easily accessible (e.g. for patrons in wheelchairs, with prams, using walking aids, etc.)

<table>
<thead>
<tr>
<th>Ramps in place to provide access to buildings</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking is available close to the event</td>
<td>Yes, demarcated</td>
</tr>
<tr>
<td>The event is easily accessible (e.g. for patrons in wheelchairs, with prams, using walking aids, etc.)</td>
<td>Yes</td>
</tr>
<tr>
<td>Entry / Exit area is easily accessible (e.g. for patrons in wheelchairs, with prams, using walking aids, etc.)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Reference:
SafeWork SA – safe, fair, productive, working lives (www.safework.sa.gov.au)

As some items were difficult a meeting was arranged with the head of security, Danie Groenewald. He was able to address all questions.

Signed: [Signature] 12 Aug 2011
## 8.2 Safety checklist during workshop

### EVENT SAFETY CHECKLIST

**Event Name:** Workshop 3

**Date of Assessment:** 17/12/2022

**Assessed By:** [Signature]

- [ ] Indoor Event
- [ ] Outdoor Event

<table>
<thead>
<tr>
<th>Checked (Ticked)</th>
<th>Event Safety Item</th>
<th>Checked Time / Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry / Exit areas are clear and accessible for staff and expected attendees</td>
<td>Yes: [Notes]</td>
</tr>
<tr>
<td></td>
<td>Entry / Exit areas are adequate for emergency exit and emergency services</td>
<td>Yes: Yes</td>
</tr>
<tr>
<td></td>
<td>Thoroughfares are well defined and clearly marked</td>
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<td>Clearly defined areas for traffic - separate from pedestrian traffic</td>
<td>Yes: Sufficiently Marked</td>
</tr>
<tr>
<td></td>
<td>Provisions for safe passage of emergency / other vehicles through pedestrian traffic</td>
<td>Yes: Yes</td>
</tr>
<tr>
<td></td>
<td>Controlled traffic flow and adequate signage for traffic erected</td>
<td>[Note]</td>
</tr>
<tr>
<td></td>
<td>Adequate parking areas to cater for the expected vehicle numbers attending the event</td>
<td>Yes: Yes, <strong>Mandatory</strong> for security, additional [Note]</td>
</tr>
<tr>
<td></td>
<td>Adequate parking supervision</td>
<td>[Note]</td>
</tr>
<tr>
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<td></td>
<td>Availability of clean fresh water for staff and attendees</td>
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<td>Adequate catering facilities for food preparation and clean up</td>
<td>Yes: Yes</td>
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<td>Yes: [Note]</td>
</tr>
<tr>
<td></td>
<td>Adequate signage for any hazardous areas or substances</td>
<td>[Note]</td>
</tr>
<tr>
<td></td>
<td>Clearly signed First Aid and fire extinguisher locations</td>
<td>Yes: [Note]</td>
</tr>
<tr>
<td></td>
<td><strong>Fire Prevention</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suitable fire extinguishers (e.g. CO₂, water, chemical) and blankets are in appropriate areas, tested and in date</td>
<td>Fire Extinguishers [Note]</td>
</tr>
<tr>
<td></td>
<td>Personnel are trained in extinguisher and blanket use</td>
<td>Yes: [Note]</td>
</tr>
<tr>
<td></td>
<td>Ignition source areas are kept clear at all times and easily accessible</td>
<td>Yes: [Note]</td>
</tr>
</tbody>
</table>
## Emergency Procedures

- Emergency response plan in place: Yes, Emergency Assembly Points have been established.
- Emergency response team trained to carry out plan: Yes.
- Current site maps available to all staff, emergency services and other relevant parties: Yes.

## First Aid

- First aid stations are suitably located, clearly signed and easily accessible for everyone: Yes, it is signed so by Safety Man.
- First aid facilities are adequate for the type of event being held: Yes.
- Good means of communication provided between personnel and first aid stations: Yes.

## Electrical / Backup Power

- All portable electrical equipment including leads are tested: Yes.
- Adequate protection of the public from electrical shock and any trip hazards from cords are minimised: Yes.
- All leads, lugs, etc. are protected from weather and other environmental conditions (e.g. water): Yes.
- Evidence of electrical safety can be provided upon request from an authorised person: Yes, this was carried out during event.
- Backup power is available in venue: Yes.

## Lighting

- Adequate natural light or artificial lighting provided for setting: Yes; in Venue Emergency Lighting was tested.
- Portable lighting is tested and in date: N/A.
- Suitable emergency lighting is in place: Yes; in Venue Emergency Lighting was tested.

## Manual Handling

- All staff and volunteers are trained to assess each task and use safe technique when lifting or carrying: Yes, Staff is trained.
- Loads are delivered as close as possible to area using vehicle or mechanical aid (e.g. trolleys): Yes, All narrow loads were delivered by Staff on Trolleys.
- Light, small loads and physical aids (assistance from second person or team lift where needed) are used: Yes.
- Staff and volunteers are trained in and used the S-M-A-R-T Lifting technique where possible and appropriate: Yes, Staff is trained to use correct lifting technique to The Head of Security.
Weather Conditions

- Weather conditions planned for and monitored
  e.g. partitions, displays and signage well
  secured for windy conditions, and shade and
  sunscreen and water provisions for heat
  
  Event: Was Ingress

Securities

- Appropriate security is available at the venue
  
  Yes

Accessibility

- Ramps are in place to provide access to
  buildings
  
  Yes, Person In Wheelchair Could Access

- Parking is available close to the event
  
  Yes

- The event is easily accessible (e.g. for patrons in
  wheelchairs, with prams, using walking aids,
  etc.)
  
  Yes

- Entry/Exit area is easily accessible (e.g. for
  patrons in wheelchairs, with prams, using
  walking aids, etc.)
  
  Yes

Reference:
SafeWork SA – safe, fair, productive, working lives (www.safework.sa.gov.au)

Safety Talk: This Talk Needed More Content. No Mention Was Made
An Emergencies Assembly Points. Incumbent Saw The Assembly Points
After Conference Hours When Walking Among A Casual Walking Line
Was Close To The Amphitheater Close To The Gorge River.
In The Events Of An Emergencies, The Incumbent Doubts That
Consequence Participants Would Have Known Where To Assemble
For Roll Call Purposes.

17/1/2019
8.3 Hotel’s safety briefing

HEALTH AND SAFETY TALK
Spier’s concern for Health and Safety, Social and Environmental activities, the sustainability of business ethics and organization integrity form part of our good corporate governance.

Spier’s Policy entails:

- Our People are, without doubt the most important asset of this Group.
- Strives to maintain safe working conditions which will minimize risk of injury to the individual, and loss of company property.
- Complying with all applicable laws, through training, awareness and competence.
- Setting of targets to ensure continual improvement.
- Integrating Health and Safety into our day to day activities in order to recognise risk for the future well-being of the Group and all its employees.
- Client satisfaction at all times.

Emergency Response

The objective of the Emergency Evacuation Plan is to ensure that all building occupants evacuate the building safely in the event of a fire or any other type of emergency.

First Aid & Fire

- An automatic fire detection and warning system together with an automatic fire call point system is installed throughout the venue.

- The fire alarm will activate in the Security Control Room by Smoke detector, Heat detector, Break Glass Point, or By phone, using the emergency number ext. 1164 (021 809 1164).

- The Security Control Room, which, is staffed 24 hours a day, will be the Control Point in any incident or emergency and they are responsible for alerting the Emergency Response team and the relevant Emergency Services.

- The emergency response team are fire and first aid trained.

- First Aid boxes are available at the Banqueting office, Banqueting Kitchen and Security Office.

- Fire Equipment are situated throughout the venue where indicated by safety signage.

Fire Evacuation Procedure

- All delegates are asked to abide by the instructions issued over the PA system by Spier Management and the emergency services.

- It is the responsibility of the Event Organiser to account for all delegates present at the event and to report at the Assembly Point. The Event Organiser will have a registered list of attendees and/or delegates available if requested by the Stellenbosch Fire Chief.

- Evacuated personnel shall congregate at the Emergency Evacuation assembly point area and remain there until a decision is reached to re-occupy the building or to send people
home. The Emergency Evacuation assembly point, unless otherwise stated, is on the Bamoo lawn area next to the river. The event’s organisers and emergency coordinators will then account for their respective individuals. If someone is missing, the Fire Department must be notified immediately of the possibility that someone is still in the building and their likely whereabouts.

EVACUATION OF INDIVIDUALS WITH DISABILITIES

- Event organisers are required to submit a list of individuals who have physical disabilities or special medical conditions to the emergency response team (ERT). Two co-workers should be assigned ahead of time to assist individuals with disabilities during an evacuation. However, event’s organisers, emergency coordinators, and the Fire Department may also be required to assist disabled individuals during an emergency evacuation.

Note:
Emergency response at Spier is a concerted effort among the members from Banqueting Management, Facilities and Security. However, it should be remembered that once The Fire Department personnel are on the scene, they are in command and their instructions must be followed.

Guests Rest Rooms

The ladies and gents rooms are situated as you walk into the conference centre on the left hand side in the following sequence:-
- Disabled
- Ladies
- Gents

Smoking Policy

In accordance with the companies smoking Policy no one will be allowed to smoke in the following areas:

- All internal building areas for guests and visitors.
- All common areas, including staircases, waiting rooms, copier rooms, mailrooms, libraries, store-rooms, reception areas, customer service areas, public toilets and changing rooms;
- Recreational areas.
9. **Satisfactory survey**

A workshop satisfaction survey form was compiled and distributed to participants attending Thyspunt SSHAC Level 3 Workshop #2. The results and analysis of this survey can be found in Appendix C.

10. **Lessons Learnt**

<table>
<thead>
<tr>
<th>ITEM NO</th>
<th>DATE</th>
<th>REFERENCE</th>
<th>DESCRIPTION OF ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>Working with a hotel that employs experienced staff and know what they are doing is monumental in the success of a workshop</td>
</tr>
<tr>
<td>2.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>Venue with gardens and space is essential for the well-being of participants</td>
</tr>
<tr>
<td>3.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>It was advantageous to have the rooms some distance from the conference venue as this resulted in participants being on time</td>
</tr>
<tr>
<td>4.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>Having a break after three days of workshop helped the PMT, PPRP and TI Leads</td>
</tr>
<tr>
<td>5.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>International teams members are encouraged to arrive a day earlier than usual to be well rested</td>
</tr>
<tr>
<td>6.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>State to hotel that the workshop is very important and the group needs peace and quiet</td>
</tr>
<tr>
<td>7.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>Light lunches work very well, having fresh fruit available in the session room and during coffee breaks helped. Having coffee available at each break is a necessity. Nuts and dried fruit should be on the tables and not sweets. The water cooler was better than having the tables cluttered.</td>
</tr>
<tr>
<td>8.</td>
<td>31/01/2012</td>
<td>WS2</td>
<td>Agenda being a separate document and being wire bound was an excellent idea</td>
</tr>
</tbody>
</table>
## 12. Conclusion

All objectives for Workshop 2 as set out in the project plan were met as evidenced below:

<table>
<thead>
<tr>
<th>SSC</th>
<th>Objective</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To review the project SSHAC Level 3 methodology, the ground rules for the conduct of the Workshops, expert roles within the project, and the participatory peer review process</td>
<td>• Introductory presentation given by PTI Julian Bommer provided the ground rules, roles of all participants, and the manner in which the PPRP would conduct its work</td>
</tr>
</tbody>
</table>
|     | To present to all participants an overview of the Thyspunt PSHA, and the structure and tasks of the SSC (seismic source characterisation) sub-project | • Introductory presentation given by SSC TI Lead Kevin Coppersmith summarized the relationship of the SSC activities to the overall TNSP.  
• SSC activities were identified according to the hazard-significant issues and elements of an SSC model |
|     | To review the progress being made on the various databases and the earthquake catalogue, and to elicit additional input, as needed, regarding these activities | • Summary given on the organization of the SSC database according to outline of database topics  
• Presentation made by the earthquake catalogue team summarizing their progress  
• Summary presentations given regarding the Geological Investigations (marine terraces and fault corridors) |
|     | To present, discuss and debate alternative models, methods, and viewpoints regarding key SSC issues | • Proponent experts gave presentations regarding Mmax methods, recurrence models, seismotectonic models, deep crustal models, stationarity of Ceres earthquakes, neotectonic evidence, nearshore geomorphology, uplift rates, and Kango fault behavioral characteristics. |
|     | To identify the technical bases for the alternatives and to discuss the associated uncertainties | • TI Team provided questions and comments to each proponent expert prior to the WS, which included requests for technical bases and uncertainties  
• TI Team questioned each of the proponent experts in interactive workshop sessions  
• Proponents were pressed to address issues of importance to SSC models |
|     | To provide a basis for the subsequent | • SSC model elements identified in |
| development of preliminary SSC model that consider these alternatives | introductory presentation
<p>| • All hazard-significant issues identified in WS1 were addressed by identified proponent and resource experts |</p>
<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th><strong>Evidence</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>To review the SSHAC Level 3 methodology, the ground rules for the conduct of the Workshop, the expert roles within the project, and the participatory peer review process</td>
<td>Covered by PTI presentation on Day 1</td>
</tr>
<tr>
<td>To present to all participants an overview of the Thyspunt PSHA project</td>
<td>Covered by PTI presentation on Day 1</td>
</tr>
<tr>
<td>To present an overview of the structure and tasks of the GMC sub-project</td>
<td>Covered by PTI presentation on Day 1</td>
</tr>
<tr>
<td>To present additional hazard sensitivity results exploring influences on long-period response spectral ordinates, including the East African Rift</td>
<td>Covered by PTI presentation on Day 1</td>
</tr>
<tr>
<td>To review the progress being made on databases:</td>
<td></td>
</tr>
<tr>
<td>- Empirical GMPEs</td>
<td>Covered by Peter Stafford presentation on Day 1</td>
</tr>
<tr>
<td>- Intensity database</td>
<td>Covered by Vunganai Midzi presentation on Day 1</td>
</tr>
<tr>
<td>- Weak-motion inversions</td>
<td>Covered by Andreas Rietbrock and Stephane Drouet presentations on Day 1</td>
</tr>
<tr>
<td>- Seismograph station classification</td>
<td>Covered by impromptu presentation by Adrian Rodriguez-Marek on Day 1</td>
</tr>
<tr>
<td>- Thyspunt site classification</td>
<td>Covered by Ellen Rathje presentation on Day 2</td>
</tr>
<tr>
<td>- Incorporating site effects into Thyspunt PSHA</td>
<td>Covered by Ellen Rathje presentation on Day 2</td>
</tr>
<tr>
<td>To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues:</td>
<td></td>
</tr>
<tr>
<td>- Adjusting empirical GMPEs (Vs-kappa)</td>
<td>Covered by Frank Scherbaum &amp; Linda Al Atik presentations on Day 2</td>
</tr>
<tr>
<td>- Adjusting empirical GMPEs (long distance, small M)</td>
<td>Covered by Peter Stafford presentation on Day 1</td>
</tr>
<tr>
<td>- Adjusting empirical GMPEs (‘stress drop scaling’)</td>
<td>Covered by Peter Stafford &amp; Frank Scherbaum presentations on Day 2</td>
</tr>
<tr>
<td>To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues</td>
<td></td>
</tr>
<tr>
<td>- South African GMPEs</td>
<td>Andrzej Kijko presentation on Day 2</td>
</tr>
<tr>
<td>Imported stochastic GMPEs</td>
<td>Julian Bommer overview on Day 1</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Hybrid-empirical models</td>
<td>Ken Campbell presentation on Day 2</td>
</tr>
</tbody>
</table>

To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues

- Attenuation in SCRs (from intensity)  
  Oona Scotti presentation on Day 3
- Attenuation in SCRs (from ground motions)  
  Trevor Allen presentation on Day 3

To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues

- Sigma models and single-station sigma  
  Adrian Rodriguez-Marek presentation on Day 3

To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues

- Selection of backbone models  
  Discussion of Peter Stafford presentation on Day 2
- Adjustments for Vs-κ, small-M, distance extrapolations  
  Discussions on Day 2
- Additional branches to capture epistemic uncertainty  
  Discussions on Day 3

To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues

- Data and approaches to ‘testing’ adjusted/extended GMPEs?  
  Discussions on Day 3
- Approach for building the sigma model?  
  Discussions on Day 3

To present, discuss and debate alternative models, methods and viewpoints regarding key GMC issues

- Extrapolation of GMRS to response periods of 10 seconds?  
  Discussions on Day 1, after GMC TI Lead presentation
- To plan work for the development of the GMC model  
  Tasks agreed and assigned, dates and locations for working meetings set
13. References

Appendix A

Participatory Peer Review Panel’s Report
SSHAC Level 3 PSHA for the Thyspunt Nuclear Siting Project

Workshop 2: Review of Database and Discussion of Alternative Models

Participatory Peer Review Panel Report

Spier, South Africa, January 22, 2012

Hilmar Bungum  Annie Kammerer  Roger Musson

Richard Quittmeyer  Gabriel Toro
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Concluding Remarks .................................................................................................. A - 10
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Introduction

This is the second report of the Participatory Peer Review Panel (PPRP) for the project titled “SSHAC Level 3 PSHA for the Thyspunt Nuclear Siting Project”. This report provides our comments on Workshop 2 (WS2), which was held January 15th to 21st 2012, in Spier, South Africa. The workshop was focused on the review of databases and discussion of alternative models and methods, consistent with the requirements for a Level 3 assessment as described by U.S. Nuclear Regulatory Commission (USNRC) NUREG/CR-6372\(^1\) (also known as the “SSHAC Guidelines”).

Within the SSHAC process, the general goals of WS2 are (1) to present, discuss, and debate alternative viewpoints regarding key technical issues; (2) to identify the technical bases for the alternative hypotheses and to discuss the associated uncertainties; and (3) to provide a basis for the subsequent development of preliminary hazard models that consider these alternative viewpoints. The workshop also provided an opportunity to review the progress being made on the database development. The specific goals of the workshop are outlined on page 2 of the workshop agenda.

All five members of the PPRP attended the workshop and were able to fully observe all aspects of the formal sessions. This is a consensus report written immediately following the workshop. The review contained in the document is based on the presentations and discussions that took place at WS2. This review has been informed by the project activities to date, including WS1 and working meetings SSC-1 and GMC-1, which members of the PPRP have attended as observers. Our work was also informed by interim documentation received from the Project.

The PPRP would like to recognize and thank Dr. Leon Reiter, who retired from the PPRP prior to this workshop, for his contributions to the work of the PPRP.

Responsibilities of the PPRP

The PPRP’s role is focused on two areas: technical review and process review. In terms of technical review, the PPRP is charged with ensuring that the full range of data, models, and methods have been duly considered in the assessment, and also that all technical decisions are adequately justified and documented. The PPRP must assure that the center, body, and range of the technically defensible interpretations (CBR of the TDI) are captured. Undertaking process review means ensuring that the project conforms to the requirements of the selected SSHAC Level 3 process. Collectively, these two roles imply oversight and assurance that the evaluation and integration aspects of the TI Teams’ assessments have been performed appropriately.

In more detail, the responsibilities include the following:

- to provide clear and timely feedback to the Project Technical Integrator (PTI) and Technical Integrator (TI) Leads, through the Project Manager (PM)
- to ensure that any technical deficiencies or violations of process are corrected at the earliest possible stage
- to highlight any data, models, or methods (and their proponents) that should be

---

considered
• to judge adequacy of the justification provided by the TI Teams for the models (included or excluded), and for the weights applied to the logic-tree branches; but **not** to judge the specific values chosen for the logic-tree weights.

To achieve the above, the attributes of the PPRP are defined in collective terms for all of the members of the panel as a group. Each member of the group should have an understanding of and commitment to the principles of the SSHAC process. The members of the panel must collectively cover all technical aspects of building seismic source characterization (SSC) and ground motion characterization (GMC) models and of conducting a probabilistic seismic hazard analysis (PSHA). Membership of the PPRP is always on an individual basis and not as an affiliate of any organization; the members represent only themselves, as experts in the field.

**Format of Review Comments**

We have organized our review comments using a numbering scheme as shown in the box below. This is a simplification of the scheme used in the PPRP Report from WS1. First the comments are broken into three general categories that follow the organization of the project: Project-wide comments, SSC-related comments, and GMC-related comments. At the request of the TI Leads, we have added a fourth classification of comments related to the “interface” (INT) between the SSC and GMC components. Each of the comments is given a sequential number, which has been continued from the WS1 PPRP Report, to avoid confusion. A “recommendation level”, denoted by one to three asterisks, is provided to convey the sense of importance assigned by the PPRP, as well as the level of response expected.

Some of these comments have already been communicated verbally to the two TI Leads and PM during the daily closed post-meeting debriefings, in the spirit of providing feedback in a timely manner. The Sponsor’s representatives were also present at the daily feedback meetings.

**Format for Numbered Comments: X-N(RL)**

<table>
<thead>
<tr>
<th>X</th>
<th>PRJ (Project-wide)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT (Interface)</td>
<td></td>
</tr>
<tr>
<td>SSC (Seismic Source Characterization)</td>
<td></td>
</tr>
<tr>
<td>GMC (Ground Motion Characterization)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Sequence Number (1,2,…,n) as continued from Workshop 1.</td>
</tr>
<tr>
<td>RL</td>
<td>Recommendation Levels (RL)</td>
</tr>
<tr>
<td>*</td>
<td>Comment only. No response needed.</td>
</tr>
<tr>
<td>**</td>
<td>Suggestion. Response preferred.</td>
</tr>
<tr>
<td>***</td>
<td>Recommendation. Response expected.</td>
</tr>
</tbody>
</table>
Comments on the Project Plan and Project Execution

PRJ-25  *
In the comments to WS1, the PPRP requested the opportunity to monitor the working meetings (see PPRP Report on WS1, comment PRJ-3). We appreciate that our request has been accepted and implemented. In light of the PPRP members' experiences at the first two working meetings, we have found that PPRP attendance at the meetings as observers has been highly productive and has helped to understand the progress of the project.

PRJ-26  ***
In comment PRJ-15 from WS1, the PPRP suggested that the results presented at WS3 should not be normalized. The TI Leads agreed with this suggestion and indicated that the Project Plan would be modified accordingly. However, Revision 2 of the Project Plan still indicates that results will be presented in normalized form (Task T-11, 2nd paragraph).

PRJ-27  ***
The PPRP has asked to have a meeting from 19th to 21st of March 2013 for the purpose of developing a consensus set of comments on the Draft Report, which is to be submitted to the PPRP on the 14th of February.

Comments on Workshop 2: Project-wide

PRJ-28  **
The PPRP notes that full engagement by the entire TI Teams in workshop discussions is crucial to achievement of the workshop goals. Specifically, the discussion and probing of alternative models, methods, and viewpoints regarding SSC and GMC issues needs proactive involvement by the full TI team to assure that proponent views are thoroughly understood. If such interaction does not take place naturally, the TI Lead needs to elicit the participation of all team members. During the SSC workshop this interaction became stronger as the workshop progressed. As at the workshops, the PPRP expects to see active participation by all TI team members at future SSC and GMC working meetings.

PRJ-29  **
During the workshop the PTI lead presented a schedule for development of interim working documents. The work of the PPRP would be greatly facilitated if the PPRP is provided with these documents as they become available. In particular, receiving the HID at the scheduled date will allow the PPRP to participate fully in WS3. The PPRP expects to be regularly informed about any updates to this documentation plan and of the various delivery dates.

PRJ-30  *
The phrase "preliminary model" used internally in the project to refer to the model to be presented at WS3 suggests a lower level of effort than will actually be involved. "Initial model" could be a better expression.

PRJ-31  **
By nature and necessity, many of the experts invited to this workshop are also involved in similar capacities in other leading edge projects and research activities. The PPRP takes it for granted that the potential implication of such overlaps, including both intellectual and project ownership, are closely considered in this project.

**PRJ-32**

Part of the task of the TI Teams is to identify and focus on issues that are important to the assessment of seismic hazard at the Thyspunt Site. Discussions during the workshop suggested that the TI Teams were moving toward a position that they would drop further consideration of hazard relating to the East African Rift from the project. The PPRP accepts that the TI team is giving adequate consideration to assessing the importance (or lack of importance) of this source.

### Comments on Workshop 2: SSC Sub-project

**SSC-26**

The PPRP notes that a number of the inputs intended for the development of the SSC model have not yet been delivered. Although these delays are often unavoidable, the PPRP is concerned that such delays will make the work of the TI Team more difficult, as they will have less time to digest these data and incorporate them into the model to be presented at WS3.

**SSC-27**

It should be remembered that bootstrap methods to assess uncertainty in earthquake parameters from macroseismic data only capture the statistical uncertainty inherent in the dataset, and not the uncertainty as to how the parameters derived from the data reflect reality. For instance, three identical intensity data points yield no uncertainty when processed in this way. The catalogue team is likely aware of this, but it is worth highlighting.

**SSC-28**

The PPRP reminds the catalogue team that macroseismic parameter estimation methods of the “third generation”, while objective and reproducible, have a trade-off in that they cannot incorporate other types of relevant information (e.g. population distribution, foreshock data, data quality).

**SSC-29**

It was suggested that comparison of site histories with simulated earthquake catalogues would provide a check on completeness estimates. This test is usually used to test the accuracy of the simulated earthquake catalogues.

**SSC-30**

A number of major fault structures potentially relevant to site hazard were mentioned (e.g. the Gamtoos Fault and the AFFZ), but there was little or no detailed discussion. We would like to make sure that these structures are not forgotten about in the development of the SSC model.

**SSC-31**
While there are many aspects of the work carried out for the CEUS SSC Project that are state-of-the-art and may be transferable to the Thyspunt PSHA, the SSC TI Team needs to guard against adopting CEUS SSC approaches without fully considering and justifying their applicability to South Africa.

**SSC-32**

On the issue of depth determination from (possibly poor) macroseismic data, the PPRP would draw attention to Burton et al. (1985), a paper perhaps not widely known.


**SSC-33**

There are few well constrained focal depths in South Africa and the SSC TI Team has indicated that the depth distribution can be improved through (or at least informed by) comparisons with other regions. The PPRP agrees with this, but would like to note at the same time that rheological comparisons (including shear-wave velocities and heat flow) have clear limitations to such ends; there are many examples, including from Africa, that earthquakes have occurred in (lower crustal) regions where the assumed ductility often is expected preclude this.

**SSC-34**

The computation of activity rates for area and fault sources, with uncertainties and ideas on alternative smoothing techniques and parameters, are critically important for the hazard model. The PPRP was surprised there was not more discussion of these issues at the workshop, and would like to be assured that clear plans are in place for how this will be handled and documented.

**Comments on Workshop 2: GMC Sub-project**

**GMC-14**

The PPRP compliments the GMC TI Team on the quality of the information provided in the draft White Paper on GMPEs that was provided prior to WS2.

**GMC-15**

At the beginning of the GMC Workshop, the PPRP was concerned that decisions had been made at Working Meeting 1 regarding various approaches to ground motion characterization without discussion and input from proponents as required by the SSHAC process. During the workshop it became apparent that the choices regarding approach made at the Working Meeting were tentative. Workshop discussion of the decisions was vigorous and involved most of the GMC TI Team members, Resource Experts, Specialty Contractors, and Proponent Experts. It was clear that the GMC TI Team was not anchored to their tentative choices, but was open to all alternative views. Nevertheless, we feel that the pre-WS2 decisions could have been better presented in SSHAC terms as a proponent position instead of a decision taken.

**GMC-16**

The PPRP notes that the GMC TI Team intends to base the project GMC model solely on empirical GMPEs with hybrid adjustments, and expects that this will be extensively discussed and justified. This is important especially because this approach, while technically
sound in principle, has not been state-of-practice in the past. The PPRP assumes that this process will also include a documented approach on how to assure that the CBR of the TDI are sufficiently well covered; a large number of logic-tree branches do not in itself guarantee this.

GMC-17 **
A highlight of WS1 was the presentation by Frank Scherbaum on visualising significant differences between ground motion models. It was surprising that no mention of this was made at WS2; it seems like an excellent way of evaluating the differences of the backbone models, as well as the modified GMPEs.

GMC-18 **
The PPRP notes that V/H conversion will be undertaken downstream of the hazard calculations, and that uncertainty in the conversion will not be included in order to prevent double counting of uncertainty. We would stress the importance of documenting the technical basis for this decision.

GMC-19 *
If the project should access “Did You Feel It” (DYFI) intensity data, it should be noted that the USGS does not use MM-56, but the Stover and Coffman (1993) scale, approximated according to the procedure described by Wald et al. (1999). The Stover and Coffman (1993) scale is an unpublished variant on MM-31 and not published in full anywhere, though a reconstruction will be published in the 2nd edition of the New Manual of Seismological Observatory Practice (in press).

GMC-20 *
The DYFI data from the August 2011 Mineral, Virginia earthquake may be helpful in understanding discrepancies among earlier intensity attenuation relationships and in determining how different or similar North America is from other SCRs.

GMC-21 **
The PPRP wants to emphasize that ground-motion parameters must be defined in a consistent manner across the project. For example, the PPRP noted instances where the term kappa was not used in a fully consistent manner.

GMC-22 **
The PPRP would like to draw attention to the fact that, as stated several times during the workshop, it is dangerous to use a subset of parameters in isolation. An example that was brought up is that changes in the near-source distance slope may lead to changes in the implied seismic moments.

GMC-23 **
In quantifying epistemic and aleatory uncertainties in ground motion, it is important to avoid double counting or underestimating uncertainties. There were very good discussions of these issues at the workshop. It would be beneficial for the TI Team to develop an overall approach to the classification and assessment of the various elements of uncertainty in a clear and transparent way. This is especially challenging when developing hybrid empirical models.
As was stated by the TI Lead, the uncertainty “sigma” is a very important ground-motion parameter, with a large effect on the calculated hazard. Because the single station sigma approach tentatively adopted by the TI Team represents the cutting edge in practice and research, and because the data available for the development of sigma models are limited, it is important that this phase of the work be documented very thoroughly and that it receives extensive internal review by other members of the TI Team. In particular, it is important that the rationale for the use of single-station sigma (in combination with analytically derived site-specific amplification factors) instead of ergodic sigma be thoroughly justified. It is also important that decisions regarding the inclusion of sigma uncertainty in the GMC logic tree be made only after this uncertainty is well understood and quantified by the TI Team.

The project should clarify the spatial extent of the site area over which developed ground motions are intended to be applicable.

In nearly all rock sites, there is a weathered layer with lower shear wave velocity near the surface. This softer material tends to amplify incoming waves. Such effects may be included in the backbone GMPEs and it may be difficult to remove them entirely. To the extent that they are not removed, this effect may be double counted when site effects are included.

There are a number of technical challenges related to converting the various native magnitudes into a single consistent $M_w$-based earthquake catalogue. It is still unclear to the PPRP what the complete process is and how the final magnitudes are being developed (and uncertainties tracked). This is a concern because this is a critical path item; therefore, the PPRP would appreciate receiving information soon about how this issue will be resolved so that we can assure ourselves that this is on track.

It was stated by Dr. Strasser that conversion between $M_L$ and $M_w$ was a SCR/ACR issue. This is not necessarily the case.

Conversion between $M_s$ and $M_w$ was not included in the conversion priority list (Johnston, 1996). We would like to flag up again that the designation “$M_s$” covers more than one practice, even if the “Prague formula” is followed.

Both the SSC and GMC TI Teams are considering whether South Africa is an SCR and, if so, whether analogs from other SRCs are applicable. Potential characterization of South Africa as an SCR may be an interface issue in that such a designation by one TI Team may have implications for the other TI Team. Depending on how each TI Team interprets South Africa with respect to SCR criteria, interface issues should be addressed and the consistency of the interpretations discussed and clarified.
Concluding Remarks

The agenda for the workshop was well developed and covered the necessary and appropriate topics to meet the workshop objectives. The workshop was well organized and well conducted. The high quality of the logistical organization of the workshop contributed greatly to its success, and we would like to express our appreciation to the CGS staff. The technical quality of both the presentations and discussion was generally very high throughout the workshop. Early in the SSC portion of the workshop, the PPRP raised concerns about limited challenge related to the proponent views and this improved as the workshop progressed. There was broad participation and interaction both amongst TI team members and between the TI team and the resource and proponent experts, particularly in the GMC portion of the workshop.

It is the judgment of the PPRP that the workshop was successful in its adherence to principles, goals, and requirements of a SSHAC Level 3 process.
APPENDIX

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<td>Active Continental Region</td>
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<tr>
<td>AFFZ</td>
<td>Agulhas Falklands Fracture Zone</td>
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<tr>
<td>CBR of the TDI</td>
<td>Center, body and range of the technically defensible interpretations</td>
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<tr>
<td>CEUS SSC</td>
<td>Central and Eastern United States Seismic Source Characterization for Nuclear Facilities Study</td>
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<tr>
<td>CGS</td>
<td>Council for GeoSciences</td>
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<tr>
<td>DYFI</td>
<td>Did You Feel It?</td>
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<td>GMC</td>
<td>Ground Motion Characterization</td>
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<tr>
<td>GMPE</td>
<td>Ground Motion Prediction Equation</td>
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<tr>
<td>HID</td>
<td>Hazard Input Document</td>
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<td>PM</td>
<td>Project Manager</td>
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<td>PPRP</td>
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<td>Probabilistic Seismic Hazard Analysis</td>
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<td>PTI</td>
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<td>SCR</td>
<td>Stable Continental Region</td>
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<td>SSC</td>
<td>Seismic Source Characterization</td>
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<td>SSHAC</td>
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<td>TI</td>
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<td>United States Nuclear Regulatory Commission</td>
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<td>V/H</td>
<td>Vertical to Horizontal ratio</td>
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TI Lead Responses to PPRP Report

Introduction

The TI Leads would like to once again express our gratitude to the five members of the Participatory Peer Review Panel (PPRP) for their time and effort throughout the Workshop, especially in view of the fact that this involved 8 full working days for Panel.

The feedback provided to us, both verbally during the Workshop and now in writing in their second report, continues to be very valuable. We would also like to note our gratitude regarding the PPRP taking cognizance of our responses to the first report in terms of simplifying the structure of the feedback.

We would also like to note that we are very pleased that the PPRP has once again clearly identified and confirmed its role and responsibilities in this project, and emphasised the importance of Panel members participating in their individual capacity.

Responses to Individual Comments

Each comment in the PPRP report is addressed below; these responses are provided by the TI Leads and will be communicated to the members of the TI Teams, and others as needed. We note, however, that in preparing our responses to some of these comments, particularly those related to project management, we have consulted with the Project Manager.

In identifying the comments in the following, we retain only the basic numbering and the recommendation level. Although the PPRP has indicated that some comments do not require any response (those marked with a single asterisk), we have opted to respond to all comments for completeness.

PRJ-25 *

We are also pleased that it has been possible for PPRP representatives to attend the two working meetings conducted prior to WS2 and that representatives of the Panel have been identified to act as observers at the three remaining working meetings for
each TI Team. We believe that the additional insight that this provides to the PPRP regarding our adherence to SSHAC process is very valuable.

PRJ-26 ***

The client, Eskom, and members of the TI Teams, have also requested that the hazard results should be presented at WS3 without normalisation. Since these results will be based on models created and owned by the TI Teams, there is no objection to doing this and the project has committed to this approach. A revised version (Rev 3) of the Project Execution Plan (PEP) has been issued in which the description of Task T-11 now makes this clear.

PRJ-27 ***

The request by the PPRP for a meeting (in London from 19th to 21st March 2013) to develop a set of consensus review comments on the Draft PSHA Report was noted during the Workshop and strongly supported by the TI Leads and the Project Manager. Eskom has agreed in principle to this request, but authorisation of the additional funding to cover the travel and accommodation costs for this meeting will have to go through the usual channels but is likely to be forthcoming.

The PTI has marked the dates of this meeting and will endeavour to be available to attend at any time, at the request of the PPRP chairman, if there are issues to clarify.

PRJ-28 **

Regarding the SSC TI Team, it is agreed that the early part of the workshop was limited in the interactive discussions among the TI Team and the proponent and resource experts. This was partially the result of a very specialized discussion the first day related to the statistical components of alternative M_{max} assessment techniques. It was also partially the result of a reluctance of the less experienced members of the TI Team to participate in a very public forum populated by acknowledged world-class experts. However, as noted by the PPRP, it is the responsibility of the TI Lead to encourage the TI Team members to take a proactive role in the workshops and working meetings, particularly inasmuch as they will become co-owners of the eventual SSC model. With such encouragement and diversification of the technical topics on the second and third days of the workshop, the SSC TI Team members gained confidence and became more engaged in the discussions. It is expected that such confidence and success will continue to grow with the progress of the project.
For the GMC TI Team, it is noted that Dr Vunganai Midzi only joined the TI Team in October of last year, and therefore neither participated in the remote discussions that developed the GMC Decision Matrix nor in working meeting GMC-1 in San Francisco in October 2011. For this reason, Dr Midzi’s participation in the discussions was somewhat less active than other members of the GMC TI Team. However, it is acknowledged that he will need to become fully engaged in the discussions and decision-making as the project progresses, in order to be able to share in the ownership of the final GMC model, as required by the SSHAC process.

PRJ-29 **

The PTI presentation on interim documentation was focused exclusively on the White Papers and Data Summary Reports being developed by the GMC TI Team, and we feel that this comment is therefore misplaced. An updated list of these GMC documents has been produced following discussions at the Workshop, and the GMC TI Lead has requested the Project Manager to pass this to the PPRP. As requested, as each of these documents becomes available, they shall be made available to the PPRP by the Project Manager.

The HIDs will be made available to the PPRP ahead of Workshop #3 as agreed. We appreciate that these will allow the PPRP to prepare for the workshop, especially with regards to formulating questions concerning the SSC and GMC models.

As was explained during the Workshop, the interim documentation of the SSC TI Team are the Data Summary and Data Evaluation Tables, and these are being developed as the project progresses. Based on experience on other SSHAC Level 3 projects that have used these tables, they will continue to be developed throughout the development of the preliminary and final SSC models and will be a fundamental means of documenting the evaluation of data, models, and methods (i.e., the tables will be appended to the final report). As the tables are completed by individual TI Team members, they are uploaded to the project portal and a summary is developed on a monthly basis that identifies which tables have been completed. The PPRP should be able to download the tables and to have access to the monthly summary reports.

PRJ-30 *

We agree with the PPRP regarding the danger of the adjective “preliminary” conveying the impression that the SSC and GMC models produced between the second and third workshops could reflect a lower level of effort. However, since this terminology has been used in the SSHAC implementation NUREG-2117 and in the Project Execution Plan, we propose to retain it for this project and include this as one
of the “lessons learnt”. The term “preliminary” was chosen to distinguish it from some type of “draft” model that would later go through a finalisation process. Rather, as required by the SSHAC guidance, the preliminary model is intended to provide valuable information and feedback to the TI Teams, but there should be no expectation that the final SSC and GMC models will conform to the preliminary models. That is, the TI Teams will be instructed to not be anchored to their assessments that comprise the preliminary model. In this way, they will learn from the feedback provided at WS3 but not feel in any way bound to the preliminary assessments.

PRJ-31 **

The very essence of the SSHAC process is the definition of and adherence to roles for all members of the project. It is noted and expected that members of the technical community who were invited to the TNSP WS2 as Proponent or Resource Experts have other roles on other SSHAC projects. This is not a concern in that all experts invited to the workshop were provided with detailed explanations of exactly what their roles would be on the TNSP and in what capacity they would participate in WS2. Because the TI Leads are currently involved in other projects in a variety of roles, they have knowledge of the roles that the invitees have played on other projects, but all experts invited to WS2 are those that have agreed to abide by the specific role expected of them on the TNSP. In this sense, the prior participation of the invitees in other projects has no material bearing on the quality or substance of their participation on the TNSP.

PRJ-32 *

The TI Leads are grateful for this recognition from the PPRP that the influence of the East African Rift on the seismic hazard estimates at Thyspunt has been given careful consideration but with a little more effort can be demonstrated to be unimportant. The GMC TI Team will undertake some additional work to make this case, which will then be documented in full in one of the White Papers.

SSC-26 **

It is agreed that there are a number of results from the geological investigations (GI) that will ultimately be important data to consider in the development of the SSC model. The members of the TI Team who are involved in the GI studies are fully aware of the timeframe for the Team’s assessments and the need for conclusions at the earliest possible dates. At the present time, the schedule for the delivery of the key results and conclusions of the GI studies are consistent with the needs of the project. For example, the fault corridor studies and the marine terrace studies will be
completed and documented in reports at the end of March, which should provide adequate time for consideration of the results by the TI Team in the development of the preliminary SSC model. Analytical geochronology results, such as those from cosmogenic nuclides and optically stimulated luminescence, are beginning to be received now and will continue to be developed over the next few months. The interpretation of the ages of the various geomorphic surfaces and deposits will be assisted by these lab results, but other correlation techniques will allow for qualitative interpretations to be made in their absence. In sum, the TI Team is very aware of the importance of the findings of the GI studies and concerted effort is being devoted to ensuring that the results of those studies are made available to the entire TI Team in a timely manner.

SSC-27 *

It is agreed that additional epistemic uncertainty exists regarding the assessment of moment magnitude from the macroseismic data (as well as any other earthquake “size” measure) and this will be part of the consideration in the assessment of moment magnitudes for all earthquakes in the catalogue.

SSC-28 ***

It is agreed that the “third generation” techniques for assessing earthquake parameters from macroseismic data do not include information of the type cited. This is indeed the trade-off between a method that can be applied and reproduced by independent researchers, versus a method that can take into account additional types of information in a more qualitative manner. To the extent practical, both types of approaches will be exercised in the estimation of parameters for the historical earthquakes in the catalogue.

SSC-29 *

It is agreed that the use of simulated earthquake catalogues is usually used as a way of comparing the simulated catalogues with the site history of earthquakes. Although perhaps not a quantitative check, this comparison is also a way of evaluating any discrepancies between the “predicted” earthquake histories from the simulated catalogues with the “observed” histories. One of the contributors to any discrepancy could be the assessment of completeness.

SSC-30 ***

The focus of the discussions at the workshop on potential fault sources was centered on those faults for which proponent or resource experts have developed data or
interpretations that pertain thereto. Hence, the focus of the discussions was on the Kango fault and the other faults of the Ceres-Kango-Baviaanskloof-Coega fault system. It is recognized that faults such as the Gamtoos fault, Plettenberg fault, and the Agulhas fracture zone, because of their proximity to the site, will also need to be evaluated as potential seismic sources.

SSC-31 *

The advice provided is well-taken. Although there are many common features between the tectonic environments of the CEUS and the site region, the datasets and approaches that are available to evaluate the two regions are quite distinct and different. Likewise, the CEUS SSC project was a regional assessment and not a site-specific study as is the TNSP. Therefore, the TI Team is considering the transferability of certain aspects of the CEUS SSC study methodology (e.g., the use of Data Summary and Data Evaluation tables), but recognizes that any and all aspects of the TNSP will need to be justified in their own right.

SSC-32 *

Identification of this reference is appreciated.

SSC-33 *

It is agreed that the development of focal depth distributions and assessments of seismogenic crustal thickness will need to be developed with caution. Clearly, the best indicators of focal depths are those that have been instrumentally determined either in the region of interest or within tectonically-analogous regions. Other indicators of seismogenic crustal thickness, such as considerations of rheology or surface heat flow, have been plagued with problems, as documented in the literature. Therefore, we will use caution in the assessment of focal depth distributions and seismogenic thickness based on such indicators.

SSC-34 **

It is agreed that the assessment of recurrence rates for all types of seismic sources is important and is a dominant control of the hazard. Discussions of the manner in which fault-specific recurrence (either slip rates or recurrence interval data), and associated uncertainties, can be assessed and included in the recurrence relationships was presented by Bob Youngs. Celine Bauval and Fleur Strasser presented approaches to assessing recurrence parameters for seismic source zones
and the associated tasks that are required to prepare the earthquake catalogue for such calculations. The key assessment that remains is the degree of spatial complexity that should be included in the recurrence analysis, ranging from spatial smoothing operations to seismic source geometry variations, to capture the degree of spatial stationarity in recurrence rates. The TI Team is aware of the tools that are available for these types of operations, but is concerned that undue complexity in the spatial models is not warranted, given the historical and instrumental density of observed earthquakes. This assessment will be made by the TI Team in the coming deliberations.

GMC-14 *

We are grateful for this positive feedback, which is encouraging. We also hope that the PPRP will be equally satisfied by future documentation, which we intend to produce to the same high standards.

GMC-15 **

The point is well taken in terms of ‘optics’, in other words that a better job could have been in the initial presentations of the GMC workshop to convey the nature and purpose of the framework that the GMC TI Team had adopted as its working model prior to WS3. The presentation made the GMC TI Lead on the last day of the Workshop was modified specifically to address this concern.

However, in terms of terminology, we would classify the framework with which we began the workshop as a preliminary or provisional decision, taken and supported by the entire GMC TI Team, rather than a proponent position. Within the SSHAC process, the TI Team cannot take a proponent position collectively (even though individual team members may make proponent presentations). Our provisional decision was to adopt an approach that we believed could meet all of the requirements, acknowledging that this was not the only way that this could be achieved, and then exposed this framework to discussion and challenge.

GMC-16 **

The GMC TI Team is cognisant of the challenges in adopting a relatively novel approach (although the TI Lead did present several cases that serve as at least partial precedents on the final day of the Workshop), and the onus that this places on us to provide extensive documentation and justification. The GMC TI Team will make extensive explorations and comparisons to ensure that the approach adequately captures the range of epistemic uncertainty to constitute the CBR of the TDI; we are acutely aware of the fact that large numbers of logic-tree branches do not provide
assurance in this respect. The visualisation tools developed by Frank Scherbaum will be one of the resources employed in this exercise.

GMC-17 **

We did not include presentations on topics and issues that are already fixed in the GMC sub-project in order to make best possible use of the short time available at the Workshop. Although these visualisation tools were not explicitly mentioned in the discussions, the GMC TI Team did confirm at its close-out meeting the day after the Workshop that SOMs will be created for the GMC models to explore both their similarities and differences, and to help identify any redundancies.

GMC-18 **

The V/H ratios developed by the GMC TI Team will be documented to the same level of detail and completeness as all other aspects of the GMC model. However, it is important to clarify that the GMC TI Team has not stated that it will not include any uncertainty associated with the V/H ratios. Rather, the team will exercise caution in capturing uncertainty in this factor since if the full uncertainty of the V/H ratios is modelled by a logic-tree in isolation, the resulting uncertainty in the vertical spectral ordinates will be exaggerated since the horizontal spectral ordinates will already capture the CBR of the TDI. In other words, the GMC model will take account of the correlations between vertical and horizontal components of motion.

GMC-19 *

The point is noted with interest, and will be taken into account in the GMC White Paper reviewing available relationships between intensity and ground-motion parameters. However, there are no data for South African earthquakes in DYFI to date, so in terms of our intensity database this difference in scales is not important.

GMC-20 *

The DYFI data from the Mineral, VA, earthquake will be examined – taking cognisance of the previous comment – to explore which of the existing intensity attenuation relationships most faithfully reflect Eastern North American ground-motion characteristics.

GMC-21 **

The comment is well taken, and the PPRP will recall that this was discussed by the TI Team, Proponent Experts and Specialty Contractors during the workshop, leading
The downloaded document is uncontrolled; therefore the user must ensure that it conforms to the authorised database version.

to an agreement to ensure that reference is made to “site kappa” or “kappa-zero” when this is the parameter of concern.

**GMC-22**

This comment is also very well taken. The GMC TI Team will need to continuously keep in mind the trade-offs between stochastic parameters and be extremely cautious about treating any of these parameters in isolation. The example of trade-offs between near-source geometric spreading, seismic moments and stress drops is a case in point. The lack of resolution on optimal combinations of the parameters that result from these trade-offs had provided a degree of vindication for the GMC TI Team in terms of not adopting the approach of building new stochastic ground-motion models for this project.

**GMC-23**

The GMC TI Team will take this recommendation on board, and develop a framework for identifying and classifying (as aleatory or epistemic) all elements of uncertainty in the GMC model.

**GMC-24**

This comment is very well taken, and the GMC TI Team will follow these suggestions. At the informal meeting immediately following WS2, the GMC TI Team decided to develop the logic-tree for sigma (and at this stage, no decisions have been taken, including with regards to the adoption of single-station sigma) following a similar process as that used to select a framework for the median ground-motion models (i.e., a decision matrix). This will be coordinated by Adrian Rodriguez-Marek rather than the TI Lead, but it will involve the entire team and include thorough review through the process of technical challenge and defence (particularly at the two working meetings that will take place prior to WS3).

**GMC-25**

The GMC logic-tree is being developed for a deep horizon within the Goudini formation at the Thyspunt site, and following NRC Approach 3 the hazard estimates will then be transformed to a horizon higher up within the Goudini bedrock (which will be specified in due course by Eskom). Both sets of estimates (deeper bedrock and ‘surface’ motions) will aim to capture the current footprint area, but may be extending spatially should additional site data become available in the near future (again, these are issues of ongoing discussions with Eskom engineering). The final reference site will be clearly defined and explained in the documentation, but it can be stated from
now that it is more likely to correspond to the site location (1 km radius) than the site area (8 km radius).

**GMC-26**

The GMC will bear this observation in mind, but agrees that quantifying and isolating the contribution to the GMPEs (both in terms of median predictions and sigma values) may be extremely challenging. Although double-counting of effects and uncertainties will be avoided wherever possible, the GMC TI Team will be cautious about any attempts to remove such effects that could lead to underestimations, which we would consider less acceptable than any double counting.

**INT-1**

The main technical challenge here is the limited number of events in the catalogue having more than one magnitude estimate available. How the various conversions are addressed depends on the data available; in most cases (e.g., $m_b$-$M_w$) the data are insufficient to constrain a locally-derived relation, hence they can only be used to test existing relations. The one set of data that is dense enough to constrain a local relation is the subset of events coming from the weak-motion inversions, for which results will be communicated to the catalogue group by the end of February. Calibration based on local data is also being investigated with the intensity data, with the results compared to those obtained using imported intensity prediction equations such as the French-SCR relation presented by Oona Scotti. The consistency between different conversions also needs to be checked, which will be done in two ways: (a) comparison of all the moment magnitudes obtained through different conversions for the few events having multiple magnitude estimates; and (b) tests of the effect of combining different conversion schemes using synthetic catalogues, as explained by Bob Youngs. The latter technique allows the derivation of bias corrections.

In terms of uncertainties, we have estimates of the uncertainty associated with the determination of the magnitudes in the native scale, as well as those associated with the conversion. The compounded uncertainty on $M_w$ obtained from these two uncertainty values will be compared to values determined from global datasets (e.g., the values proposed by Johnston, 1996), which serve as a lower bound. The spread of $M_w$ values obtained for individual events for which multiple conversions are possible will also be considered.

Finally, the catalogue team has noted the comment made by one of the PPRP members during the workshop that the best estimate $M_w$ value can be obtained from a weighted combination of alternative possible values instead of a simple preference
scheme. This approach will be considered whenever multiple determinations of comparable quality are available.

**INT-2** *

The comment is noted. Considering it an SCR/ACR issue mainly comes from the way $M_w$ and $M_L$ are defined, with the latter explicitly depending on a regional calibration, hence potentially affected by differences in attenuation between SCR and ACR.

**INT-3** *

The comment is noted. The reason an $M_s$ conversion does not appear in the magnitude preference scheme slide for the instrumental (post-1971) part of the catalogue is simply the unavailability of well-constrained $M_s$ values, except for a few events for which an $M_w$ estimate is already available. Thus, the $M_s$-$M_w$ conversion is really only an issue for the few early instrumental events having a Pasadena $M_s$, all of which are included in the Johnston et al. (1994) study. These magnitudes will also be checked against the $M_w$ values obtained from intensity data.

**INT-4** *

The TI Leads will continue to liaise on this issue and ensure that any decisions made regarding the classification of South Africa as an SCR or otherwise are consistent between the SSC and GMC Teams. At the same time, the TI Teams will keep in mind that while SCRs may be useful analogues in terms of $M_{max}$ and other SSC characteristics, the classification of South Africa would not automatically indicate that any particular SCR is an analogue in terms of ground-motion models.

**Concluding Remarks**

We are grateful for the overall endorsement that the PPRP has given for Workshop #2 having been successfully conducted and having conformed to the principles, goals and requirements of a SSHAC Level 3 process.

We look forward to engaging with the complete PPRP at Workshop #3 in August 2012, and to their direct engagement in interrogating the TI Teams on the preliminary SSC and GMC models that will be developed over the coming months. We trust that they will be satisfied at that time that the issues and concerns that have been raised will be resolved or will be receiving due attention. Of course, in the meantime, if any of these responses are not to the satisfaction of the Panel then we
would expect this to be communicated to the Project Manager. In closing, we once again thank the PPRP for their very valuable contributions and their insightful and constructive comments.

Julian J Bommer
PTI/GMC TI Lead

Kevin J Coppersmith
SSC TI Lead

30 January 2012
Appendix C

Workshop satisfaction survey
Workshop Satisfaction Survey

Thyspunt Workshop 2
Review of Database and Discussion of Alternative Models
15 – 21 January 2012

Annabel Graham
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1. Introduction

The Council for Geoscience (CGS) hosted a workshop at Spier Hotel from 15-21 January 2012. The workshop was divided into two sections, each three days long. A Workshop Satisfaction Survey was distributed to all participants at the Workshop. A total of 67 questionnaires were received back from a total of 101 anticipated participants.

2. Workshop Satisfaction Survey

The Nuclear Geohazards Group of the CGS conforms to an Integrated Management System (IMS), which includes continuous improvement. In order to continually improve the quality of our workshops, we devised a Workshop Satisfaction Survey which has to be completed at all the workshops. The survey covers a total of 18 questions divided into three main groups:

- Pre-workshop arrangements (questions 1-4)
  1. Were you kept adequately informed regarding the arrangements for the Workshop leading up to the event?
  2. Were the methods of communication adequate (e-mail, newsletters, etc.)?
  3. How was your travel arrangements (air ticket and transfers) handled?
  4. Upon arrival, how were you received by the organizers and hotel staff?

- Venue (questions 5-14)
  5. How would you rate Spier Hotel as a location for the Workshop?
  6. If you stayed at Spier Hotel during the Workshop, how would you rate the accommodation?
  7. If you live in Cape Town and drove to Spier Hotel, how did you find the parking at the Workshop?
  8. On average, how did you find the session room to be in terms of seating and view?
  9. How satisfied were you with the technology and multimedia available during the sessions?
 10. Were the organizers and hotel staff helpful and courteous throughout the Workshop?
 11. How would you rate the venues for the meals?
 12. How would you rate the meals and snacks provided during the Workshop?
 13. If you had special dietary requirements, were these catered for?
 14. Was the safety briefing adequate?

- General (questions 15-18)
  15. Was the workshop document pack informative enough?
  16. Was the Agenda kept to, and did the sessions begin on time?
  17. Were you able to add value to the discussions during the Workshop?
  18. Were the objectives you thought should be met, achieved by the Workshop?
Weights were assigned to each question, these are: Excellent = 4; Good = 3; Average = 2; Poor = 1; No data = 0.

Unfortunately two questionnaires were not completed in full and as such these were assigned weights of zero.

3. Results
Questionnaires were completed by 67 participants and the following results were obtained (percentages).

During our analysis of the results from Workshop #1, it became apparent that the results could be grouped into three categories, viz. satisfied (excellent out weights good); room for improvement (good out weights excellent) and not applicable. Not applicable does not mean the question is invalid, it means that the majority of the participants did not respond to the question, these normally pertain to parking for day visitors and dietary requirements.

3.1 Pre-workshop arrangements

From the results it can be seen that the overall satisfaction was excellent. Comments relating to Q3 and Q4 are follows:

Q3: 19% of the participants did not complete this question.
Q4: 1% of the participants rated the reception on arrival as average because some rooms were not ready on their arrival and the CGS organisers did not meet them on the day-off. 4% did not complete this question.

3.2 Venue

3.2.1 Satisfied

![Venue - satisfied](image)

**Figure 2: Satisfaction - venue (satisfied)**

From the results it can be seen that the overall satisfaction was excellent. Comments relating to the questions are as follows:

Q5: 1% of the participants did not complete this question.

Q6: 1% of the participants rated the accommodation as average but provided no feedback on this question. 13% did not complete this question.

Q10: From the lessons learnt meeting held on 31 January 2012 it was agreed that to work with an organization such as Spier, whose staff are well trained and know what they are doing is critical in the efficient running of a workshop.

Q11: 3% of the participants rated the venues for the meals as average. The only comment received was: they were required to sit outside and the shading was not adequate to protect from the heat; no other comments were given. 3% did not complete this question.

Q12: 4% of the participants rated the meals and snacks as average but provided no feedback. 3% did not complete this question. From the lessons learnt meeting held on 31 January 2012 Spier should be complemented on their food. The light lunches were very welcome due to the very long days; the availability of fruit throughout the day; the workshop snacks; the water fountain being available to top up water; the variation of the dinners. The one complaint regarding the food was not so much about the food, but rather that the set menu that was served the one night was not actually feasible for such a group that rushes to get through dinner.
3.2.2 Room for improvement

From the results it can be seen that the overall satisfaction was good. Comments relating to these questions are follows:

Q8: 13% of the participants rated the session room as average because viewing presentations from the back was difficult and the text was small; tables were a bit too close to each other.

Q9: 1% of the participants rated the AV as average and another 1% rated it as poor but gave no reason. This poor rating is not necessarily a reflection on the actual AV and AV staff but could be because of the small fonts used in some of the presentations.

Q14: 12% of the participants rated the safety briefing as average, 1% as poor and 6% did not complete the question. The comments received were that the safety briefing was not adequate because the assembly points were not pointed out; safety briefing could be more detailed to include safety outside the conference room; mention could also be made that there are exits behind the screens to the outside.
### 3.2.3 Mostly not applicable

#### Figure 4: Satisfaction – venue (mostly not applicable)

From the results it can be seen that the overall satisfaction was good. Comments relating to Q7 and Q13 are as follows:

**Q7:** 72% of the participants did not complete this question as they stayed at Spier. A complaint from the day participants was that their cars were exposed to the sun the whole day.

**Q13:** 73% did not complete this question.
3.3 General

From the results it can be seen that the satisfaction was mixed. Comments relating to these questions are follows:

Q15: 3% of the participants rated the documentation pack as average but gave no feedback. 6% of the participants did not complete this question.

Q16: 3% did not complete this question.

Q17: 6% rated adding value to the discussion as average; 1% rated it as poor and 27% did not complete the question. The only comment received was that a participant was unable to add value due to their lack of knowledge.

Q18: 4% of the participants rated whether the objectives were met or not as average but provided no reason. 6% did not complete this question.
4. How did we fair?
Since continuous improvement and quality go hand in hand it is important for us to compare the results of Workshop 2 with those of Workshop 1. The table below lists the comparative results (based only on the excellent results) between Workshop 1 and 2 (percentage).

<table>
<thead>
<tr>
<th>Question</th>
<th>Workshop #1</th>
<th>Workshop #2</th>
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<tbody>
<tr>
<td>1</td>
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</table>

The question numbers have been assigned a colour code to reflect the level of satisfaction; green = satisfied; red = improvement; orange = mostly not applicable. The graphic representation gives an indication of where we have improved, slipped or not changed from Workshop 1 to Workshop 2. Due to Question 7 and 13 not affecting the larger group these questions will not be analyzed further. Question 17 will also not be analyzed any further because if a participant cannot add value due to lack of knowledge then the area cannot be improved on from a workshop organization point of view.

Taking the other fifteen questions into consideration we can see that there has been an 87% increase in satisfaction from Workshop 1 to Workshop 2.

It is important to try and improve on all areas for Workshop 3 but the areas that will require a little more attention to make the overall satisfaction increase are:

5. Session room – we need to make sure that everyone is comfortable and that the row spacing is sufficient.

6. AV – presenters must be reminded of the presentation guidelines and make use of the suggested font sizes and colours to make the viewing experience better; this could be linked to the point above.

7. Safety Briefing – the hotel must be made aware of the importance of safety and that it is a requirement for the third workshop. Issues that were raised included the exit to the outside and必须ing points not being pointed out. It is advisable that the Spier Safety Manager present the Safety Briefing.
5. Conclusions

The success of Workshop 2 can mostly be attributed to the change in venue for the workshop as well as the support the CGS staff received from the Spier staff. The venue provided a much needed stimulus with its open space and gardens that the participants needed during such an intense workshop. The CGS would like to thank Spier for making our workshop so successful; in particular we would like to thank the following members of staff (although our thanks goes way beyond them, and should be cascaded down to all staff):

Conferencing: Portia, Natalie, Alison, Liezl, Jeanette
Reception: Vanessa, Siwe, Dawn, Shaun, Janine, Cindy, Gallo
All the Porters
Banqueting: Wynette, Bill, Lilanie, Ben (all the wait staff)
Restaurant: Johnathin, Hamilton (all the wait staff)
Chefs: Lollie, Stewart, Paul
Barman: Tyrone