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The Editor
Geological Society of Malaysia
c/o Department of Geology,
University of Malaya,
50603 Kuala Lumpur, Malaysia
Tel: 603-79577036 Fax: 603-79563900
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Pencirian keberintangan geo-elektrik dan potensi aquifer Formasi Ganduman di Semenanjung Dent, Lahad Datu, Sabah

(Geo-electrical resistivity characterisation and aquifer potential of Ganduman Formation in the Dent Peninsula, Lahad Datu, Sabah)

HARDIANSHAH SALEH^{1,*}, ABDUL RAHIM SAMSUDIN², SANUDIN TAHIR¹ & BABA MUSTA¹

¹Program Geologi, Fakulti Sains Dan Sumber Alam, Universiti Malaysia Sabah,
88400 Jalan UMS, Kota Kinabalu, Sabah, Malaysia

²Program Geologi, Pusat Pengajian Sains Sekitaran dan Sumber Alam, Fakulti Sains Dan Teknologi,
Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor D.E., Malaysia

*Corresponding author email address: hardianshah@ums.edu.my

Abstrak: Kajian keberintangan geo-elektrik telah dijalankan di kawasan batuan Formasi Ganduman yang merupakan sebahagian daripada batuan sedimen Kumpulan Dent di kawasan Semenanjung Dent, Lahad Datu, Sabah. Sebanyak 27 stesen keberintangan duga dalam (Vertical Electrical Sounding, VES) dengan menggunakan tatarajah Schlumberger telah di ukur bagi menentukan perlapisan bahan bumi dan potensi akuifer formasi ini. Teknik duga dalam melibatkan dua elektrod bagi mengukur potensi (P_1 dan P_2) dan dua elektrod bagi mengukur arus (C_1 dan C_2) yang disusun secara linear dengan jarak maksimum elektrod arus adalah 500m dan anggaran kedalaman penembusan sekitar 100m. Hasil survei VES menunjukkan, Formasi Ganduman mempunyai dua corak lengkung keberintangan geo-elektrik yang dominan terdiri daripada lengkung keberintangan jenis HK dan jenis H. Kesemua data anggaran keberintangan ini kemudiannya diproses dengan menggunakan perisian PROGRESS 3.0 bagi menghasilkan log keberintangan menegak dengan ketebalan lapisan untuk setiap stesen survei. Hasil analisis menunjukkan lapisan dominasi dan lapisan dominasi lempung menjadi bahan asas pembentukan Formasi Ganduman. Formasi ini ditafsirkan sebagai selang lapis pasir dan lempung daripada bahagian atas sehingga bawah lapisan dengan pembentukan kekanta batu kapur pada kedalaman tertentu. Zon dominasi pasir dan lempung ini mampu membentuk akuifer terkekang atau semi terkekang dalam Formasi Ganduman.

Kata kunci: Akuifer, teknik duga dalam menegak, keberintangan, Formasi Ganduman

Abstract: A geo-electrical resistivity survey was conducted in the Ganduman Formation area, part of Dent group's sedimentary rock that builds Dent peninsular of Lahad Datu, Sabah. A total of 27 Vertical Electrical Sounding, VES stations were carried out by using Schlumberger array to determine subsurface layering structure and aquifer potential. The array involved two potential electrodes (P_1 and P_2) and two other current electrodes (C_1 and C_2) which arranged in a linear configuration with maximum 500m of electrode distance to obtain the depth of information up to 100m from a surface. The results of VES survey indicates that the Ganduman Formation consists of two typical geo-electrical resistivity curves; HK and H types. Measured resistivity data were processed by using PROGRESS 3.0 software to produce vertical resistivity log with thicknesses of interpreted layers for every VES stations. Analysed data shows that sand dominated layer and clay dominated layer are the two main earth material that formed the formation. The formation is interpreted as interbedded sandstone with clay with appearances of limestone lenses at a certain depth. Zones of dominated sand and clay layers in the Ganduman Formation have the potential to form confined or semi-confined aquifers.

Keywords: Aquifer, vertical electrical sounding, resistivity, Ganduman Formation

PENGENALAN

Kaedah geofizik telah di gunakan secara meluas oleh para pengkaji dalam membantu menentukan struktur dan sifat fizikal subpermukaan batuan di lapangan. Potensi air bawah tanah boleh ditentukan dengan kaedah keberintangan yang ditunjukkan oleh julat keberintangan batuan yang berbeza mengikut jenis litologi. Julat nilai keberintangan tertentu juga menunjukkan porositi dan

kebolehtelapan batuan yang tertentu. Nilai kebolehtelapan batuan mempengaruhi nilai keberintangan arus elektrik yang mampu memberikan gambaran potensi air bawah tanah (Lihat dalam Lakam & Rahman, 2006; Hardianshah & Abdul Rahim, 2013b; Mahmoud & Dina, 2017). Ini kerana jenis air bawah tanah yang wujud di lapangan kerana sifat kekonduksian air dipengaruhi oleh bahan terlarut dalam air tersebut. Dalam kajian ini,

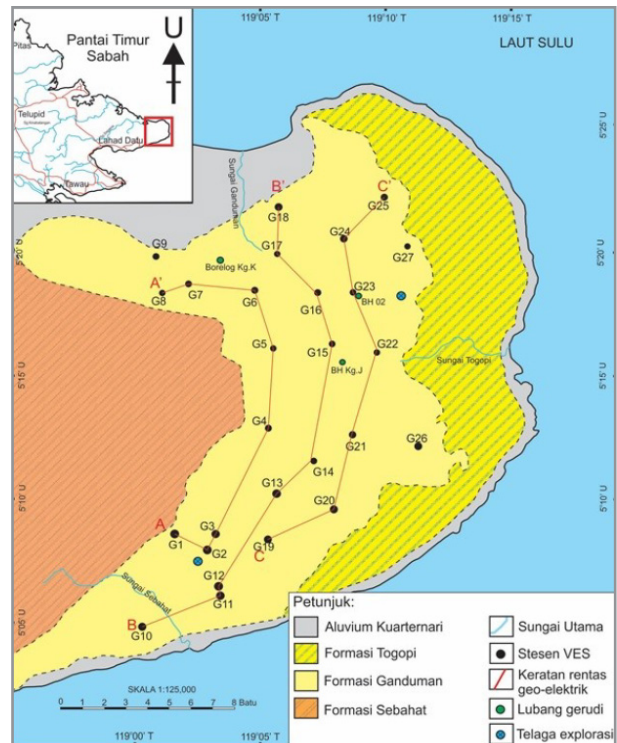
pencirian tanah atau batuan dilakukan berdasarkan nilai keberintangan tanah atau batuan yang diukur di lapangan. Pencirian tanah, batuan dan air bawah tanah mampu memberikan gambaran yang lebih jelas tentang zon tepu dan zon tak tepu di kawasan kajian tanpa memerlukan data lubang gerudi yang banyak. Perkaitan data keberintangan yang diperolehi dengan jenis tanah dan batuan adalah berdasarkan kepada pengelasan oleh Telford *et al.* (1990).

GEOLOGI DAN STRATIGRAFI

Kawasan kajian terletak di daerah Lahad Datu iaitu di bahagian tenggara Sabah yang membentuk semenanjung Dent di sekitar Teluk Darvel (Rajah 1). Haile & Wong (1965) mendapati semenanjung Dent terbentuk daripada dua kumpulan batuan iaitu Kumpulan Segama dan Kumpulan Dent. Kumpulan Segama terdiri daripada batuan Vulkanik Neogen manakala Kumpulan Dent terdiri daripada batuan sedimen iaitu Formasi Sebahat, Formasi Ganduman dan Formasi Togopi. Kajian ini hanya melibatkan kawasan Formasi Ganduman dalam Kumpulan Dent sahaja (Rajah 2).

Formasi Ganduman dicirikan sebagai formasi yang sangat berpasir dan ditafsirkan terenap di kawasan sistem delta-fluvial (Ismail Che Mat Zin, 1994). Formasi ini kelaskan sebagai fasis selang lapis palung (Foto 1a) yang mempunyai batu pasir kasar hijau-kelabu sehingga sederhana kasar (Hutchison, 2005). Abd. Manaf *et al.* (1990) mendapati bahawa Formasi Ganduman terdiri daripada dua bahagian iaitu Ganduman Bawah yang terdiri daripada selang lapis argilit dan arenit, dan Ganduman Atas yang terdiri daripada selang lapis pasir dan lempung. Formasi Ganduman Atas dan Formasi Ganduman Bawah telah di gabungkan menjadi Formasi Ganduman sahaja oleh Walker (1993); Wong (1993); dan Sanudin & Baba (2007). Menurut Sanudin & Baba (2007) bahagian bawah Formasi Ganduman mempunyai kelimpahan rangka foraminifera, karang, algae dan sedikit moluska yang tidak terdapat di bahagian atas Formasi Ganduman.

Batu pasir dalam Formasi Ganduman dianggap mempunyai potensi yang baik bagi punca air bawah tanah



Rajah 1: Peta geologi menunjukkan Formasi Ganduman di kawasan Semenanjung Dent dan kedudukan stesen VES serta lubang gerudi (Ubahsui Haile & Wong, 1965; IPASA, 2011; Hardianshah & Abdul Rahim, 2013b).

Juta Tahun	Usia	Kump.	Haile & Wong. (1965)	Walker (1993)	Wong (1993)	Sanudin & Baba (2007)
2.0	Pleistosen	Dent	Togopi	Togopi	Togopi	Togopi
			Ganduman Atas	Ganduman	Ganduman	Ganduman
Ganduman Bawah						
5.1	Pliosen		Sebahat	Sebahat	Sebahat	Sebahat
		Atas				
Miosen	Tengah	Segama	Libong Tuffite	Tanjung	Tungku	Libong Tuffite
			Tabanak	Tabanak	Tungku	Tabanak

Rajah 2: Stratigrafi kawasan Semenanjung Dent oleh beberapa orang pengkaji terdahulu (Ubahsui daripada Hardianshah & Abdul Rahim, 2013a).

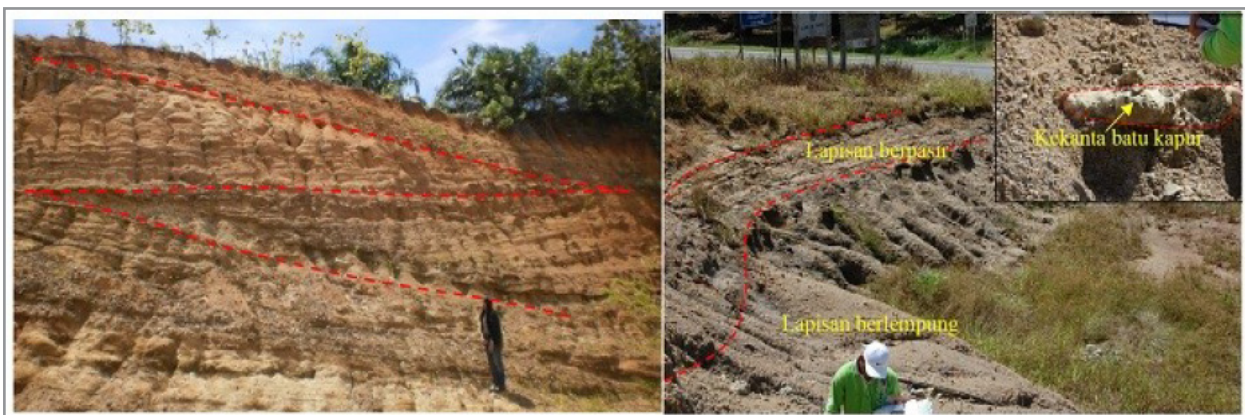


Foto 1: a) Singkapan struktur selang lapis palung (*trough cross-bedding*) yang jelas ditemui dalam dalam Formasi Ganduman. Lokaliti berhampiran stesen survei G10. b) Selang lapis batu pasir dan batu lumpur dengan kehadiran lensa batu kapur tersingkap di lapangan (lokaliti berhampiran G20 & G21).

bersama dengan batu pasir dan batu kapur dalam Formasi Togopi. Berdasarkan laporan telaga minyak luar pantai, purata keporosan direkodkan sebanyak 16% bagi batu pasir dalam Formasi Ganduman (Abdul Manaf, 1990). Walaupun ini tidak semestinya menunjukkan keporosan yang sama dengan batu pasir di darat Semenanjung Dent, namun ia memberikan penunjuk awal bagi keporosan yang baik (Abdul Manaf, 1990).

BAHAN DAN KAEDAH

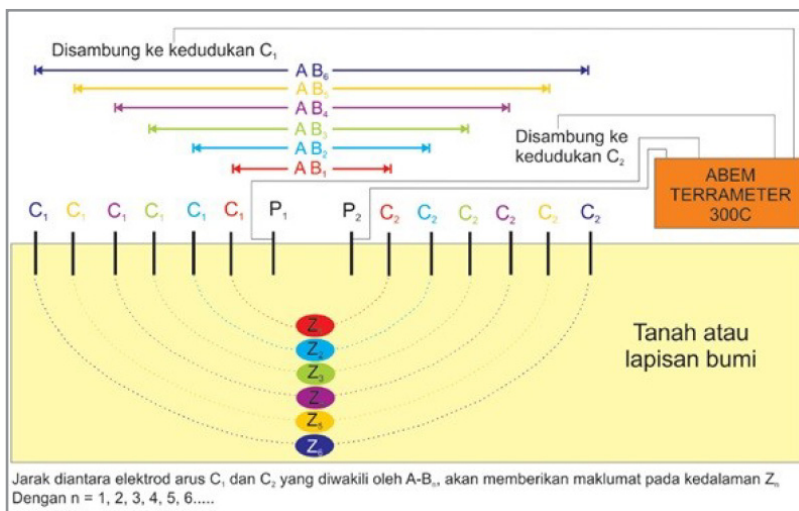
Kaedah duga dalam yang digunakan dalam penyelidikan ini melibatkan pengukuran perubahan menegak nilai keberintangan elektrik. Kaedah ini telah dikenalpasti sesuai bagi survei hidrogeologi dalam batuan sedimen (Kelly & Stanislav (1993) dalam Hadi (2009)). Survei duga dalam menegak (VES) dilakukan dengan menggunakan alat keberintangan ABEM Terrameter SAS 300C di semua 27 stesen kajian (Rajah 1) dengan susun atur elektrod mengikut tatarajah Schlumberger (Rajah 3) yang menggunakan 4 elektrod besi tahan karat. Nilai keberintangan yang diperolehi kemudiannya di plotkan ke dalam graf (log berganda keberintangan melawan separuh jarak bukaan elektrod, AB/2) dan ditafsir untuk mendapatkan keberintangan dan ketebalan sebenar lapisan (Oseji *et al.*, 2005) dengan menggunakan perisian PROGRESS. Perisian ini melibatkan proses permodelan lapisan keberintangan di bawah permukaan secara hadapan (*forward*) dan songsang (*Inverse*).

Pentafsiran lengkung keberintangan duga dalam ini akan menghasilkan bilangan dan ketebalan lapisan serta nilai keberintangan lapisan untuk setiap stesen VES. Bagi meningkatkan kedalaman penembusan data keberintangan elektrik, jarak elektrod arus ditambah sehingga kedalaman yang diperlukan diperolehi (Umar *et al.*, 2006) dan jarak elektrod keupayaan dikekalkan pada setiap pembacaan. Jarak maksimum bukaan antara elektrod arus yang digunakan adalah 500 meter dengan kedalaman maklumat keberintangan yang boleh dicapai sekitar 100m (Umar *et al.*, 1993).

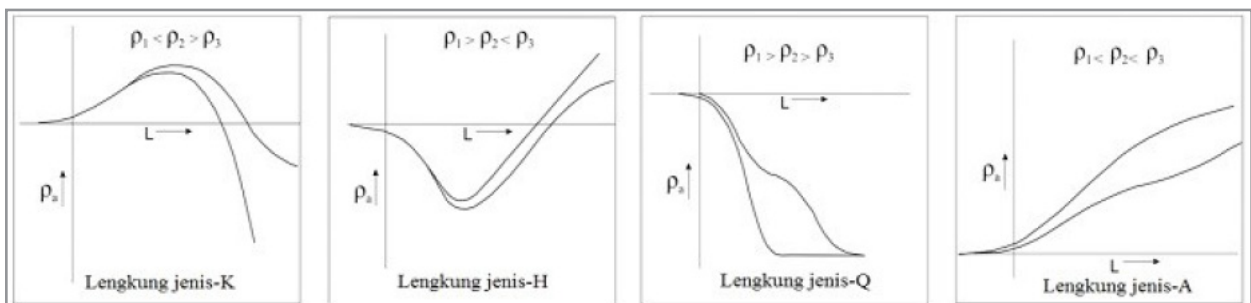
HASIL DAN PERBINCANGAN
Lengkung tipikal keberintangan geo-elektrik Formasi Ganduman

Berdasarkan pengelasan Parasnis, 1962 (Rajah 4), hasil kajian menunjukkan terdapat dua corak lengkung keberintangan geo-elektrik yang dominan dalam Formasi Ganduman yang terdiri daripada lengkung keberintangan jenis HK dan jenis H (Rajah 5a & 5b). Selain itu, terdapat juga lengkung keberintangan yang terdiri daripada jenis KA dan QA (Rajah 5d). Lengkung keberintangan ini di kelaskan sebagai sub-kumpulan kepada lengkung keberintangan jenis H kerana mempunyai ciri yang hampir sama pada lapisan kedua (ditandakan dengan kotak hitam) namun terdapat sedikit perbezaan bahan bumi.

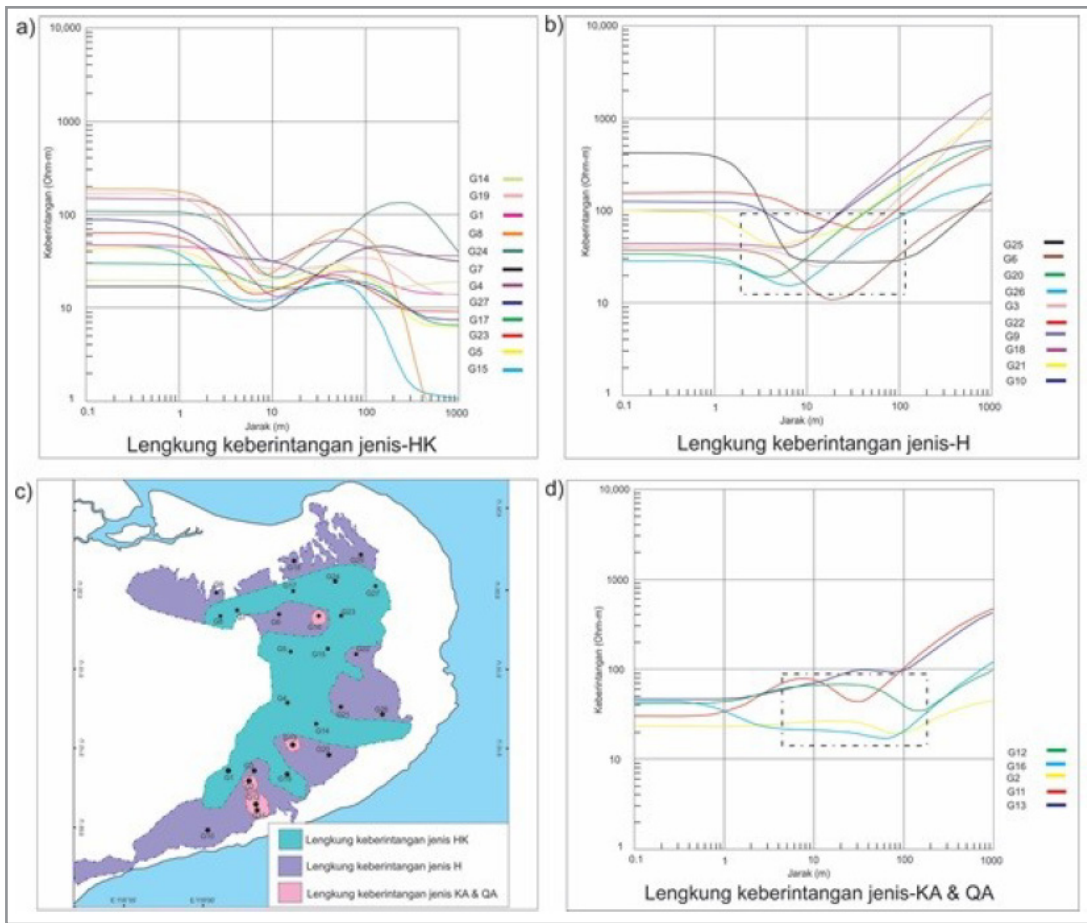
Secara teorinya, corak lengkung keberintangan yang sama akan memberikan sifat yang sama tentang bahan



Rajah 3: Tatarajah Schlumberger mengekalkan jarak elektrod keupayaan (P₁ & P₂) (hanya digerakkan pada keadaan tertentu sahaja), manakala jarak elektrod arus (C₁ & C₂) yang diwakili oleh AB ditambah untuk menambah kedalaman data yang ingin diperolehi.



Rajah 4: Jenis lengkung keberintangan VES (Parasnis, 1962).



Rajah 5: Pengelasan lengkung keberintangan geo-elektrik mengikut jenis lengkung berdasarkan (a,b & d) dan taburannya (c) di dalam Formasi Ganduman.

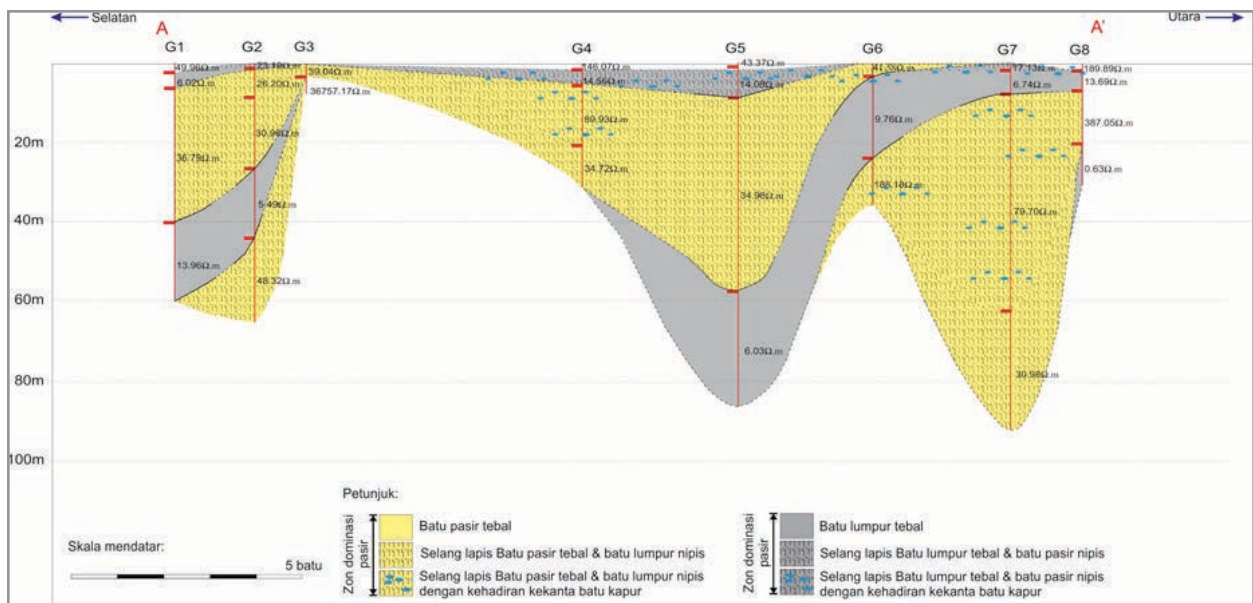
bumi dan struktur peralihan suatu sub-permukaan. Taburan lengkung jenis HK banyak di temui di zon tengah Formasi Ganduman manakala lengkung jenis H mendominasi zon utara dan selatan Formasi Ganduman. Berdasarkan taburan pencirian keberintangan (Rajah 5c) ini tidak memberikan korelasi yang signifikan dengan pengelasan dan pembahagian Formasi Ganduman (Ganduman Atas dan Ganduman Bawah) yang dilakukan oleh Haile & Wong (1965). Namun taburan lengkung keberintangan ini lebih sejajar dengan pendapat Walker, (1993); Wong (1993); Sanudin & Baba (2007) yang menyatakan bahawa sempadan antara Ganduman Atas dan Bawah adalah tidak jelas di lapangan, justeru itu formasi ini digabungkan kepada satu formasi sahaja.

Pentafsiran korelasi stesen-stesen VES dan keratan rentas geo-elektrik

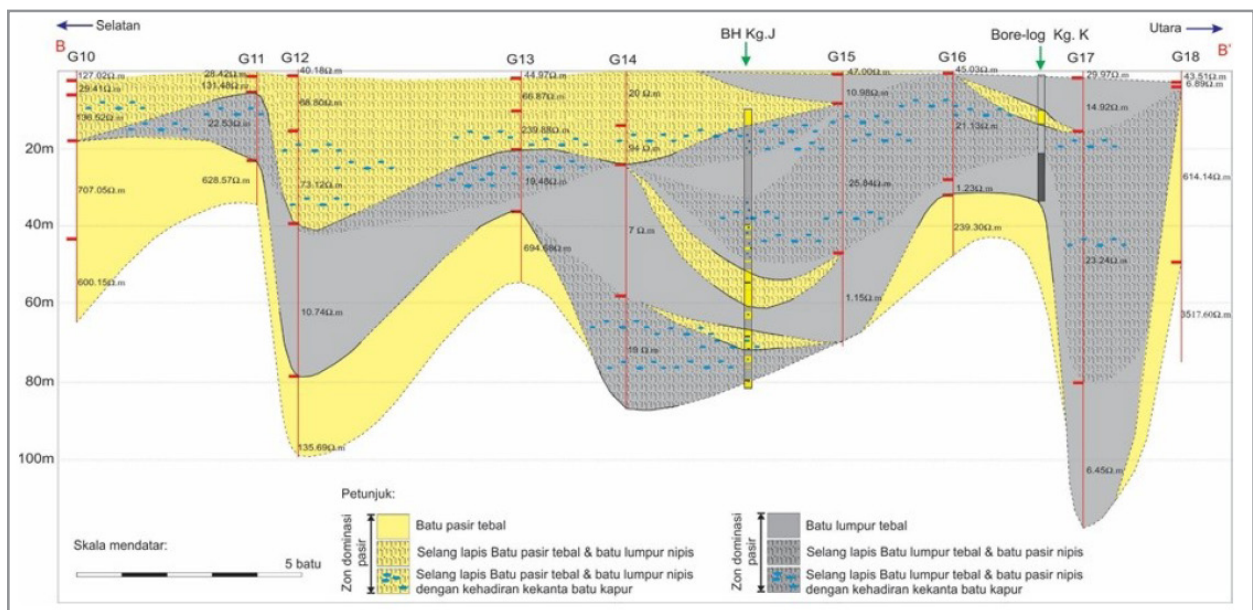
Data lengkung keberintangan daripada 27 stesen survei di tafsir dengan melibatkan proses permodelan hadapan (*forward*) dan songsang (*inverse*) menggunakan perisian PROGRESS 3.0 memberikan ketebalan dan nilai keberintangan lapisan secara menegak untuk setiap stesen keberintangan. Korelasi antara stesen-stesen survei menghasilkan tiga keratan rentas geo-elektrik yang merentas Formasi Ganduman (orientasi Utara-Selatan)

yang dilabelkan sebagai keratan rentas A-A', B-B' dan C-C' seperti yang ditunjukkan dalam Rajah 1. Pentafsiran keratan rentas geo-elektrik ini dibantu dengan maklumat (*in situ*) bahan bumi yang diperolehi daripada lubang gerudi yang berada di dalam Formasi Ganduman (BH Kg. J, BH Kg. K dan BH 02).

Keratan rentas A-A' (Rajah 6) merupakan keratan rentas paling timur dalam kawasan kajian dan di tafsirkan mempunyai tiga hingga lima lapisan bahan bumi yang ketara. Pada kedalaman 5 hingga 10 meter yang pertama, lapisan bahan bumi ditafsirkan sebagai bahan bumi selang lapis batu lumpur tebal dan batu pasir nipis dengan kehadiran kekanta batu kapur dengan julat keberintangan (15-23 Ω.m). Lapisan ini menindih lapisan dominasi bahan pasir yang ditafsirkan sebagai selang lapis batu pasir tebal dengan batu lumpur nipis (julat keberintangan 30 hingga 40 Ω.m). Kekanta batu kapur juga turut ditafsirkan terbentuk di beberapa stesen survei (G4, G6, G7 dan G8) bagi lapisan pasir ini yang memberikan nilai keberintangan ketara yang lebih tinggi daripada nilai keberintangan tipikal lapisan pasir dalam formasi ini iaitu sekitar 80 hingga 180 Ω.m. Pada kedalaman 40 hingga 80 meter, satu zon lapisan batu lumpur tebal ditafsirkan terbentuk pada kedalaman ini yang dikesan pada G1, G2 dan G5 dan ditunjukkan oleh nilai keberintangan yang rendah



Rajah 6: Keratan rentas geo-elektrik A-A'.



Rajah 7: Keratan rentas geo-elektrik B-B'.

iaitu 6-13 Ω .m. Pembentukan lapisan ini ditafsirkan mengunjur hingga ke permukaan yang di korelasi dengan maklumat pada G6 dan G7. Namun lapisan batu lumpur ini ditafsirkan tidak bersambung di sepanjang keratan rentas A-A' (G1 hingga G8) dan kedudukan per lapisannya juga berubah mengikut kedalaman bahan bumi.

Bagi keratan rentas B-B' pula (Rajah 7), bahan bumi ditafsirkan mempunyai empat hingga enam lapisan yang berbeza mengikut stesen survei dan menghasilkan keratan rentas yang agak kompleks. Daripada permukaan hingga mencapai kedalaman 40m, bahagian selatan hingga tengah keratan rentas B-B' (G10, G11, G12, G13 dan G14) ditafsirkan sebagai zon dominasi bahan pasir yang terdiri daripada selang lapis batu pasir tebal dengan batu lumpur nipis dengan julat keberintangan 20-70 Ω .m. Kehadiran

lapisan ini juga turut ditunjukkan oleh maklumat lubang gerudi BH Kg. J. Pada bahagian bawah lapisan dominasi pasir ini, terdapat zon dengan nilai keberintangan yang lebih tinggi (70-240 Ω .m) telah dikesan, dan zon ini ditafsirkan sebagai bahan yang sama namun dengan kehadiran kekanta batu kapur. Lapisan dominasi pasir ini menindih lapisan dominasi bahan lumpur yang ditafsirkan sebagai batu lumpur tebal (1-15 Ω .m) dan diikuti selang lapis batu lumpur tebal dan batu pasir nipis dengan kekanta batu kapur (19-25 Ω .m). Dengan korelasi yang baik dengan maklumat lubang gerudi BH Kg. J dan bore-log Kg. K, lapisan dominasi batu lumpur ini ditafsirkan mengunjur dan tersingkap di permukaan pada bahagian utara keratan rentas (Formasi Ganduman). Lapisan dominasi lempung ini kemudiannya menindih

satu lagi lapisan pasir lain yang ditafsirkan sebagai batu pasir tebal dengan nilai keberintangan 130-600 Ω .m yang ditunjukkan oleh stesen-stesen survei G10, G11, G12, G13, G16 dan G18.

Keratan rentas geo-elektrik C-C' (Rajah 8) juga menunjukkan ciri overlapisan bahan bumi yang hampir sama dengan keratan rentas A-A' dan B-B'. Secara keseluruhannya, keratan rentas C-C' ditafsirkan mempunyai dua hingga lima lapisan yang ketara dan mempunyai korelasi yang baik dengan maklumat daripada lubang gerudi BH02. Pada kedalaman 10m dari permukaan, lapisan lumpur dikesan dengan nilai keberintangan rendah (5-16 Ω .m) yang mendominasi bahagian Utara dan Selatan keratan rentas. Pembentukan lapisan lempung ini juga menunjukkan korelasi yang baik dengan maklumat lubang gerudi BH02. Lapisan batu lumpur tebal dengan ketebalan sekitar 10-30 meter juga dikesan pada kedalaman 50 meter dan 80 meter pada G23 dan kedalaman 75 meter pada G19. Daripada bahagian tengah keratan rentas, bahan pasir yang ditafsirkan sebagai selang lapis pasir tebal dengan batu lumpur nipis yang juga mendominasi hampir keseluruhan keratan rentas sehingga mampu mencapai kedalaman melebihi 100 meter dari permukaan dengan nilai keberintangan 20 hingga 55 Ω .m. Lapisan dominasi pasir ini dikesan oleh kesemua stesen survei bagi keratan rentas ini dan kehadiran kekanta batu kapur ditafsirkan terbentuk secara rawak pada lapisan ini, dengan julat nilai keberintangan yang sedikit lebih tinggi iaitu sekitar 70 hingga 400 Ω .m. Lapisan terakhir ditafsirkan sebagai lapisan batu pasir tebal dengan nilai keberintangan 500-3000 Ω .m (G20, G21 dan G22).

Secara umumnya, lapisan dominasi pasir (selang lapis batu pasir tebal dan batu lumpur nipis) dan lapisan dominasi lempung (Selang lapis batu lempung tebal dan batu pasir nipis) menjadi bahan asas pembentukan Formasi Ganduman. Namun kehadiran bahan ini (pasir dan

lempung) bersilih ganti ketebalannya daripada bahagian atas sehingga bawah lapisan Formasi Ganduman dengan pembentukan kekanta batu kapur pada kedalaman tertentu (Foto 1b).

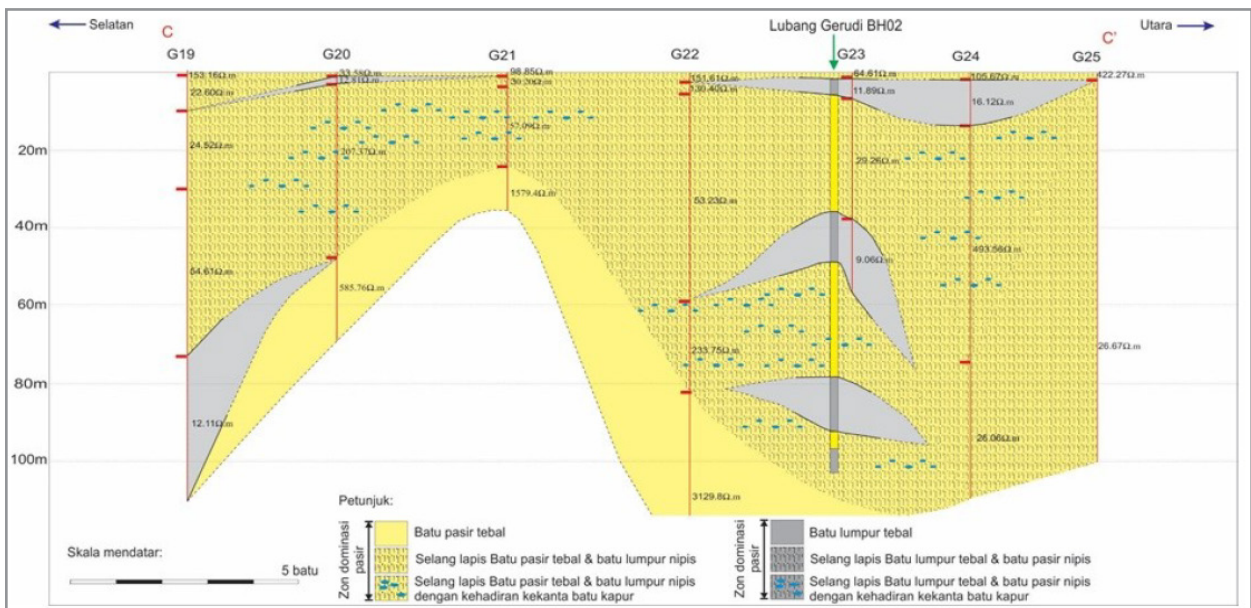
Potensi akuifer Formasi Ganduman

Pentafsiran dan korelasi stesen-stesen survei geoelektrik dalam Formasi Ganduman menunjukkan potensi wujudnya lapisan dominan batu pasir yang tebal yang ditafsirkan sebagai sederhana baik sehingga sangat baik. Ketebalan lapisan dominan batu pasir ini boleh menjangkau 10m hingga 60m berdasarkan pentafsiran data keberintangan dan banding beza dengan data lubang gerudi berhampiran (Jadual 1).

Sifat berpasir yang wujud dalam lapisan ini menyediakan keliangan dan keporosan yang sangat baik bagi menyimpan air bawah tanah dan di sokong oleh pengkaji terdahulu (Ismail, 1994; Tan, 1994). Berdasarkan maklumat log (*offshore*), keporosan batu pasir Miosen Atas berada pada julat 11-35% (Abando & Ansay, 2002), dan ini merupakan potensi yang baik untuk membentuk akuifer.

Selain lapisan berpasir, Formasi Ganduman juga mempunyai lapisan tak telap seperti lapisan lempung. Lapisan lempung boleh menjadi lapisan penutup akuifer seterusnya membentuk akuifer terkekang yang menghasilkan artesian. Artesian di temui di beberapa telaga penghasilan (*production well*) lama dalam kawasan kajian (Foto 2).

Berdasarkan data lubang gerudi, ketebalan zon dominasi lapisan batu pasir dan zon dominasi lempung berubah mengikut kedalaman Formasi Ganduman. Lapisan zon dominasi lempung yang wujud dalam Formasi Ganduman dipercayai tidak bersambung secara terus. Lapisan dominasi lempung ini (terdapat juga lapisan yang mempunyai lensa batu kapur) tersingkap di lapangan terutamanya bahagian timur Formasi Ganduman. Hasil



Rajah 8: Keratan rentas geo-elektrik C-C'.

Jadual 1: Pentafsiran bahan bumi berdasarkan nilai julat keberintangan bagi keratan rentas keberintangan A-A', B-B' dan C-C'.

Keratan rentas	Julat keberintangan	Pentafsiran bahan bumi	Pentafsiran potensi akuifer
A-A'	6 - 13 Ω .m	Batu lumpur tebal.	Sangat rendah
	15 - 23 Ω .m	Selang lapis batu lumpur tebal dan batu pasir nipis dengan kekanta batu kapur.	Rendah
	30 - 40 Ω .m	Selang lapis batu pasir tebal dan batu lumpur nipis.	Baik
	80 - 180 Ω .m	Selang lapis batu pasir tebal dan batu lumpur nipis dengan kekanta batu kapur.	Baik
B-B'	1 - 15 Ω .m	Sebagai batu lumpur tebal.	Sangat rendah
	19 - 25 Ω .m	Selang lapis batu lumpur tebal dan batu pasir nipis dengan kekanta batu kapur.	Rendah
	20 - 70 Ω .m	Selang lapis batu pasir tebal dengan batu lumpur nipis.	Baik
	70 - 240 Ω .m	Selang lapis batu pasir tebal dengan batu lumpur nipis dengan kekanta batu kapur.	Baik
	130 - 600 Ω .m	Batu pasir tebal.	Sangat Baik
C-C'	5 - 16 Ω .m	Batu lumpur tebal.	Sangat rendah
	20 - 55 Ω .m	Selang lapis pasir tebal dengan batu lumpur nipis.	Rendah
	70 - 400 Ω .m.	Selang lapis batu pasir tebal dengan batu lumpur nipis dengan kekanta batu kapur.	Baik
	500 - 3000 Ω .m	Batu pasir tebal.	Sangat baik



Foto 2: Telaga penghasilan lama yang masih menghasilkan telaga artesian walaupun sistem pam sudah tidak berfungsi. Lokaliti telaga ditandakan pada **Rajah 1** sebagai telaga eksplorasi yang berhampiran stesen survei G2.

pentafsiran ini jika dilihat secara keseluruhan kawasan kajian menunjukkan Formasi Ganduman berpotensi membentuk akuifer separa terkekang (*semi-confined aquifer*) berikutan lapisan lempung tidak berterusan di dalam formasi ini.

Hasil survei VES dalam kajian ini memberikan lengkung tipikal keberintangan dan data log 1D untuk setiap stesen survei yang seterusnya membantu mentafsir struktur subpermukaan dan potensi akuifer kawasan kajian. Namun, jarak antara stesen survei yang besar (sekitar 8 km) memberikan maklumat yang terhad tentang bahan bumi yang terbentuk di antara dua stesen survei dan

boleh menimbulkan ambiguiti dalam pentafsiran bahan bumi di kawasan tersebut. Bagi mendapatkan data yang lebih tepat maka jarak stesen survei yang lebih dekat (stesen survei secara grid) dicadangkan untuk kajian lebih lanjut. Ini membantu memberikan pentafsiran lebih terperinci berkaitan terhadap struktur dan potensi akuifer kawasan kajian.

KESIMPULAN

Secara umumnya dua jenis lengkung keberintangan elektrik yang dominan ditemui di kawasan Formasi Ganduman iaitu jenis HK dan H. Namun sempadan taburan

antara lengkung keberintangan jenis HK dan jenis H di lapangan adalah tidak jelas. Pencirian keberintangan geoelektrik hasil survei VES dapat memberikan gambaran tentang sifat bahan bumi dan perlapisan dalam Formasi Ganduman. Keratan rentas geo-elektrik dengan korelasi maklumat lubang gerudi yang dihasilkan menunjukkan kawasan kajian mempunyai potensi membentuk akuifer yang baik pada lapisan dominasi pasir, manakala zon yang didominasi oleh bahan berlempung yang boleh membentuk lapisan separa telap. Kombinasi zon dominasi pasir dan lempung ini mampu membentuk akuifer terkekang atau semi terkekang dalam Formasi Ganduman.

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Penulis ingin merakamkan jutaan terima kasih kepada Kementerian Pendidikan Malaysia (Dahulunya dikenali sebagai Kementerian Pengajian Tinggi, KPT), Universiti Kebangsaan Malaysia dan Universiti Malaysia Sabah atas sokongan dan kemudahan kelengkapan penyelidikan. Terima kasih juga pihak pengurusan Felda Sahabat, Lahad Datu dan Felda Engineering Service Sdn Bhd (FESS) atas kerjasama dan bantuan teknikal sepanjang kajian dijalankan. Tidak dilupakan kepada pasukan keselamatan negara yang menjaga keselamatan negara semasa pencerobohan Lahad Datu 2013 bersamaan fasa akhir kajian lapangan bagi penyelidikan ini.

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A case study and model of shallow water flow (SWF) from Sabah deepwater drilling operations, offshore Malaysia

STEVE MCGIVERON^{1,*} & JOHN JONG²

¹ Independent Marine Geoscience Consultant, UK

² JX Nippon Oil and Gas Exploration (Deepwater Sabah) Limited

*Corresponding author email address: smcgiveron@outlook.com

Abstract: The prediction of shallow water flows prior to drilling is important both from safety and economic viewpoints, in particular for deepwater operations. However, even closely spaced wells can perform unpredictably in the shallow open hole section within what may at first appear to be a seismically uniform succession. This study considers this phenomenon and proposes a model that could be more generally applied in deepwater slope setting, and compared with a study from more outboard turbidity deposition where both have evidence for the presence of mass transport deposits, and the impact of these deposits play on the prediction for shallow water flows.

Keywords: deepwater drilling, mass transport deposits, shallow water flows

INTRODUCTION

Shallow water flow (SWF) is one of the most problematic aspects of deepwater drilling operations resulting in the premature abandonment of many wells and expensive delays. A SWF can be defined as uncontrolled water flow typically on the outside of the structural casing to the ocean floor. Casing programs of many wells in the deepwater Gulf of Mexico, the Nile delta, and other offshore drilling provinces like Sabah deepwater are affected by SWF geopressure within 300m to 750m beneath the seafloor. When SWF geopressured aquifers are not properly isolated, a sustained water flow may occur around the surface casing, leading to buckling of the casing, erosion around the casing shoe and a large deposit of sand carried to the seafloor by the flow (Offshore, 2005).

The occurrence of SWFs due to excess pore pressure has been identified as one of the top challenges facing deepwater drilling, in addition to other geohazards including shallow gas, gas hydrates, seabed instability and man-made debris. In many parts of the world geopressure related drilling problems giving rise to SWFs are the leading cause of drilling problems ranging from remedial work to casing, to total well abandonment.

Engineering solutions can be successful in preventing or managing SWF. Potentially the most critical zone to the well for SWF is the deepest part of the open hole where the casing shoe is to be set. Accurate prediction and avoidance of SWF zones is best to mitigate potential drilling challenges. Pre-drilling evaluation of the existing seismic data can often be cost effective, but identification of potentially problematic zones and shallow water

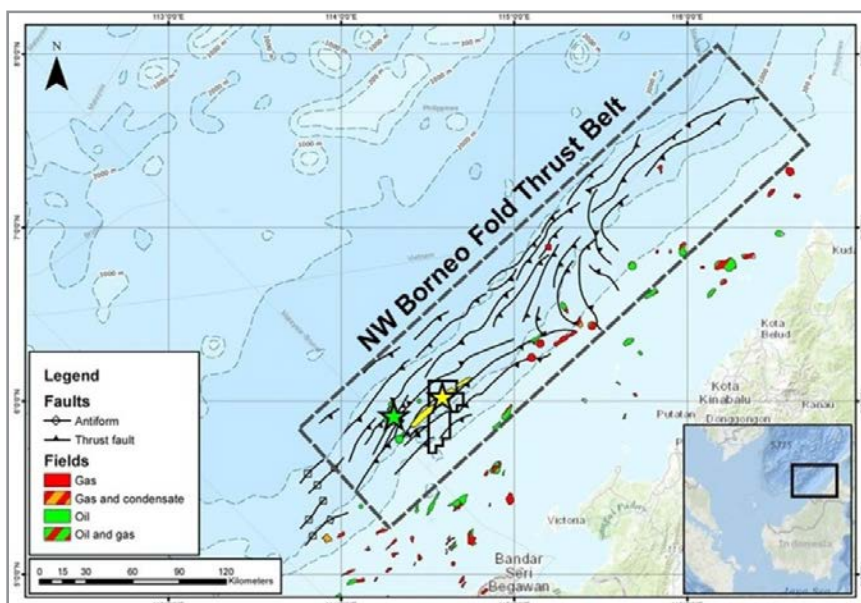


Figure 1: Location map of offshore Sabah Block X (solid black polygon) within the NW Borneo Fold Thrust Belt. Wells 1, 2 and 3 are located in the structure annotated by the yellow star. The green star, located outboard of Block X structural trend represents the mass transport deposits (MTDs) area investigated by Algar *et al.* (2011). Map modified after Khamis *et al.* (2017).

prediction becomes increasingly difficult as seismic resolution decreases with increased depth.

Offset well data should provide the most reliable method of shallow water prediction but observations from closely spaced wells, and even from wells drilled from the same drill centre can show very different SWF responses at the same stratigraphic level. Why is this so? Therefore, the main objective of this study is to review the data and drilling experience from Sabah deepwater drilling operations, offshore Malaysia (Figure 1), and to develop a model that explains the SWFs phenomena. We hope the model can be applied to help decrease the risk posed by unexpected SWFs in similar wells in the study area and in other deepwater settings worldwide.

MASS TRANSPORT DEPOSITS ON THE DEEPWATER NW BORNEO MARGIN

Slope failure and the resulting mass transport deposits (MTDs) are characteristic of the NW Borneo margin, offshore Sabah from the Early Miocene to the Pleistocene (Jones *et al.*, 2016; Jong *et al.*, 2016; Khamis *et al.*, 2017 & 2018; Siti Aishah Abdullah *et al.*, 2018). They have a planar, often erosional base with a rugose upper surface as a result of transport deformation and particularly the

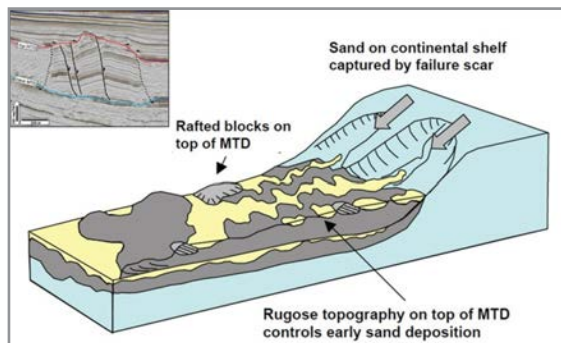


Figure 2: Ponded sand formation on rugose upper surface of an MTD (modified after Algar *et al.*, 2011). Inset is a seismic example of rafted block with its inherent cohesiveness remains intact (from Armitage & Jackson, 2010).

inclusion of rafted blocks of consolidated and deformed sediments contained within the flow matrix (Figure 2). The connection between MTDs and their sand delivery systems is of great importance in understanding the creation and preservation of potential sand reservoirs associated with the upper surfaces of MTDs (Figure 3).

Slope failures and their downslope MTDs tentatively dated to the last glacial maximum *ca.* 20,000 years BP are buried by typically 20m to 30m of sediments in offshore Sabah. The underlying MTDs with rafted block inclusions have a marked influence on the present-day seabed topography (Figures 4 and 5).

Of importance to the present study is the detailed sedimentary succession that buries the MTDs. The characteristic sequence illustrated on Figure 6 comprises:

- Instantaneous MTD emplacement creating deposit about 50m in thickness with a rugose seabed topography;
- Rapid infilling of the topography by sandy turbidites (50% of total overburden);
- Waning of turbidite deposition resulting in thin sand horizons interbedded with hemipelagic clay (25% of total overburden);
- Hemipelagic clay (25% of total overburden).

This sequence is commonly present over wide areas where MTDs are present. It is also recognised within wells at depth where the turbidite sands form important oil and gas reservoirs (Figures 6 and 7).

SHALLOW MASS TRANSPORT DEPOSITS IN DEEPWATER BLOCK X

Similar young MTDs and complexes are also seen buried at shallow depths beneath the seabed in deepwater Block X (Figure 8), and with a rugose upper surface (Figures 8 and 9). However, there are subtle differences (Figure 9) compared to Figure 6 adapted from Algar *et al.* (2011):

- The MTD unit is between 40m and 50m in thickness, comparable in scale to that found in the more outboard

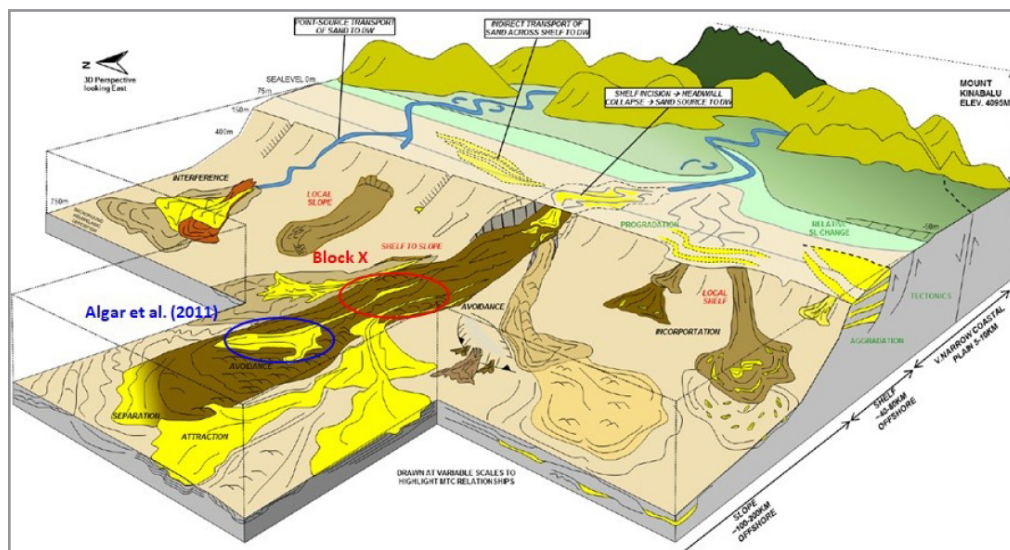


Figure 3: Connection between MTDs and sand delivery systems (after Jones *et al.*, 2016) with relative positions of Block X and the study area of Algar *et al.* (2011) shown.

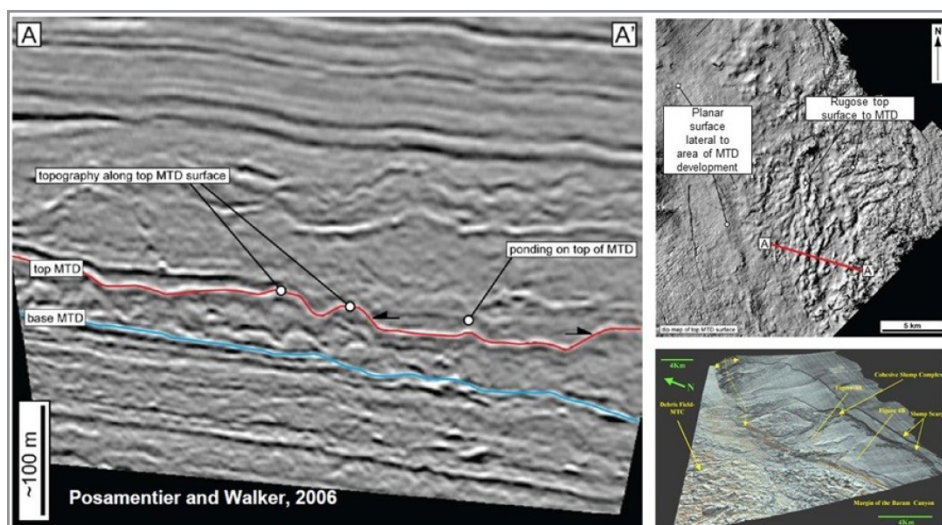


Figure 4: Examples of MTD topography on seismic reflection data with ponding on highly irregular and rugose top surface of MTDs (after Posamentier & Walker, 2006). Bottom right figure shows present-day development of mass transport complexes within the Baram Delta Canyon, offshore Brunei (after McGilvery & Cook, 2003).

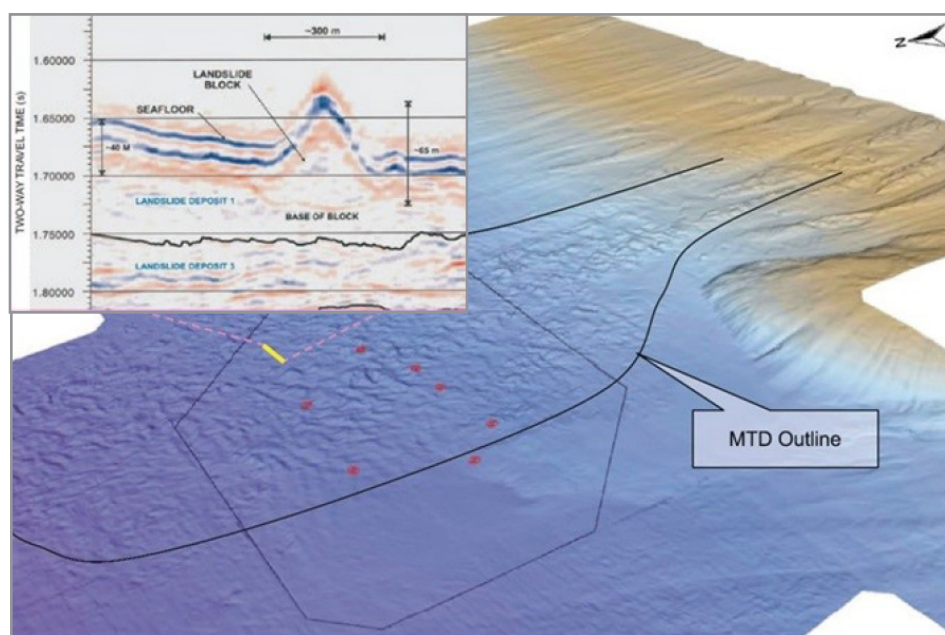


Figure 5: Rugose upper surface of near seabed MTD located outboard of Block X (after Algar *et al.*, 2011).

setting described by Algar *et al.* (2011);

- There is no thick sand turbidite package burying the MTD. Instead, the sand deposits are restricted to ponds within the rugose upper surface of the MTD. This is an important point to note.
- The waning phase of turbidite deposition where thin sands are interbedded with hemipelagic deposits is poorly imaged due to the lower resolution of the 3D seismic data in comparison to the high frequency survey AUV (Autonomous Underwater Vehicle) data recorded in the outboard area. The unit may possibly be up to 20m in thickness or possibly absent;
- Uniform seabed hemipelagic clay deposits up to 30m in thickness.

The differences in turbidite sand deposition immediately overlying the MTD may be due to the more proximal position of deepwater Block X to the continental margin slope failures compared to the more outboard examples published in Algar *et al.*, 2011 (Figure 3).

Sandy turbidites associated with the slope failures may bypass the proximal slope, either through channels or because of the higher seabed gradient, with preferential deposition occurring deeper offshore (Figure 3). A slope bypass channel (SBC) is present upslope in the south-west of Figure 8. However, its downslope extent cannot be determined as it has been removed within the evacuation scar (ES).

DEEP MASS TRANSPORT DEPOSITS IN DEEPWATER BLOCK X

MTDs and complexes are present throughout the succession in deepwater Block X down to a depth of at least 3000m subsea in the inter-thrust basins (Figure 10 – left panel, and Figure 11). A horizon of interest, designated gh080, is discussed here as SWF was reported in Well 3 below this event. Analysis of the areal attributes of horizon gh080 and the seismic data immediately below this event reveals the presence of stacked MTDs and that

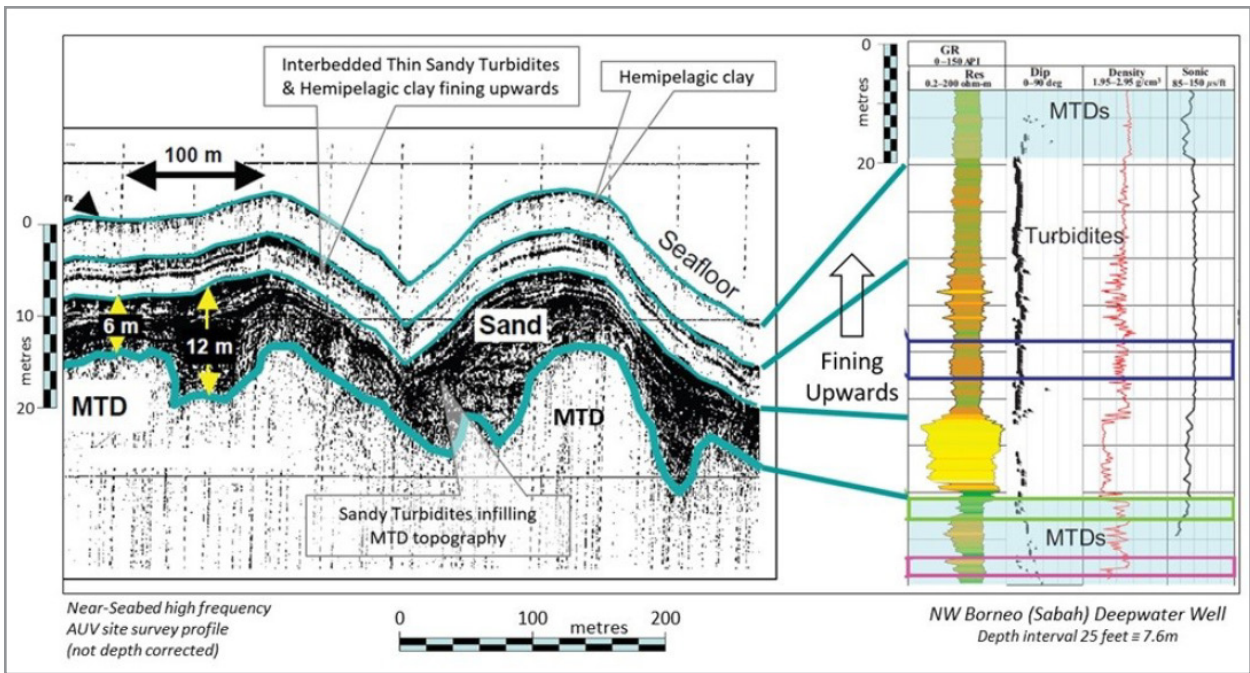


Figure 6: Comparison of near seabed with ponded sands against well log in area located outboard of Block X (modified after Algar *et al.*, 2011).

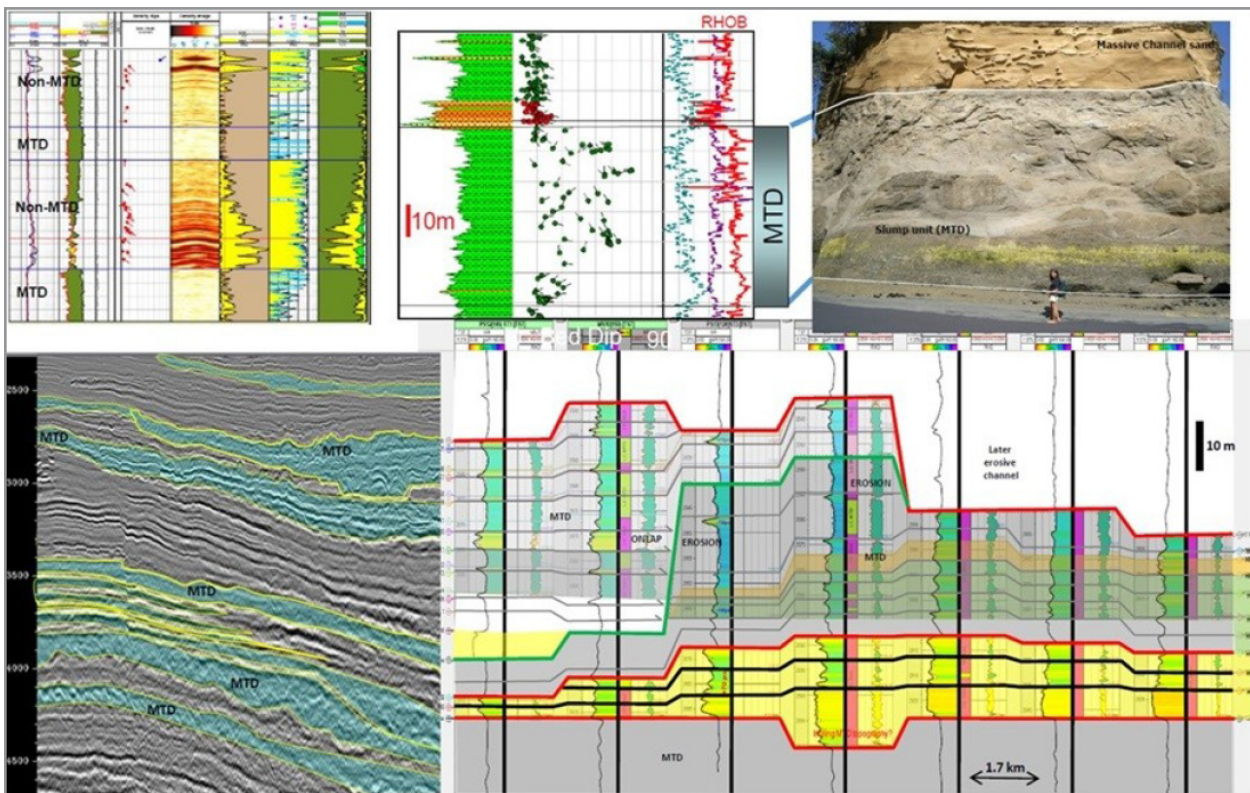


Figure 7: Depositional relationship between reservoir sandstones and MTDs (after Jones *et al.*, 2016).

the deposits too have a rugose and blocky upper surface wherever they are better imaged in the basins (Figure 10 – right panel). The seismic data suggests that the MTDs and complexes are continuous from the basin to over the thrust ridge, where they have been uplifted in the vicinity of the wells (Figure 11).

A comparison of the MTDs and their associated turbidites between Algar *et al.* (2011), located outboard of deepwater Block X, and in the Block X study area is presented on Figure 12. The seismic sections in both panels are displayed at the same two-way time and horizontal scales. The right hand panel from Algar *et al.* (2011)

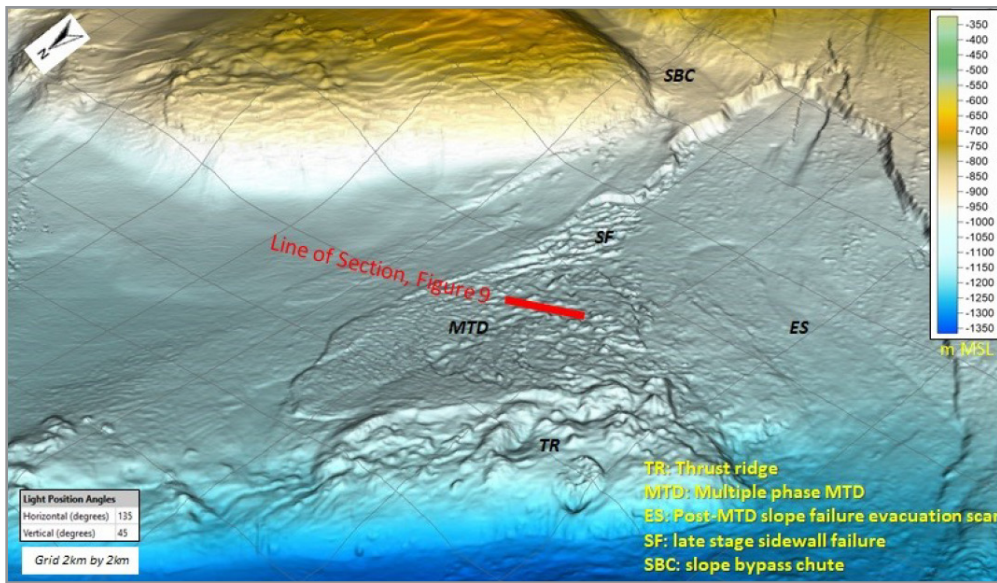


Figure 8: Three dimensional rendering of a shallow buried MTD with a rugose upper surface from 3D seismic data (horizon gh010 below approximately 50m of hemipelagic drape) from Sabah deepwater Block X – compare Figure 4.

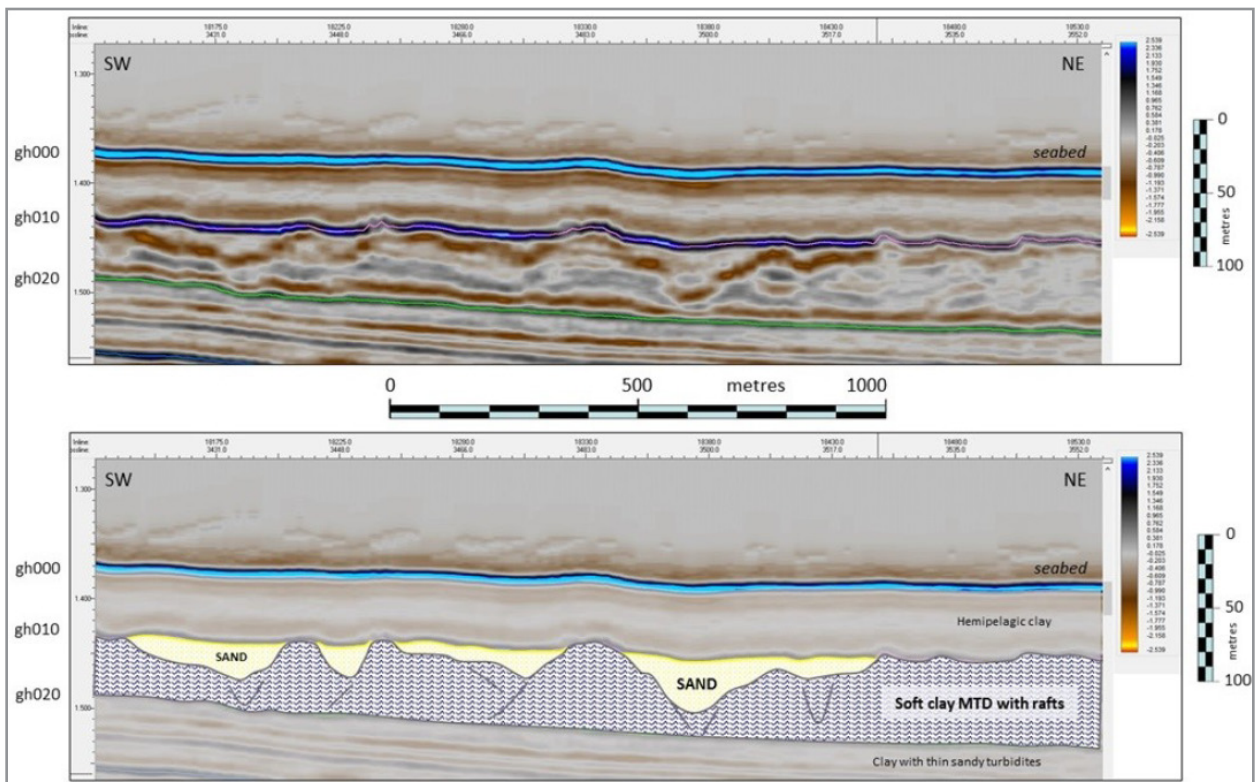


Figure 9: Interpreted profile across shallow MTD Complex, Horizons gh010 to gh020 (x3 vertical exaggeration).

shows a series of stacked MTDs, locally with erosive bases, buried by laterally extensive, thick turbidite sands. These sands create important reservoirs. In comparison, the left panel illustrates deepwater Block X, where the MTDs themselves are comparable in thickness but the turbidite sands are poorly developed. They are interpreted to be constrained within semi-isolated ponds formed on the top of the rugose upper surface of the MTDs in a similar fashion to what we see at the youngest MTD complexes in deepwater Block X discussed above. As a result, they do not form extensive reservoirs at this depth.

DEEP MASS TRANSPORT DEPOSITS IN DEEPWATER BLOCK X AND SHALLOW WATER FLOW

Three wells have been drilled on the thrust ridge in deepwater Block X. Two wells, Well 1 and Well 2, were static yet the third well, Well 3, flowed below horizon gh080.

A comparison between the representative outboard well and the deepwater Block X Wells is presented on Figure 13. The outboard well records a thick sand above an MTD comparable to what is seen near the seabed in that area (compare Figures 6 and 7).

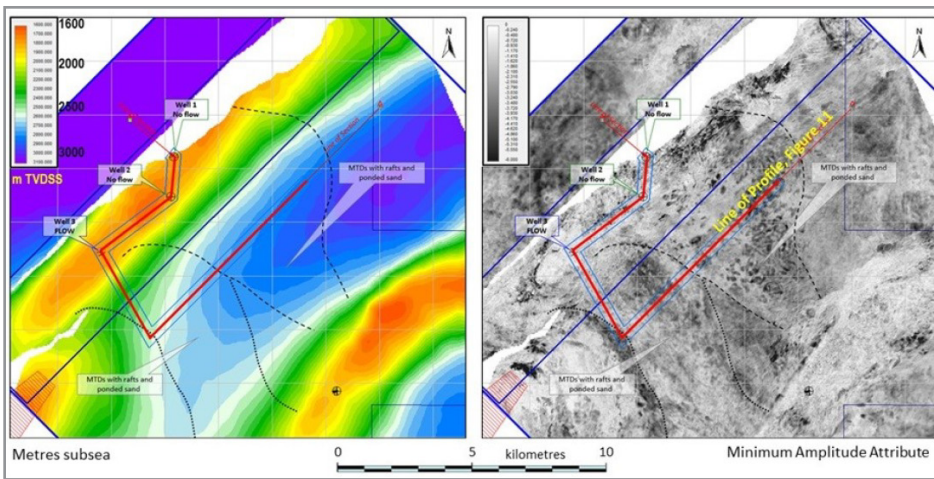


Figure 10: Horizon gh080 identifying the top of a package of stacked MTDs within the lowermost open hole section (profile line in Figure 11).

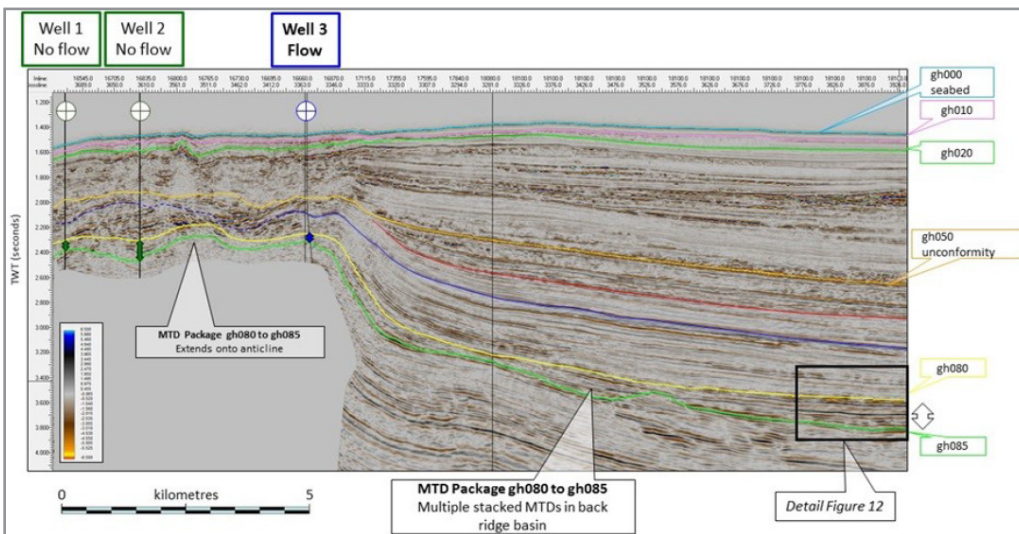


Figure 11: Horizons gh080 to gh085 identifying a package of stacked succession of MTDs within the lowermost open hole section (line of profile on Figure 10).

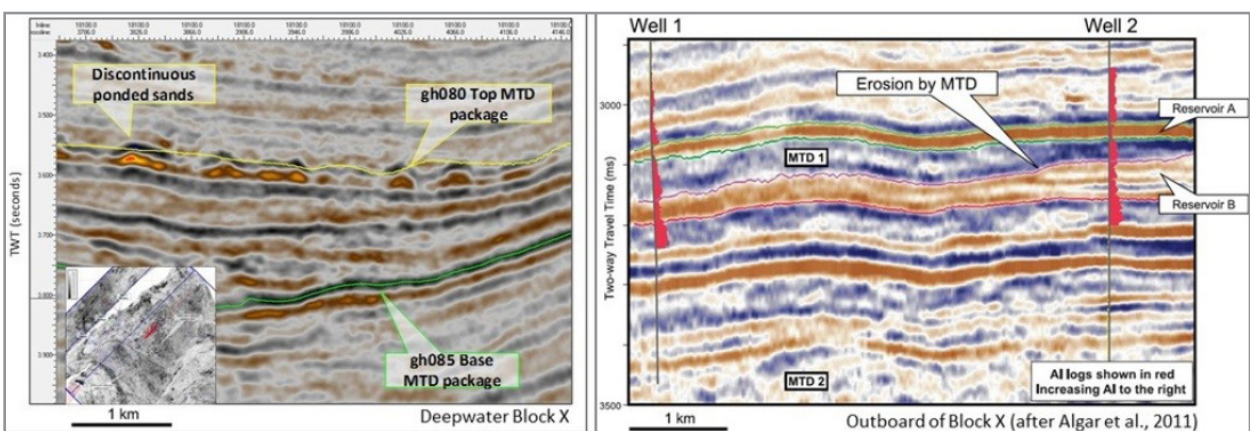


Figure 12: Detail comparison of seismic expression of stacked MTDs in Block X and MTD related reservoirs located outboard of the study area (after Algar *et al.*, 2011) displaying on the same vertical and horizontal scales.

A similar thick sand is also recorded in Well 3 in deepwater Block X below horizon gh080 overlain by a fining upward sequence of thin sands interbedded with hemipelagic clay. The thick sand and fining upwards sequence is absent at both Well 1 and Well 2. Hence, it is proposed that the deep MTD-turbidite sand relationship in deepwater Block X is also similar to that seen in the youngest MTD complex near

the seabed; namely that it is discontinuous and constrained within semi-isolated sand-filled ponds on the top of the rugose MTD surface with a fining upward sequence, and also laterally constrained within the ponds (compare Figure 9). Well 3 flowed because the open hole terminated within a ponded sand, whilst Wells 1 and 2 were static as they penetrated only MTD clays and no sand.

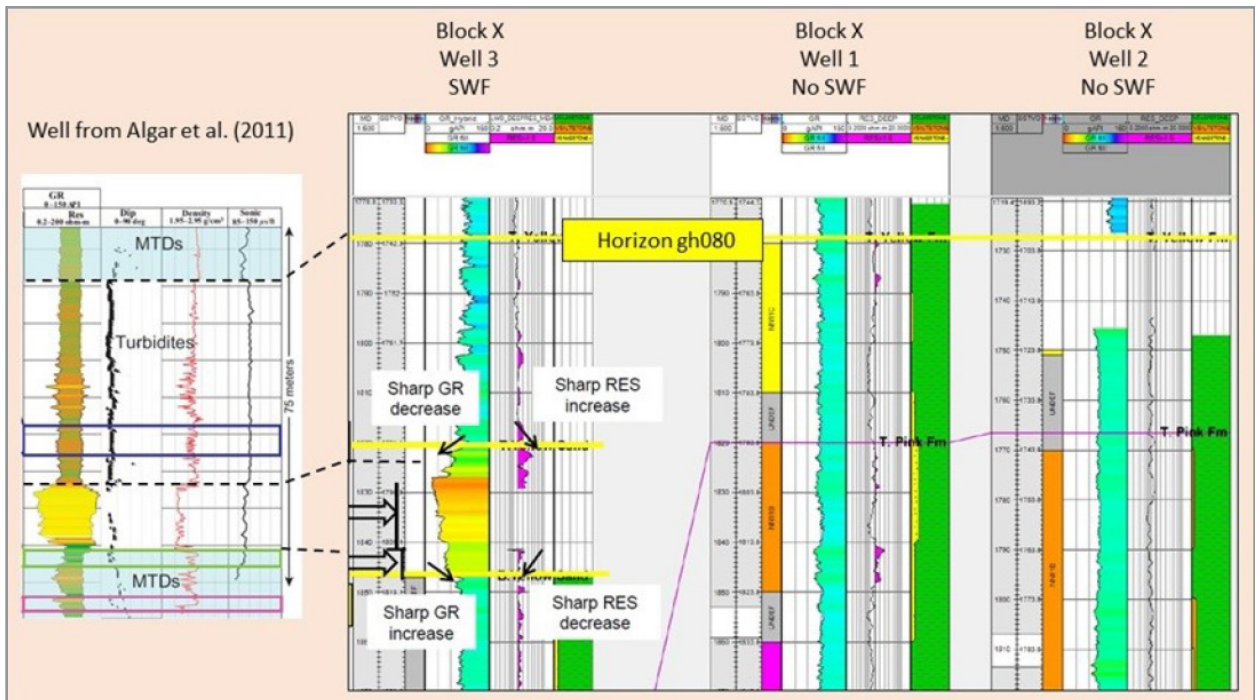


Figure 13: Comparison of MTD-Sand expressions in the well logs, with Well 3 encountered SWF.

DEEPWATER BLOCK X SHALLOW WATER FLOW MODEL AND GEOHAZARD PREDICTION

A general model is presented here to illustrate how the rapid lateral variation in sand distribution on the top of the MTD influences SWF well conditions in the open hole, both in single wells and multiple wells drilled from a single drill centre.

Four hypothetical wells are illustrated on Figure 14 (single wells along a structure) and Figure 15 (multiple wells from a drill centre):

- Well A: Static. Well passes entirely through clay MTD raft and chaotic clay matrix. Sand is absent;
- Well B: SWF. The well passes through a fining upwards succession of interbedded thin turbidite sands and hemipelagic clays before entering the high permeability, thick but laterally constrained aquifer;

- Well C: Static. Well passes entirely through clay MTD raft and chaotic clay matrix. Sand is absent;
- Well D: SWF. The well passes through a fining upwards succession of interbedded thin turbidite sands and hemipelagic clays before entering the high permeability, thick but laterally constrained aquifer.

The rapid lateral variation in sand distributions and the variation in connectivity of the aquifer at about the depth of the casing shoe below gh080 is problematic as the SWF conditions cannot be predicted with accuracy due to resolution limitations in identifying the ponded sands. However, an elevated risk zone can be identified by lateral interpretation of the MTDs in the inter-ridge basins, where they are better imaged, to the ridge crestal closures where seismic imaging is often poorer. The flow risk could be avoided by setting casing shallower than ideal but this may impact on cost and the final hole

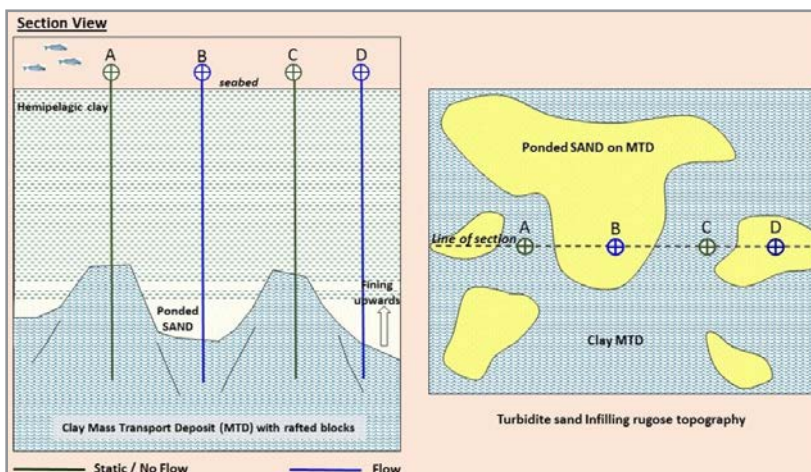


Figure 14: Schematic model for formation of discontinuous semi-isolated sand on rugose MTD, with different well SWF responses.

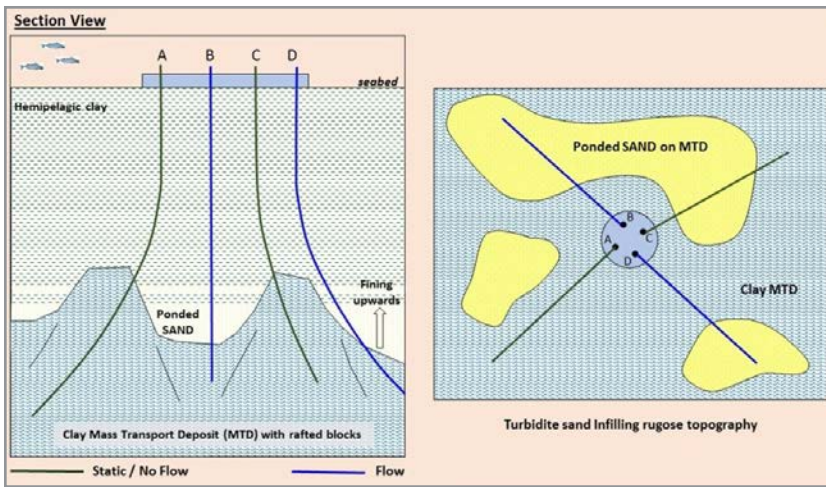


Figure 15: Schematic model for formation of discontinuous semi-isolated sand on rugose MTD, with different well SWF responses from a single drill centre.

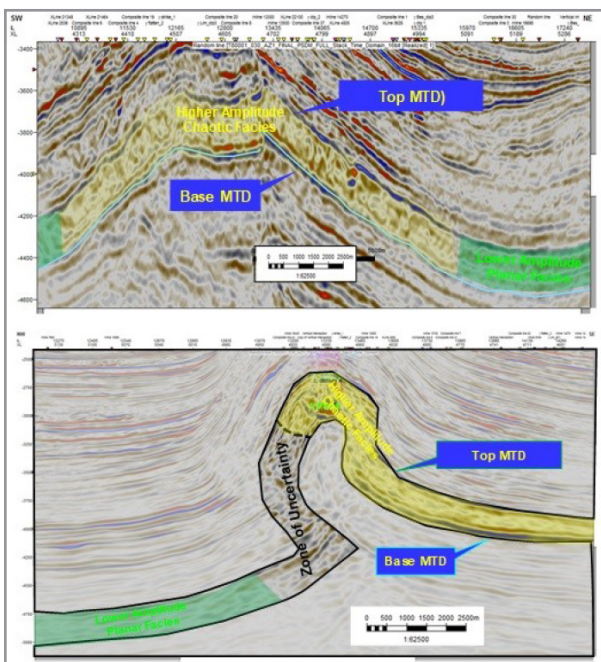


Figure 16: Examples of MTD facies change in Block X from the lower amplitude planar facies (green) in the basinal area to higher amplitude chaotic facies (yellow) in the anticlinal area.

size in the reservoir if an extra casing string is needed. Alternatively, preparations need to be in place to rapidly close down the flow before formation erosion occurs at the proposed shoe depth.

SUMMARY AND CONCLUSIONS

MTDs produce a rugose seabed topography. Infilling of the topography by sandy turbidites results in semi-isolated higher permeability ponds separated by low permeability clay dominated MTD deposits, of which rafted blocks play a key role in the creation of a fragmented sandy reservoir with variability on the scale of tens to hundreds of metres. If the reservoir becomes overpressured then adjacent wells will exhibit different SWF performance depending upon whether the well penetrates a ponded reservoir or a low permeability

rafted block. The difference in SWF performance is further enhanced by the variations in size of the ponded reservoirs and their interconnectivity to adjacent ponds.

The relatively small scale variations in reservoir development make them very difficult to identify and differentiate seismically. As a result, from a geohazard perspective an elevated risk zone can often only be identified rather than location specific hazardous events. Identification of potentially hazardous intervals is improved where MTD complexes identified in the basinal areas (where seismic imaging is often best) can be consistently and accurately traced into the anticlinal prospective areas (Figure 16).

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PERSATUAN GEOLOGI MALAYSIA
GEOLOGICAL SOCIETY OF MALAYSIA

**52nd ANNUAL GENERAL MEETING
& ANNUAL REPORT 2017**



27th April 2018
Department of Geology, University of Malaya,
Kuala Lumpur

AGENDA

Date: 27th April 2018
Time: 5.30 p.m.
Venue: Department of Geology, University of Malaya, K. Lumpur

The Agenda for the Annual General Meeting is as follows:

1. Welcoming Address by the President for Session 2017/2018
2. Confirmation of Minutes of the 51st AGM held on the 21st April 2017
3. Matters Arising
4. Annual Report for Session 2017/2018
 - a. President's Report
 - b. Secretary's Report
 - c. Editor's Report
 - d. Treasurer's Report
 - e. Honorary Auditor's Report
 - f. GSM Endowment Fund Report
5. Election of Honorary Auditor
6. Other Matters
7. Announcement of New Council for 2018/2019
8. Presidential Address for 2018/2019

PERSATUAN GEOLOGI MALAYSIA GEOLOGICAL SOCIETY OF MALAYSIA (GSM)

MINUTES OF THE 51st ANNUAL GENERAL MEETING

Date: 21st April 2017
Time: 5.30 p.m.
Venue: Persatuan Alumni Universiti Malaya (PAUM) Club House, Kuala Lumpur

Member Present:

- | | |
|-----------------------------|------------------------------|
| 1. Abd Rasid Jaapar | 20. Meor Hakif Amir Hassan |
| 2. Ahmad Nizam Hasan | 21. Mohd Hariri Arifin |
| 3. Ahmad Said | 22. Ng Tham Fatt |
| 4. Askury Abd Kadir | 23. Nicholas Jacob |
| 5. Azman Abd. Ghani | 24. Nizarulikram Abdul Rahim |
| 6. Che Aziz Ali | 25. Nur Iskandar Taib |
| 7. Cheang Kok Keong | 26. Peter Abolins |
| 8. Chin Lik Suan | 27. Shee Kein Wei |
| 9. Chow Yor Chun | 28. Tan Boon Kong |
| 10. Fateh Chand (Datuk) | 29. Teng King Kuen |
| 11. Goh Shin Mei | 30. Teng Yu He |
| 12. Joy J Pereira | 31. Wan Hasiah Abdullah |
| 13. Lee Chai Peng | 32. Woo Chaw Hong |
| 14. Leong Khee Meng | 33. Yip Chia Chun |
| 15. Lim Choun Sian | 34. Yip Foo Weng |
| 16. Ling Nan Ley | 35. Yunus Abd Razak (Dato') |
| 17. Lionel Chiew Kwong Seng | 36. Zakaria Mohamad (Dato') |
| 18. Low Keng Lok | 37. Zuhar Zahir Tuan Harith |
| 19. Mazlan Madon | |

1. Welcoming Address by the President for Session 2016/2017

Dr Mazlan Madon, the President of Geological Society of Malaysia acted as the Chairperson of the AGM and called the meeting to order at 5.30 pm. He commended the overwhelming response of the members to the AGM that was held in PAUM Club House for the first time.

2. Adoption of Agenda

The Chairperson tabled the following agenda to the AGM for acceptance:

1. Welcoming Address by the President for Session 2016/2017
2. Confirmation of Minutes of the 50th AGM held on the 29th April 2016
3. Matters Arising (50th AGM Minutes)
4. Annual Report for Session 2016/2017
 - a. President's Report
 - b. Secretary's Report
 - c. Editor's Report
 - d. Treasurer's
 - e. Honorary Auditor's Reports
 - f. Endowment Fund Report
5. GSM Endowment Fund: Board of Trustee - Appointment of a new Chairman and at least 3 independent Full Members
6. Election of Honorary Auditor
7. Other Matters:
 - a. PIDM on bank deposits
 - b. Note from K.M. Leong, in appreciation of GSM Councils on Sabah Pre-Cretaceous Geology
8. Announcement of New Council for 2017/2018
9. Presidential Address for 2017/2018

The agenda was unanimously accepted.

2. Confirmation of Minutes of the 50th AGM held on the 29th April 2016

The Minutes of the 50th AGM was tabled for confirmation.

Dato’ Yunus Abdul Razak proposed that the minutes be confirmed, seconded by Datuk Fateh Chand. The minutes were unanimously confirmed without any amendment.

3. Matters Arising (50th AGM Minutes)

Matters Arising	Responses
GSM Office	UM Geology Dept will revert with a drafted Memorandum of Understanding (MoU) and Memorandum of Agreement (MoA). Contribution allocated for meeting room renovation was used to replace the Air-Conditioner units in the department with the agreement of the Head Dept.
Council Members from outside Klang Valley	This year GSM has a Council Member outside Klang Valley.
GSM books given away at events	GSM will try to reduce the giving GSM books during event and keep record of the given books. For event organisation, the value of the book at cost-price will be considered as monetary sponsorship.
Clarification on “subscription revenue fee” under the item “Subscription” in Auditor’s Report	The “Subscription” was Member’s Annual/ Renewal Fee.
GSM Endowment Fund Report on Recommendations from the Board of Trustees	The recommendation was fulfilled. See report from Board of Trustees.
Prof H.D. Tjia’s comment on “errors and outdated ‘expressions’ in GSM publications”	The comment has been highlighted by a GSM member (Leong Khee Meng) write-ups via GSM publications in 1998, 2009 and 2016. See also KM Leong’s note under Other Matters.

4. Annual Report for Session 2016/2017

a. President’s Report

Mazlan Madon tabled the President’s Report (Appendix I).

The AGM discussed the following matters:

- To encourage all universities that offer geology program to encourage their students to collaborate in conducting geoscience activities.

Action: Incoming Council

Prof. Joy Pereira and Datuk Fateh Chand commended the Council for the new collaboration with NrgEdge. Datuk Fateh Chand proposed that the President’s Report to be accepted, seconded by Abd Rasid Jaapar and Askury Abd Kadir.

b. Secretary’s Report

Lim Choun Sian tabled the Secretary’s Report and read Assistant Secretary’s Report (Appendix II).

The AGM discussed the following matters:

- Poor attendance in council meeting – Suggestion by AGM: To write reminder letter to who absent three consecutive meeting to remind them of their obligation in council meeting.
- Additional suggestion: To review performance of Working Groups and consolidate as appropriate.

Action: Incoming Council

Ng Tham Fatt proposed that the Secretary’s Report to be accepted, seconded by Tan Boon Kong and Abdul Rasid Jaapar. Prof Joy Pereira proposed that the Assistant Secretary’s Report to be accepted, seconded by Askury Abd Kadir.

c. Editor’s Report

Wan Hasiah Abdullah tabled the Editor’s Report (Appendix III).

Prof. Joy Pereira proposed that the Editor’s Report to be accepted, seconded by Abdul Rasid Jaapar.

d. Treasurer’s Report

Ahmad Nizam Hasan tabled the Treasurer’s and Honorary Auditor’s Report (Appendix IV).

Dato’ Yunus Abdul Razak proposed that the Treasurer’s and Honorary Auditor’s Report to be accepted, Nicholas Jacob seconded.

e. Honorary Auditor’s Reports

Ahmad Nizam Hasan tabled the Honorary Auditor’s Report (Appendix V).

Nicholas Jacob proposed that the Honorary Auditor’s Report be accepted, Lee Chai Peng seconded.

f. GSM Endowment Fund Report

Dato' Yunus Abd Razak, Chairman in Board of Trustees of the GSM Endowment Fund tabled the GSM Endowment Fund Report and Recommendation from the Board of Trustees (Appendix VI). Recommendation from the Board of Trustees was accepted by AGM.

Action: Incoming Council

Lee Chai Peng proposed that the GSM Endowment Fund Report be accepted, Nicholas Jacob seconded.

5. GSM Endowment Fund: Board of Trustee

Appointment of a new Chairman and at least 3 independent Full Members

The AGM accepted the Council proposal to appoint **Datuk Fateh Chand** as the new Chairman. The Full Members appointed: **Mr Ahmad Said, Prof. Joy Pereira, Dr Lee Chai Peng and Dato' Yunus Abdul Razak.**

6. Election of Honorary Auditor

Ahmad Nizam Hasan proposed to continue appointing S.F. Lee & Co as the Honorary Auditor for the year 2017.

The AGM unanimously agreed to the appointment.

7. Other Matters:

a. PIDM on bank deposits

The AGM was briefed on sums of money and banks GSM deals with in regards to the banking policy where savings in bank under the conditional protection of Perbadanan Insurans Deposit Malaysia (PIDM), stated as: "All types of depositors, whether businesses or individuals, are protected. The maximum limit of coverage is RM250,000 per depositor per member bank."

THE AGM noted the policy, and via majority voted GSM to maintain the current banking practices at 2 banks and the Treasurer to monitor performance of banks.

Action: Incoming Council

b. Note from K.M. Leong, in appreciation of GSM Councils on Sabah Pre-Cretaceous Geology

Mr K.M. Leong noted the transparency of GSM Council/Editor for published his write-ups in Leong (2016) and earlier Leong (1998, 2009) as highlighted by himself and Prof Emeritus Tjia HD, who re-affirmed Sabah Pre-Cretaceous (Jurassic or older) Crystalline Basement granitic and metamorphic rocks underlying Cretaceous formations/ophiolites in Geological Survey GS /Minerals and Geoscience's Geological Maps of Sabah (Wilford, 1967; Lim, 1985) where in some publications omitted the geology Pre-Cretaceous granitic and metamorphic rocks outcrops in Upper Segama area.

The AGM also proposed GSM to create a HD Tjia Award in honouring Prof Emeritus Tjia HD contribution.

Action: Incoming Council

8. Announcement of New Council for 2017/2018

The result from Election for GSM New Council 2017/2018:

President	: Mr. Abd. Rasid Jaapar (Geomapping Technology)
Vice-President	: Prof. Dr. Che Aziz Ali (UKM)
Immediate Past President	: Dr. Mazlan Madon (PETRONAS)
Secretary	: Mr. Lim Choun Sian (UKM)
Assistant Secretary	: Assoc. Prof. Askury Abd Kadir (UTP)
Treasurer	: Mr. Ahmad Nizam Hasan (GeoSolution Resources)
Editor	: Prof. Dr. Wan Hasiah Abdullah (UM)

Councillors (2 years) 2017/2019:

Mr. Nicholas Jacob (JKR)
Dr. Nur Iskandar Taib (UM)
Mr. Tan Boon Kong (Consultant)
Dato' Yunus Abdul Razak (SEADPRI-UKM)

Councillors (1 year) 2017/2018:

Ms. Marelyn Telun Daniel (UM)
Dr. Meor Hakif Amir Hassan (UM)
Mr. Muhammad Ashahadi Dzulkafli (UKM)
Dr. Norbert Simon (UKM)

9. Presidential Address for 2017/2018

The newly-elected President, Abd Rasid Jaapar expressed that it is a great honour for him to be elected to serve as the President and followed by delivering his inaugural speech. He pledged that he and the new Council would try their best to serve for the good of the Society.

The AGM was adjourned at 7:30 p.m.

LIM CHOON SIAN
Secretary 2016/2017
21 April 2017

APPENDIX I

PRESIDENT'S REPORT

Introduction

The Geological Society of Malaysia (GSM) has sustained its objective of actively promoting the advancement of the geological sciences in the country and the region. Over the past year, GSM continued with activities that were designed to strengthen the capacity of geoscientists and had embarked on initiatives to formalise collaborations and alliances with key institutions within the geoscience fraternity.

Promotion and Collaborations

The (Institut Geologi Malaysia) IGM-GSM Joint Committee had met 2 times over the year. The Joint Committee has accepted the Terms of References (TOR) for the formation of the Geoscience Business Working Group (GBWG). The Joint Committee will continue to oversee the collaboration between the two institutions, especially on capacity building, geoscience policy and quality geoscience education in Malaysia.

GSM will also cooperate with US-based Society for Exploration Geophysicists (SEG) through a memorandum of understanding (MOU) signed last year. Through this MOU, GSM may work with SEG to organise a special session on near surface geophysics as well as a 1-day short course on geophysics during the upcoming National Geoscience Conference 2018. GSM will also continue its cooperation with another international organisation that has an established office in Malaysia, European Association for Geoscientists and Engineers (EAGE). The recently concluded 1st Asia Pacific Meeting on Near Surface Geoscience and Engineering in Jogjakarta, Indonesia, organised by EAGE and HAGI between 9th and 13th April 2018 was endorsed by GSM. At this event, GSM was represented by the Chairman, Working Group on Geophysics, Dr Mohd Hariri of UKM. GSM will also support Petronas and EAGE in organising an International Seminar on Salt Tectonics planned to be held in May or June 2019. With that, I also will pursue further to closely work with Petronas again for mutual benefit.

GSM will provide its support to the Society for Engineering Geology & Rock Mechanics Malaysia (SEGRM), which is affiliated to ISRM and IAEG, in organising their inaugural Symposium in Geo-Engineering in the Tropic on 3rd and 4th July 2018 at Universiti Teknologi Malaysia (UTM), Kuala Lumpur. There will be a 2-day International Short Course on Rock Engineering after the Symposium.

GSM has informed the Director-General of Jabatan Mineral dan Geosains (JMG), the current chair of the CCOP (Coordinating Committee for Geoscience Programmes in East and Southeast Asia, based in Bangkok, Thailand), on our intention to be a cooperating organisation within CCOP. We trust our members can benefit from the many events organised by CCOP. GSM also will continue to work under Newton-Ungku Omar Fund until 2019.

It is also noted that, with the support of GSM, Universiti Kebangsaan Malaysia (UKM) has successfully conducted a series of technical talks in its campus in Bangi. As part of the Society's promotion to geoscience students, the President has visited the following universities during the past year and delivered a lecture entitled 'A Profile of Professional Geologist' and/or 'Geologist in Civil Works';

- University of Malaya – on 20th April 2017 during Geoscience Industrial Week

- University Technology of Petronas – on 14th June 2017 as part of initiative by AAPG Student Chapter and NRGEdge
- Universiti Kebangsaan Malaysia – on 20th September 2017
- Universiti Malaysia Sabah – on 25th October 2017 in conjunction with Seminar Bencana Alam

Arrangements are being made for visits to Universiti Malaysia Kelantan, Universiti Sains Malaysia and Curtin University.

National Geoscience Conference (NGC)

The 30th edition of National Geoscience Conference 2017 (NGC2017) was successfully co-organised with the Mineral and Geoscience Department of Malaysia (JMG) with the support of partners on 9th and 10th October 2017 at Istana Hotel, Kuala Lumpur. Last year also marked the 50th Anniversary of GSM's founding. The event was officiated by the Minister of Natural Resources and Environments. Detailed report of the NGC2017 has been published in *Warta Geologi*, Vol. 43, No. 4. The NGC2017 had also provided exhibition booths for exhibitors to promote their products and services. With the successful organisation of NGC2017, we believe that GSM has started a new adventure to elevate NGC as premier event that will be recognised internationally.

The National Geoscience Conference 2018 (NGC2018) will be co-organised by Universiti Sains Malaysia (USM) and JMG Kedah/Pulau Pinang/Perlis at the Bayview Hotel, Pulau Pinang, on 17th and 18th September 2018. Again, GSM would also like to encourage all members to participate in this annual event.

GEOSEA

The 15th Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia (GEOSEA XV) will be in Hanoi, Vietnam between 16th and 17th October 2018 with pre- and post-congress Field Excursions. GSM would like to encourage our members to participate in the GEOSEA XV. Incidentally, Vietnam is a new member of GEOSEA. GSM is still the Secretariat of GEOSEA.

Publications

The GSM quarterly Newsletter, *Warta Geologi*, is now up to date and published almost on time. The Volume 44, No. 1 (January to March) is being circulated now. The Council agreed to that the NGC Programme Book shall be published as part of *Warta Geologi*.

The GSM technical publication, the Bulletin of the Geological Society of Malaysia, was almost consistently published twice a year. A detailed report shall be presented in Editor's Report. Personally, I would like to thank Editorial Team lead by Prof Dr Wan Hasiah for their tireless efforts. Congratulations also to Associate Professor Dr Ng Tham Fatt who has been appointed as Managing Editor for the Bulletin. Perhaps, it is timely for GSM to explore option of paperless publications as well as a full-time Editor.

Way Forward

Considering the old adage that 'the best geologist is (the one) who has seen the most geology' (Read, 1940), I feel it is strange that GSM no longer organise field excursion for many years. I do hope that GSM can organise field excursion in the coming years in whatever platform. We can do field excursion in neighbouring countries as well by taking advantage of cheaper air ticket cost nowadays.

We do hope in the coming years GSM Council can look into how to improve the management of GSM. We need to manage GSM professionally like a business entity, with more full-time staffs. GSM also need to re-vamp its current website to be more interactive with members and incorporate an on-line payment system, on-line technical papers submission, etc. GSM may organise a brainstorming session among the council members, chairs of WG's, regional representatives and representative(s) from IGM and/or BOG on how to move forward, the national geoscience agenda, etc.

Closing Remarks

As a final remark, I would like to encourage GSM, IGM and (Board of Geologists) BOG to come together and come out with a solid agenda to further develop geoscience for the country.

We would like to thank all the outgoing council members for the contributions; to all members for ideas and supports. Thanks to all organising chairs of all events, working group chairs and regional representatives. Last but not least, a big thank to the one and only secretariat member, Ms Anna Lee for another excellent year of contribution.

ABD RASID JAAPAR
President 2017/2018
Geological Society of Malaysia

SECRETARY'S REPORT 2017/2018

Introduction

On behalf of the members of the Council of the Geological Society of Malaysia (GSM), it is my pleasure to present the Secretary's Report for the session 2017/2018.

Society structure

The Society's stakeholders are the members of the Society led by an elected Council. The Council's main functions are to set directions to promote the advancement of geosciences, endorse activities and provide guidance for the execution of the activities of the Society.

The Council is supported by 6 Working Groups, 6 Regional Representatives and an Editorial Group. The Working Group previously known as Stratigraphy, was renamed in last council year as **Stratigraphy, Sedimentology & Petroleum Geology** to cover a wider spectrum. An **Editorial Group** chaired by the Editor was created in the council (2016/17) for the management of the Society's publications (Warta and Bulletin), including editing, publication and improving indexing.

Membership

As at 31st December 2017, the total number of members in the Society stands at **734**, increased from 703 as of 2016. The drop in membership is mainly from Malaysia's Full and Student categories. However, there is quite a big increase in the number of Life Membership. There is an increase of Honorary Membership from 2 to 12 for this year, after 10 GSM Past Presidents were awarded the Honorary Memberships during the 50th GSM Anniversary NGC 2017 for their contributions to the Society. The table below presents the membership categories and their geographical breakdown.

Breakdown of Membership:

COUNTRY	Hon.	Life	Full	Assoc.	Student	Inst.	Total 2017	Total 2016	Total 2015
Malaysia	11 (2)	350 (330)	102 (107)	3 (3)	95 (192)	0 (0)	461	634	544
Australia	1	18 (19)	-	1 (1)	-	-	20	20	18
Bangladesh	-	2 (1)	-	-	-	-	2	1	-
Brunei	-	1 (1)	-	-	-	-	1	1	-
Canada	-	1 (1)	-	-	-	-	1	1	3
China	-	1 (1)	-	-	2 (1)	-	3	2	2
Europe	-	12 (11)	-	-	-	1 (2)	13	13	15
Hong Kong	-	2 (1)	-	-	-	-	2	1	2
India	-	1 (1)	-	-	-	-	1	1	-
Indonesia	-	2 (2)	0 (1)	-	1 (0)	-	3	3	5
Japan	-	2 (2)	-	-	-	-	2	2	3
Middle East	-	1 (4)	-	-	1 (0)	-	2	4	3
Philippines	-	2 (3)	-	-	-	-	2	3	2
Singapore	-	7 (6)	0 (0)	0 (1)	-	1 (1)	8	7	7
Thailand	-	3 (3)	-	-	-	-	3	3	2
USA	-	7 (7)	0 (0)	-	-	-	7	7	7
Africa	-	2 (0)	-	-	1 (0)	-	3	-	-
TOTAL 2017	12	414	102	4	200	2	734		
TOTAL 2016	2	393	108	4	193	3		703	
TOTAL 2015	2	352	130	4	121	6			613

Note: 1. X(Y) - X=Number for year 2017, Y=Number for year 2016

2. Country - Based on Mailing Address, not Nationality

The Council

The Council for the Geological Society of Malaysia for 2017/2018 session resumed their office after the 51st AGM on the 21st April 2017.

COUNCIL FOR 2017/2018	
President	: Mr. Abd Rasid Jaapar (Geomapping Technology)
Vice-President	: Prof. Che Aziz Ali (UKM)
Immediate Past President	: Dr. Mazlan Madon (Consultant)
Secretary	: Dr. Lim Choun Sian (UKM)
Assistant Secretary	: Prof. Madya Askury Abd Kadir (UTP)
Treasurer	: Mr. Ahmad Nizam Hasan (GeoSolution Resources)
Editor	: Prof. Dr. Wan Hasiah Abdullah (UM)
Councillors (2 years) 2017-2019	: Mr. Nicholas Jacob (JMG)
	: Dr. Nur Iskandar Taib (UM)
	: Mr. Tan Boon Kong (Consultant)
	: Dato' Yunus Abdul Razak (SEADPRI-UKM)
Councillors (1 years) 2017-2018	: Ms. Marelyn Telun Daniel (UM)
	: Dr. Meor Hakif Amir Hassan (UM)
	: Mr. Muhammad Ashahadi Dzulkafli (UKM)
	: Dr. Norbert Simon (UKM)

Council Meetings

During the 2017/2018 session, the Council met 9 times. The attendance of the council members to the meetings is presented in the table below. All the meetings were conducted at the meeting room of the Department of Geology, University of Malaya, Kuala Lumpur.

Attendance of Council Members at Council Meetings:

NAME	1	2	3	4	5	6	7	8	9	Total
Abdul Rasid Jaapar, Mr	/	/	/	/	/	/	/	/	/	9/9
Ahmad Nizam Hasan, Mr	/	0	/	/	/	/	0	/	/	7/9
Askury Abd Kadir, Prof Madya	/	/	/	/	/	/	/	/	0	8/9
Che Aziz Ali, Prof.	0	/	/	/	/	/	0	/	/	7/9
Lim Choun Sian, Dr	/	/	/	/	/	/	0	/	/	8/9
Mazlan Madon, Dr	/	0	0	/	0	0	/	0	0	3/9
Marelyn Telun Daniel	0	0	0	0	/	/	0	0	/	3/9
Meor Hakif Amir Hassan, Dr	/	/	/	0	/	/	/	0	/	7/9
Muhammad Ashahadi Dzulkafli, Mr	/	0	/	0	/	/	/	0	0	5/9
Nicholas Jacob, Mr	0	0	/	/	0	/	0	0	/	4/9
Norbert Simon, Dr	/	0	/	0	/	/	/	/	0	6/9
Nur Iskandar Taib, Dr	/	/	/	/	/	/	0	0	/	7/9
Tan Boon Kong, Mr	/	0	/	0	/	0	/	/	/	6/9
Wan Hasiah Abdullah, Prof	/	/	0	/	0	/	/	/	/	7/9
Yunus Abdul Razak, Dato'	/	/	0	0	/	/	/	0	/	6/9

Working Groups

The Working Groups and the Chairs for the session are as follows:

	WORKING GROUP	CHAIRMAN
1	Engineering Geology, Hydrogeology & Environmental Geology	Mr. Tan Boon Kong
2	Promotion of Geoscience & Young Geologists	Ms. Marelyn Telun Daniel
3	Economic Geology	Dr K.K. Cheang
4	Regional Geology	Dr. Mohd Rozi Umor
5	Geophysics	Dr. Mohd Hariri Arifin
6	Stratigraphy, Sedimentology & Petroleum Geology	Dr. Meor Hakif Amir Hassan

Regional Representatives

The Society is trying to strengthen its delivery mechanism at the sub-national level through the appointment of Regional Representatives to work in conjunction with the local membership to advance geoscience in the respective regions. The Regional Representatives for the session are as follows:

	REGION	REPRESENTATIVE
1	Southern Peninsular Malaysia	Prof. Edy Tonnizam Mohamad (UTM)
2	Perak	Assoc. Prof. Askury Abd Kadir (UTP)
3	Northern Peninsular Malaysia	Dr. Kamar Shah Ariffin (USM)
4	Eastern Peninsular Malaysia	Mr. Ahmad Rosli (JMG)
5	Sarawak	Dr. Dana Badang (JMG)
6	Sabah	Prof. Felix Tongkul (UMS)

Activities, Project and Secretariat

The Society has successfully celebrated the 50th anniversary of the Geological Society of Malaysia (GSM) with the organisation of the 30th National Geoscience Conference and Exhibition (NGC2017) at Hotel Istana, Kuala Lumpur on 9th to 10th October 2017. The NGC 2018 will be held in Penang on 18 – 19 September 2018.

Regionally, GSM serves as Permanent Secretariat for Geological Congress of Southeast Asia (GEOSEA) up to year 2020. GEOSEA 2018 will be held in Hanoi on 13 – 21 October 2018.

On research activity, GSM is one of the partners in the Research Project called “Disaster Resilient Cities: Forecasting Local Level Climate Extremes and Physical Hazards for Kuala Lumpur”, which is led by SEADPRI-UKM in collaboration with associated Partners in UK and Malaysia in securing the grant from Newton-Ungku Omar Fund. GSM’s role is to benchmark the process and guide knowledge transfer in the research.

During the session, the Council with the cooperation of Working Groups, Regional Representatives, and in collaboration with UKM, UM, USM, UMS, IGM, CCOP, AAPG, JMG and Newton-Ungku Omar project partners were able to organise a total of 24 sessions inclusive of **technical talks, workshops, conferences, and a short course**.

This Council year, the GSM-IGM Joint Committee met on 21 July 2017 and 9 March 2018. The Joint Committee, which is a requirement under the Agreement signed between GSM and IGM on 5 April 2013 and was tasked to set up various subcommittees with the objectives, among others, to promote education, research, and graduate membership, and to oversee and review geoscience curricula in Malaysian universities. The meetings discussed on future joint organisation of NGC, technical talks, geoscience curricula and continuous professional development programme.

An MoU for affiliation between Society of Exploration Geophysicists (SEG) and GSM was inked in 16 June 2017, both parties endeavour to interchange publication, promotion of events and joint activities.

Summary of Activities:

No	Date	Activity	Topic	Venue	Collaborators
1	27 April 2017	Technical Talk	Why would sea-level rise for global warming and polar ice-melt? [Aftab Alam Khan (Professor, Department of Geology, Dhaka University, Dhaka, Bangladesh)]	UM	UM
2	9 May 2017	Technical Talk	Retirement Lecture No. 6: Engineering Geology of Kuala Lumpur – An Overview of Landslides and Sinkholes [Dato’ Zakaria Mohamad (ex-JMG)]	UM	IGM
3	18 May 2017	Technical Talk	1) A New Comprehensive Rock Slope Protection Solution. 2) Embedding Geohazards & Engineering Geological Assessment in Geological Terrain Mapping for Development Proposal. [Abd. Rasid Jaapar (Geomapping Technology)]	UM	IGM
4	11 - 13 July 2017	Workshop	Workshop on LiDAR for Landslide Hazard Mapping and Monitoring	The Everly Hotel, Putrajaya	Newton-Ungku Omar Project Partners, GSM-IGM Flagship
5	18 July 2017	Technical Talk	The Ordovician Radiation in Reef Ecosystems [Dr. Qi-Jian LI (Nanjing Institute of Geology and Palaeontology, Chinese Academy)]	UM	UM
6	26 July 2017	Technical Talk	The early evolution and diversity of the Chondrichthyes (cartilaginous fishes - sharks, rays, etc.) [Dr. Gilles Cuny (Professor in Vertebrate Palaeontology, University Claude)]	UM	UM

PERTEMUAN PERSATUAN (MEETINGS OF THE SOCIETY)

7	7 Aug 2017	Technical Talk	Geobiology and Geomicrobiology: Frontier areas in Earth System Science [Professor Ramanathan Baskar (University of Science and Technology, Hisar)]	UM	UM
8	23 Aug 2017	Technical Talk	An Update of Journey to Antarctic Peninsula: Geomechanical Strength of Antarctica Rocks [Dr. Goh Thian Lai]	UM	IGM
9	28 September 2017	Forum	Geoscience Ideas Xchange: Advancing geoscience practice in Malaysia; Formation of IGM-GSM Geoscience Business Working Group Lead Discussant: Mr. Abd Rasid Jaapar	UM	GSM-IGM Flagship
10	20 September 2017	GSM Road show	Profile of a Professional Geologist Mr. Abd. Rasid Jaapar (Presiden Persatuan Geologi Malaysia)	UKM	UKM
11	4 October 2017	Technical Talk	Signature of mass mortality of fauna and high temperature pressure event preserved in Late Cretaceous bone bed of Fatehgrah Formation of Barmer Basin, India.[Prof. Dr. Mathur C.S. (Department of Geology, J.N.V. University, Jodhpur, India)]	UKM	UKM
12	10-12 Oct 2017	Conference / Workshop	<ul style="list-style-type: none"> • NGC 2017 • Mineral Applications to the Manufacturing Industries & Environment • Post NGC Fieldtrip to Cameron Highlands: MW2C@UKM – Training Workshop on Geohazards and Disaster Risk Reduction 	Hotel Istana KL/ UM/ Cameron Highland	NGC 2017 partners
13	2 Nov 2017	Technical Talk	Modelling the evolution of submarine channels and their deposits [Prof. Bill McCaffrey (Leeds University)]	UM	UM
14	8 Nov 2017	Technical Talk	Fauna Ediacara Mistaken Point, Kanada apabila organisma bersaiz besar muncul di dunia [Prof. Dr. Mohd Shafeea Leman]	UKM	UKM
15	14-16 Nov 2017	Workshop	MW2C@UKM Training Workshop on the Predictability of Extreme Weather Events	PJ	ANCST, Newton-Ungku Omar Project Partners
16	16 Nov 2017	Conference	Regional Science Policy Dialogue on Science, Technology and Innovation for Bridging Disaster Risk Reduction and Climate Change Adaptation	Everly Putrajaya	ANCST, GSM-IGM Flagship
17	6 Dec 2017	Technical Talk	Application of Geophysics in Oil and Gas Industry by Kian Wei Tan / Petroleum Economics by José Manuel / Skill to survive in O & G and why it's exciting by Syaiful Mustapa	UKM	UKM
18	10 Jan 2018	Technical Talk	Chairman's Lecture No. 23: "Engineering Geology in Malaysia – Some Case Histories" (In collaboration with the Institute of Geology Malaysia) Speaker: Sdr. Tan Boon Kong	UM	IGM
19	23-24 Jan 2018	Workshop	Workshop on Resilience of Asian Cities: Urban Geology of Kuala Lumpur	Everly, Putrajaya	GSM-IGM Flagship, Newton Ungku-Omar partners
20	1 March 2018	Workshop	Disaster Risk Reduction: Workshop on Landslide & Karst Susceptibility Assessment	Pulse Grande Hotel Putrajaya	GSM-IGM Flagship, Newton Ungku-Omar partners
21	15 March 2018	Forum	SEGRM-GSM Quarterly Forum	JMG HQ	SEGRM, JMG
22	2-4 April 2018	Conference	Regional Geoheritage Conference 2018	Khon Kaen, Thailand	Thailand, Malaysia
23	11 April 2018	Technical Talk	A Play-Based Evaluation of a Deepwater Sabah Exploration Area: Prospect Maturation and Implications for Remaining Prospectivity. [Siti Aishah Abdullah]	UKM	UKM
24	18 April 2018	Technical Talk	Infrared Thermography: Introductory and Possible Research Application. [Dr. Fathoni Usman]	UKM	UKM

GSM Awards

GSM has set up numerous awards for members as follows and their status:

- *Honorary Membership* – The Council nominated 10 Past President in conjunction with 50th Anniversary of GSM
- “Hutchison Best Student Award”, previously the “GSM Best Student Award” – UKM named one student.
- “N.S. Haile Publication Award”, previously the “Young Geoscientist Award” - The Council yet to receive complete nomination for this award.
- “DJ Gobbett Award”, previously the “Geoscientist Award”, - The Council yet to receive complete nomination for this award.

Linkages and Collaborations

GSM maintained linkages with national and international institutions such as:

- Institute of Geology Malaysia
- Confederation of Scientific and Technological Association of Malaysia (COSTAM) – represented by two Council members: Mr. Tan Boon Kong and Mr. Nicholas Jacob
- Formation Evaluation Society Malaysia (FESM)
- American Association of Petroleum Geology (AAPG)
 - AAPG House of Delegates: represented by Dr. Mazlan Madon of PETRONAS. Mr. Askury Abd. Kadir of University Teknologi Petronas is the alternative representative
- Newton Ungku Omar Fund and IGM-GSM Flagship since July 2015
- GEOSEA
 - GSM is the present host of the Permanent Secretariat up to 2020, represented by GSM Secretary and Dato’ Yunus Abdul Razak
 - GEOSEA 2018 will be in Hanoi, Vietnam. GSP offered to host the next GEOSEA 2020 in the Philippines
- MoU with NrgEdge
- Asian Network on Climate Science and Technology, and Newton-Ungku Omar project partners
- Society of Exploration Geophysicists (SEG)
- For the Student’s Geological Club Collaboration, only AAPG Student Chapter of University of Malaya is collaborating with GSM at present

Acknowledgement

The Society would like to record its utmost appreciation to all the individuals and organisations in organising the Society’s numerous activities during the session. Special mention must be made of the tremendous support by the Head and staff of the Geology Department, University of Malaya especially in the use of its premises for most of the Society’s meetings and activities. The continued co-operation and support extended by JMG, PETRONAS, UKM, UMS, UTP, IGM, ANCST and Newton-Ungku Omar project partners is recorded with gratitude. The unwavering support of Ms. Anna Lee and Ms Wan Aida in the administration of GSM is also very much appreciated. Last but not least, the Council also wishes to record its appreciation to all GSM members for their advice, guidance and support throughout the session.

LIM CHOUN SIAN
Secretary 2017/2018
Geological Society of Malaysia

ASSISTANT SECRETARY'S REPORT

The sales of the Society publications and the list of organizations and institutions that were exchanging publications with GSM are presented in the following tables.

Sales and stock of publications for 2017

Publications	Sales 2017	Stock remaining by end of 2017	Stock remaining by end of 2016
Bulletin 1	0	0	0
Bulletin 2	5	159	164
Bulletin 3	5	134	139
Bulletin 4	5	48	53
Bulletin 6	5	371	376
Bulletin 7	5	230	235
Bulletin 13	0	0	0
Bulletin 17	0	0	0
Bulletin 18	0	0	0
Bulletin 19	5	351	356
Bulletin 20	5	304	309
Bulletin 21	5	104	109
Bulletin 22	5	180	185
Bulletin 23	5	193	198
Bulletin 24	5	352	357
Bulletin 25	5	60	65
Bulletin 26	5	160	165
Bulletin 27	5	34	39
Bulletin 28	5	69	74
Bulletin 29	5	84	89
Bulletin 30	5	95	100
Bulletin 31	5	86	91
Bulletin 32	5	60	65
Bulletin 33	5	218	223
Bulletin 34	5	39	44
Bulletin 35	0	0	0
Bulletin 36	10	67	77
Bulletin 37	7	122	129
Bulletin 38	5	190	195
Bulletin 39	0	0	0
Bulletin 40	10	45	55
Bulletin 42	0	0	8
Bulletin 43	9	102	111
Bulletin 44	7	22	29
Bulletin 45	8	63	71

Publications	Sales 2017	Stock remaining by end of 2017	Stock remaining by end of 2016
Bulletin 46	0	0	0
Bulletin 47	7	18	25
Bulletin 48	10	11	21
Bulletin 49	10	273	283
Bulletin 50	5	310	315
Bulletin 51	10	183	193
Bulletin 52	1	206	207
Bulletin 53	8	297	305
Bulletin 54	5	250	255
Bulletin 55	5	269	274
Bulletin 56	6	321	327
Bulletin 57	5	33	38
Bulletin 58	8	0	8
Bulletin 59	8	84	92
Bulletin 60	8	85	93
Bulletin 61	8	45	53
Abstract (Bull 6)	0	0	0
Proceeding AGC 2000	0	0	0
Proceeding AGC 2001	11	101	112
Malaysian Stratigraphic guide	0	0	0
Lexicon of stratigraphy	0	0	0
Stratigraphic correlation	0	0	0
Rocks poster	0	0	0
Geology of Borneo (CD)	0	0	0
Geology of Borneo (Map)	7	683	690
Geol. Evolution of SEA	12	430	442
Geology of P. Malaysia	58	446	504

PERTEMUAN PERSATUAN (MEETINGS OF THE SOCIETY)

List of organizations and institutions that are exchanging publications with GSM

Item	Organization	Country
1.	New South Wales Dept of Mineral Resources	Australia
2.	Geologica Belgica a.s.b.I	Belgium
3.	University of Geosciences	China
4.	Nanking Institute of Geology	China
5.	National Geological Library	China
6.	Peking College of Geology	China
7.	Suomalaineu Tiedeakatemia	Finland
8.	Freie Universitat Berlin	Germany
9.	Senckenberg Research Institute and Natural History Museum Frankfurt	Germany
10.	National Museum of Natural History	Holland
11.	Geological Society of Japan	Japan
12.	Dept Mineral & Planetary Science, Hiroshima	Japan
13.	Museum of Nature & Human Activities	Japan
14.	National Science Museum	Japan
15.	Natural History Museum and Institute	Japan
16.	Institute of Geosciences	Japan
17.	Geological Society of Korea	Korea
18.	Dewan Bahasa dan Pustaka	Malaysia
19.	Minerals and Geoscience Department Malaysia, Headquarters	Malaysia
20.	Minerals and Geoscience Department Malaysia, Ipoh	Malaysia
21.	Minerals and Geoscience Department Malaysia, Kuching	Malaysia
22.	Minerals and Geoscience Department Malaysia, Kota Kinabalu	Malaysia
23.	Kementerian Dalam Negeri	Malaysia
24.	Perpustakaan Negara Malaysia	Malaysia
25.	Library PETRONAS Berhad	Malaysia
26.	Pusat Sumber Maklumat Negeri Sarawak	Malaysia
27.	Perpustakaan Tun Sri Lanang, UKM	Malaysia
28.	Program Geologi, UKM	Malaysia
29.	Library, UM	Malaysia
30.	Library, USM	Malaysia
31.	Malaysian Institute of Nuclear Technology	Malaysia
32.	Library of Congress, USA Embassy	Malaysia
33.	Information Resource Centre, UTP	Malaysia
34.	Institute of Ecological & Nuclear Science	New Zealand
35.	National Library	Singapore
36.	Central Geological Survey	Taiwan
37.	American Museum of Natural History, New York	USA
38.	CIGESE Library	USA
39.	Oklahoma Geological Survey	USA
40.	US Geological Survey	USA
41.	University of Kansas	USA
42.	AAPG Foundation Library	USA

ASKURY ABD KADIR
Assistant Secretary 2017/2018
Geological Society of Malaysia

EDITOR'S REPORT

In 2017, four issues of *Warta Geologi* (Volume 43, Issue 1, 2, 3 & 4) and two volumes of the *GSM Bulletin* (Volume 63 and 64) were published, thus the status of publication is currently up to date. Together, these represent *GSM's* 50th anniversary issues. The Society is grateful to authors for their contribution, members of the editorial board and reviewers for their time and effort to improve the quality of the Society's publications.

The *GSM* online publication website is now in its 5th year and the website has been viewed by more than 11,200 visitors from 103 countries, with more than 28,000 views/downloads. In 2016, volumes 46 to 61 of the *GSM Bulletin* were abstracted and indexed in *MyJurnal* (Malaysia Journal Management System). The *Bulletin* is also indexed in the following indexing services and databases: *Scopus*, *Ebsco* and *AAPG Datapages*. *Bulletin* volumes 26 to 45, 62 and 63 have recently been abstracted and indexed in *MyJurnal*, while works on depositing the rest are ongoing.

I am pleased to inform regarding the appointment of Associate Prof Dr Ng Tham Fatt as Managing Editor to help with the increasing and demanding task in handling publication, indexing and website issues. May I take this opportunity to thank all the editorial sub-committee members especially Ms Anna Lee and Puan Wan Aida for their assistance during the editorial process.

WAN HASIAH ABDULLAH
Editor 2017/2018
Geological Society of Malaysia

TREASURER'S REPORT

For the Financial Year 2017, the society's account posted a deficit of RM 1,008.00 compared to deficit of RM 35,601.00 in year 2016. The net current asset showed a slightly depreciation of from RM 2,594,364.00 for year 2016 to RM 2,620,875.00 for year 2017.

Operating revenue for year 2017 posted higher with a total income of RM 90,638.00 compared to year 2016 of RM 58,858.00. The revenue posted for Subscription shows higher from RM 15,348.00 of year 2016 to RM 20,375.00 for year 2017, income for National Geoscience Conference (NGC) held at Istana Hotel, Kuala Lumpur in-conjunction with 50th Anniversary of *GSM* posted higher from RM 2,210.00 for NGC 2016 to RM 20,272.00 for NGC 2017 and Sales of publications are RM 13,825.00 higher compare to RM 2,277.00 for year 2016. Hence, there is lower revenue of interest from fixed deposit of RM 34,163.00 for year 2016 to RM 18,489.00 for year 2017.

Total operating expenditure for Financial Year 2017 shows lower from RM 94,459.00 for year 2016 to RM 90,822.00. Honorarium shows lower from RM 36,911.00 of 2016 to RM 19,280.00 for year 2017. Annual Dinner 2017 that was held at PAUM shows lower from RM 8,076.00 for year 2016 to RM 2,693.00 and printing of *Warta Geologi* are RM 21,865.00 higher compare to RM 8,384.00 for year 2016. Finally, expenses on speaker's account shows slightly higher for year 2017 of RM 4,487.00 compare to RM 3,418.00 for year 2016.

For year 2017, an increase of Endowment fund with a total amount of RM 1,672,520.00 compare to RM 1,661,310.00 for year 2016, held as fixed deposit (FD) in UOB Bank given an accrued interest of RM 80,519.81 held in UOB Bank current account.

The Hon. Treasurer would like to express a great appreciation to all organizing committee of NGC 2017 lead by chairman and president of society En. Abd Rasid Jaapar for their support on successfully managing the conference and research grants that generously supporting the administration expenses for year 2017. Great appreciation also to rest of the donors and sponsors on their contributions and supports throughout the year. Last but not least to Ms Anna Lee on her contribution managing the accounts throughout the year.

AHMAD NIZAM HASAN
Treasurer 2016/2017
Geological Society of Malaysia

- NOTES: 1. The RM 10,888.00 are AAPG-UM student chapter fund held into our current account to finance their activities.
2. Young geoscientist award fund of RM 3,143.00 still held as no candidates nominated.
3. The fixed deposits with licensed bank have a maturity of between 6 to 15 months (2017: 6 to 15 months). Interest rate for the deposits ranged from (2017: 2.85% to 2.95% per annum).

HONORARY AUDITOR'S REPORT

**PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)
(Registered in Malaysia)**

**REPORT AND ACCOUNTS
31 DECEMBER 2017**

**S.F. LEE & CO.
CHARTERED ACCOUNTANTS**

**PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)
(Registered in Malaysia)**

COUNCIL MEMBERS FOR 2017 / 2018

President	:	Mr. Abd Rasid Jaapar (Asian Geos)
Vice President	:	Dr. Che Aziz Aii (UKM)
Immediate Past President	:	Dr. Mazlan Madon (PETRONAS)
Secretary	:	Dr. Lim Choun Sian (UKM)
Assistant Secretary	:	Mr. Askury Abd Kadir (UTP)
Treasurer	:	Mr. Ahmad Nizam Hasan (GeoSolution Resources)
Editor	:	Prof Dr Wan Hasiah Abdullah (UM)
Councillors (1 Year) (2017/2018)	:	Dr. Meor Hakif Amir Hassan (UM) Ms. Marelyn Telun Daniel (UM) Mr. Muhammad Ashahadi Dzulkafli (UKM) Mr. Norbert Simon (UKM)
Councillors (2 Years) (2017/2019)	:	Mr. Nicholas Jacob (JKR) Dr. Nur Iskandar Taib (UM) Mr. Tan Boon Kong (Consultant) Dato' Yunus Abdul Razak

**PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)
(Registered in Malaysia)**

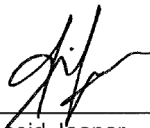
**FINANCIAL STATEMENTS
31 DECEMBER 2017**

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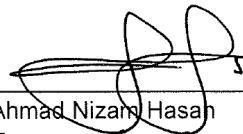
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PERSATUAN GEOLOGI MALAYSIA (GEOLOGICAL SOCIETY OF MALAYSIA)
STATEMENT BY THE COUNCIL

We, Abd Rasid Jaapar and Ahmad Nizam Hasan, being the President and Treasurer respectively, of the Persatuan Geologi Malaysia (Geological Society Of Malaysia) do hereby state that, in the opinion of the Council, the financial statements set out pages 4 to 9 are properly drawn up in accordance with applicable approved accounting standards so as to give a true and fair view of the financial position of the Persatuan Geologi Malaysia (Geological Society of Malaysia) as at 31 December 2017, and of the result and cash flows for the year then ended.



Abd Rasid Jaapar
President



Ahmad Nizam Hasan
Treasurer

Kuala Lumpur

Dated : 12 APR 2018

PERTEMUAN PERSATUAN (MEETINGS OF THE SOCIETY)

PERSATUAN GEOLOGI MALAYSIA (GEOLOGICAL SOCIETY OF MALAYSIA)
DECLARATION BY THE OFFICER PRIMARILY RESPONSIBLE FOR THE
FINANCIAL MANAGEMENT OF THE SOCIETY

I, Ahmad Nizam Hasan, the officer primarily responsible for the financial management of the Persatuan Geologi Malaysia (Geological Society Of Malaysia), do solemnly and sincerely declare that the accompanying financial statements set out on pages 4 to 9 are, to the best of my knowledge and belief correct, and I make this solemn declaration conscientiously believing the same to be true and by virtue of the provisions of the Statutory Declarations Act, 1960.

Subscribed and solemnly declared by)

the abovenamed Ahmad Nizam Hasan)

at Kuala Lumpur in Wilayah Persekutuan)

on **12 APR 2018**)



Ahmad Nizam Hasan

Before me,



Commissioner for Oaths ~~Bangunan~~ Lot 1.08, Tingkat 1,
Bangunan KWSP, Jin Raja Laut,
50350 Kuala Lumpur.
Tel: 019-6680745



S.F. LEE & CO (AF : 0670)

APPENDIX V

REPORT OF THE AUDITORS TO MEMBERS OF THE
PERSATUAN GEOLOGI MALAYSIA (GEOLOGICAL SOCIETY OF MALAYSIA)

We have audited the financial statements set out on pages 4 to 9. These financial statements are the responsibility of the Council Members of the Society. It is our responsibility to form an independent opinion, based on our audit, on those financial statements and to report our opinion to you, as a body, and for no other purpose. We do not assume responsibility to any other person for the content of this report.

We conducted our audit in accordance with approved auditing standards in Malaysia. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the Council Members, as well as evaluating the overall financial statements presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements give a true and fair view of the statement of assets and liabilities of the Society as at 31 December 2017 and of its statement of income and expenditure and cash flows for the financial year ended 31 December 2017 in accordance with the MASB approved accounting standards in Malaysia.

S.F. LEE & CO. (AF 0670)
Chartered Accountants

LEE SIEW FATT
(1179/9/18J)
Chartered Accountant

Kuala Lumpur

Date : 12 APR 2018

Geological Society of Malaysia
52nd Annual General Meeting

**PERSATUAN GEOLOGI MALAYSIA
(GEOLOGICAL SOCIETY OF MALAYSIA)
(Registered in Malaysia)**

APPENDIX V

STATEMENT OF ASSETS AND LIABILITIES AS AT 31 DECEMBER 2017

	Note	2017 RM	2016 RM
FUND ACCOUNTS			
GENERAL FUND	3	916,991	917,999
ENDOWMENT FUND	4	1,672,520	1,661,310
STUDENT LOAN FUND		955	955
YOUNG GEOSCIENTIST AWARD FUND		3,143	3,143
AAPG-UM STUDENT CHAPTER FUND	5	10,888	10,957
DRCKL	6	8,864	-
MW2C @ UKM	7	7,514	-
		<u>2,620,875</u>	<u>2,594,364</u>
Represented by:			
NON-CURRENT ASSETS			
PROPERTY, PLANT AND EQUIPMENT	8	16,203	17,128
CURRENT ASSETS			
Deposits and prepayment	9	600	880
Fixed deposits with licensed bank	10	2,229,701	2,229,701
Cash and bank balances		445,354	431,235
		<u>2,675,655</u>	<u>2,661,816</u>
CURRENT LIABILITIES			
Other payables		<u>70,983</u>	<u>84,580</u>
NET CURRENT ASSETS			
		2,604,672	2,577,236
		<u>2,620,875</u>	<u>2,594,364</u>

The accompanying notes are an integral part of the financial statements

**STATEMENT OF INCOME AND EXPENDITURE FOR THE YEAR ENDED
31 DECEMBER 2017**

INCOME	2017	2016
	RM	RM
Entrance fee	1,020	520
Fixed deposits interest income	18,489	34,163
Subscription	20,375	15,384
Sales of publications	13,825	2,277
Geology of Peninsular Malaysia	9,520	-
National Geoscience Conference	20,272	2,210
Working Groups	-	3,000
Geological Evolution of Southeast Asia	1,949	1,304
Others	5,188	-
	<u>90,638</u>	<u>58,858</u>
 EXPENDITURE		
Annual dinner	2,693	8,076
Audit fee	1,200	1,200
Bank charges	69	48
Depreciation on property, plant and equipment	2,125	2,310
Department of geology	106	13,830
Geoscience	-	4,154
Geology of Peninsular Malaysia	-	3,295
Honorarium	19,280	36,911
National Geoscience Conference	-	1,269
Photocopy expenses	173	327
Postages	1,192	3,668
Printing and Stationery		
- Warta Geologi	21,865	8,384
- Bulletin	27,436	-
- Stationery	1,130	-
Professional fee	959	-
Refreshment	1,205	1,104
Speakers' account	4,487	3,418
Sponsorship for student's activities	5,000	1,000
Student's award	-	1,000
Subscription fee	100	-
Miscellaneous expenses	-	2,175
Telefax	-	562
Telephone	-	562
Upkeep of computer	1,802	1,166
	<u>90,822</u>	<u>94,459</u>
 Deficit before tax	(184)	(35,601)
Income tax expense	(824)	-
Net deficit for the year	<u>(1,008)</u>	<u>(35,601)</u>

CASH FLOW STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2017

	2017	2016
	RM	RM
Cash flows from operating activities		
Deficit of income over expenditure for the year	(184)	(35,601)
Adjustments for:-		
Depreciation on property, plant & equipment	2,125	2,310
Interest income	(18,489)	(34,163)
Deficit before working capital changes	<u>(16,548)</u>	<u>(67,454)</u>
Decrease in Geoscience fund	-	(17,609)
Increase in Endowment Fund	11,210	61,413
Decrease in Economic Geology Workshop Fund	-	(3,000)
Decrease / (Increase) in receivables	280	(280)
(Decrease) / Increase in AAPG-UM Student Chapter Fund	(69)	3,151
Increase / (Decrease) in other payables	2,781	(32,958)
Cash generated from / (used in) operations	<u>(2,346)</u>	<u>(56,737)</u>
Tax paid	(824)	-
Interest income	18,489	34,163
Purchase of property, plant and equipment	(1,200)	(2,753)
Net cash generated from / (used in) operating activities	<u>14,119</u>	<u>(25,327)</u>
Net increase / (decrease) in cash and cash equivalents	14,119	(25,327)
Cash and cash equivalents at beginning of the year	2,660,936	2,686,263
Cash and cash equivalents at end of the year	<u>2,675,055</u>	<u>2,660,936</u>
Cash and cash equivalents comprised of:		
Deposits held with licensed banks	2,229,701	2,229,701
Cash and bank balances	445,354	431,235
	<u>2,675,055</u>	<u>2,660,936</u>

NOTES TO THE FINANCIAL STATEMENTS - 31 DECEMBER 2017

1. PRINCIPAL OBJECTIVES

The objective of the Society is to promote the advancement of the geological sciences in Malaysia.

2. ACCOUNTING POLICIES

(a) Basic of Accounting

The financial statements have been prepared under the historical cost convention and comply with applicable Approved Accounting Standards issued by the Malaysian Association Standards Board.

(b) Property, Plant and Equipment

Property, plant and equipment is stated at historical cost less accumulated depreciation. Depreciation on property, plant and equipment is computed on the reducing balance basis calculated to write-off the cost of the assets over their estimated useful lives.

The principal annual rates used are:-

Information technology equipment	20%
Office equipment	10%

The carrying values of the assets are reviewed for impairment when there is an indication that the assets might be impaired. Impairment is measured by comparing the carrying values of the assets with their recoverable amounts.

(c) INVENTORIES

Inventories consists of compass and maps valued at the lower of cost and net realizable value.

(d) INCOME RECOGNITION

Membership subscription is recognised on an accrual basis and customer acceptances.

Income from sale of publications is recognised upon delivery of goods.

Income from organising conference is recognised on received and receivable basis.

Fixed deposits interest income is recognised on an accrual basis.

3. GENERAL FUND

	2017	2016
	RM	RM
At 1 January	917,999	1,453,600
Deficit for the year	(1,008)	(35,601)
Transfer to endowment fund	-	(500,000)
At 31 December	<u>916,991</u>	<u>917,999</u>

Geological Society of Malaysia
52nd Annual General Meeting

PERSATUAN GEOLOGI MALAYSIA
(Registered in Malaysia)

APPENDIX V

3. GENERAL FUND	2017 RM	2016 RM
At 1 January	917,999	1,453,600
Deficit for the year	(1,008)	(35,601)
Transfer to endowment fund	-	(500,000)
At 31 December	<u>916,991</u>	<u>917,999</u>
4. ENDOWMENT FUND	2017 RM	2016 RM
As at 1 January	1,661,310	1,099,897
Add : Fixed deposits interest income	61,210	19,413
	<u>1,722,520</u>	<u>1,119,310</u>
Add : Placement of fixed deposits	-	542,000
Less : Transfer to NGC	(50,000)	-
As at 31 December	<u>1,672,520</u>	<u>1,661,310</u>
5. AAPG-UM STUDENT CHAPTER FUND	2017 RM	2016 RM
As at 1 January	10,957	7,806
Donation	4,422	3,711
	<u>15,379</u>	<u>11,517</u>
Less : Printing and Stationery	314	100
Refreshment	1,177	460
Travelling	3,000	-
As at 31 December	<u>10,888</u>	<u>10,957</u>
6. DRCKL	2017 RM	2016 RM
As at 1 January	-	-
Add : Grants received	155,558	-
	<u>155,558</u>	<u>-</u>
Less : Honorarium	65,000	-
Printing	18,312	-
Workshop	45,816	-
Office expenses	7,615	-
Travelling expenses	5,584	-
Postage	4,367	-
As at 31 December	<u>8,864</u>	<u>-</u>

PERSATUAN GEOLOGI MALAYSIA
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7. MW2C @ UKM	2017	2016
	RM	RM
As at 1 January	-	-
Add : Grants received	133,000	-
	<u>133,000</u>	<u>-</u>
Less : Workshop	24,530	-
Registration fee for conference	36,770	-
Hotel expenses	55,615	-
Miscellaneous expenses	8,571	-
As at 31 December	<u>7,514</u>	<u>-</u>

8. PROPERTY, PLANT AND EQUIPMENT

	Cost			Balance at 31/12/2017 RM
	Balance at 1/1/2017	Additions	Disposal	
	RM	RM	RM	
Information technology equipment	7,831	-	-	7,831
Office equipment	132,175	1,200	-	133,375
	<u>140,006</u>	<u>1,200</u>	<u>-</u>	<u>141,206</u>

	Accumulated depreciation			Balance at 31/12/2017 RM
	Balance at 1/1/2017	Charge for the year	Disposal	
	RM	RM	RM	
Information technology equipment	4,908	584	-	5,492
Office equipment	117,970	1,541	-	119,511
	<u>122,878</u>	<u>2,125</u>	<u>-</u>	<u>125,003</u>

Net Carrying Amount	2017	2016
	RM	RM
Information technology equipment	2,339	2,923
Office equipment	13,864	14,205
	<u>16,203</u>	<u>17,128</u>

9. DEPOSITS AND PREPAYMENT	2017	2016
	RM	RM
Deposits	600	600
Prepayment	-	280
	<u>600</u>	<u>880</u>

10. FIXED DEPOSITS WITH LICENSED BANK

The fixed deposits with licensed bank have a maturity of between 6 to 15 months (2016 : 6 to 15 months). Interest rates for the deposits ranged from 2.85% to 2.95% (2016 : 2.85% to 2.95%) per annum.

GSM ENDOWMENT FUND: BOARD OF TRUSTEES REPORT

GSM ENDOWMENT FUND: BOARD OF TRUSTEES REPORT 52nd ANNUAL GENERAL MEETING OF THE GEOLOGICAL SOCIETY OF MALAYSIA 27 April 2018, Kuala Lumpur

Background

1. The 47th AGM in 2013 confirmed the establishment of the GSM Endowment Fund and endorsed the Terms of Reference prepared by Advocates and Solicitors, Messrs Yeap, Yong and Amy. The AGM also agreed that the Council obtain "tax deductible" status to encourage donations directly into the "GSM Endowment Fund"; (iii) and that the interest portion accrued, be used to meet expenses incurred in the implementation of programmes run by the Society.
2. The 48th AGM in 2014 approved an amendment to the Terms of Reference to provide for the establishment of the "Board of Trustees of the GSM Endowment Fund", whose members shall comprise the GSM President, Immediate Past President, Secretary, Treasurer, Editor and at least three independent Full Members "in good standing", to be appointed at the AGM.
3. Items arising out of the 49th, 50th and 51st AGM that are pending action are as follows:-
 - i. The In-Coming GSM Council be requested to appoint a tax consultant to obtain "tax deductible" status of GSM to inform potential donors on the tax deductible status of their donation;
 - ii. The In-Coming GSM Council be encouraged to increase the principal amount in the GSM Endowment Fund through fund raising activities; and
 - iii. The In-Coming GSM Council to consider transferring a portion of the fixed deposit of the GSM operating account to the Endowment Fund to increase the principal amount.

Report of the Board of Trustees

1. This report covers the period since the 51th AGM to 31 December 2017. The Board of Trustees met to scrutinise the administration of the GSM Endowment Fund on 6 April 2018 at the Geology Department of University of Malaya, Kuala Lumpur. The meeting was chaired by Datuk Fateh Chand. Members in attendance were GSM President, Mr. Abd Rasid Jaapar; Secretary, Dr. Lim Choun Sian; Treasurer, Mr. Ahmad Nizam Hasan; Editor, Prof. Wan Hasiah Abdullah; and GSM Members Dato' Yunus Abd Razak, Prof. Joy Jacqueline Pereira, Dr. Lee Chai Peng and Mr. Ahmad Said.
2. The principal amount now stands at RM 1,591,999.99 with United Overseas Bank Malaysia (UOBM). The principal amount has not been increased by the GSM Council in 2017.
3. A special operating account is also maintained with UOBM to receive the interest accrued from the principal amount. The interest is kept in this GSM current account at UOBM (which is separate from the operational account of GSM at the Standard Chartered Bank Bhd.). The total interest accrued in 2017 is RM 61,211.04. The total accumulated interest as of 31 December 2017 is RM 80,519.81.
4. The sum of RM 50,001.06 of the interest portion accrued was transferred to the GSM operational account at the Standard Chartered Bank Bhd. in 2017. The funds were used to organise the National Geoscience Conference in 2017.

Recommendations to the 52nd AGM of the GSM

The Board of Trustees of the GSM Endowment Fund makes the following recommendation to be considered by the 52nd AGM of the GSM to be held on 27 April 2018:-

- i. The In-Coming GSM Council is requested to appoint a tax consultant to obtain "tax deductible" status of GSM to inform potential donors on the tax deductible status of their donation;
- ii. The In-Coming GSM Council to consider transferring a portion of the fixed deposit of the GSM operating account to the Endowment Fund to increase the principal amount, and to obtain a higher interest.
- iii. The In-Coming GSM Council be encouraged to increase the principal amount in the GSM Endowment Fund through fund raising activities;
- iv. The AGM accept and endorse the Standard Operating Procedure for the GSM Endowment Fund (Revised 6 April 2018); and
- v. The AGM accept and endorse the GSM Council's request for a specific sum to be utilised from the interest accrued in the Endowment Fund for publications and office space rental for 2018.

On behalf of the Board of Trustees, I declare that I am satisfied that the GSM Endowment Fund is being administered in a satisfactory manner and that the terms of reference are adhered to. I hereby approve the report prepared for the 52nd AGM of the GSM.



Datuk Fateh Chand
Chairman
Board of Trustees of the GSM Endowment Fund
Geological Society of Malaysia
6 April 2018



GEOLOGICAL
SOCIETY OF
MALAYSIA

STANDARD OPERATING PROCEDURE – GSM ENDOWMENT FUND (Revised 6 April 2018)

INTRODUCTION

1. The Geological Society of Malaysia's Annual General Meeting in 2012 approved the proposal of the GSM Council to create the "PGCE Endowment Fund" that will be administered by GSM in a separate account, where the principal sum remains in perpetuity with the interest to be used to build capacity in petroleum geoscience.
2. The AGM in 2013 endorsed the Terms of Reference prepared by Advocates and Solicitors, Messrs Yeap, Yong and Amy. The AGM also agreed that (i) "PGCE Endowment Fund" be renamed the "GSM Endowment Fund"; (ii) the Council obtain "tax deductible" status to encourage donations directly into the "GSM Endowment Fund"; (iii) and that the interest portion accrued, be used to meet expenses incurred in the implementation of programmes run by the Society.
3. The AGM in 2014 accepted and endorsed an addition to the Terms of Reference prepared by Advocates and Solicitors, Messrs Yeap, Yong and Amy. The addition is on the establishment of "Trustees of the GSM Endowment Fund", which comprises the President, Immediate Past President, Secretary, Treasurer, Editor and three independent Full Members in good standing, to be appointed at the AGM. Appointment to the Board is for a period of three years and the Chairman of the Board will be appointed by the GSM Council. The Board will meet at least once a year to scrutinise the administration of the GSM Endowment Fund, ensure the terms of reference are adhered to and approve the report prepared for the AGM thereafter.
4. The AGM in 2014 also agreed that the interest portion accrued could be used for the following items:-
 - Book prize and awards for students and geoscientists;
 - Scholarships for education and training;
 - Fellowships for capacity building, research and internships;
 - Honorarium for invited speakers and other contributors;
 - Community service and geoscience education and awareness;
 - Education and training workshops;
 - Organisation of scientific meetings;
 - Publication of scientific material;
 - Subscription and purchase of scientific publications; and
 - Any other activity deemed by the Council to enhance the objectives of GSM.
5. The AGM in 2017 approved the following persons to serve as Trustees of the GSM Endowment Fund:-Datuk Fateh Chand (Chairman); GSM President, Immediate Past President, Secretary, Treasurer and Editor (GSM Council Members); Dato' Yunus Abd Razak, Prof. Joy Jacqueline Pereira, Dr. Lee Chai Peng and Mr. Ahmad Said (GSM Members).

TERMS OF REFERENCE

The Terms of Reference for the GSM Endowment Fund is extracted from the Minutes of the 47th Annual General Meeting (AGM) held on 5 April 2013, Eastin Hotel, Petaling Jaya (Item 6.1: GSM Endowment Fund and Appendix 5).

1. The Geological Society of Malaysia (hereinafter referred to as "the Society") shall maintain a GSM Endowment Fund (hereinafter referred to as "the fund") subject to the approval of a majority of the members of the Society present at the next Annual General Meeting of the Society.
2. If such approval shall be forthcoming, an account shall be opened at an appropriate bank (hereinafter referred to as "the account") for the sum of RM600,000.00 (hereinafter referred to as the "the initial

principal amount"), which shall remain the minimum amount to be kept in the account at all material times. The initial principal amount may be increased at the discretion of the Council Members of the Society, comprising the President, Immediate Past President, Secretary, Treasurer, Editor and three independent Full Members in good standing appointed at any AGM, who will serve in the Board of Trustees of the GSM Endowment Fund, subject to approval of a majority of members present at an Annual General Meeting of the Society. Appointment to the Board is for a period of three years and the Chairman of the Board will be appointed by the GSM Council. The Board will meet at least once a year to scrutinise the administration of the GSM Endowment Fund, ensure the terms of reference are adhered to and approve the report prepared for the AGM thereafter.

3. The fund shall be maintained in perpetuity and shall be overseen by the Council Members of the Society, who shall have the absolute discretion to withdraw the interest portion accruing from the account to meet expenses incurred in the implementation of programmes run by the Society.
4. The Council Members of the Society shall render an account of the fund to all members present at each Annual General Meeting of the Society.
5. The fund shall be subject to an annual audit and the findings reported by the Treasurer of the Society to the members present at each Annual General Meeting of the Society.
6. These Terms of Reference shall be legally binding and incorporated as part of the agenda of every Annual General Meeting of the Society, unless and until a majority of the members of the Society decide otherwise by ballot.

RESPONSIBILITIES (Approved at the 50th AGM held on 29 April 2016)

1. The GSM Council shall maintain at an appropriate bank the sum of RM600,000.00 as the initial principal amount of the GSM Endowment Fund, which shall remain the minimum amount to be kept in the account at all material times.
2. The GSM Council shall maintain the initial principal amount in perpetuity and have the absolute discretion to withdraw the interest portion accruing from the account to meet expenses incurred in the implementation of programmes run by the Society.
3. The GSM Council shall ensure that the annual audited accounts and the findings for the GSM Endowment Fund are reported by the Treasurer of the Society at each AGM.
4. The GSM Council shall prepare a report of the GSM Endowment Fund at each AGM of the Society.
5. The Board of Trustees of the GSM Endowment Fund will meet at least once a year to scrutinise the administration of the GSM Endowment Fund, ensure the terms of reference are adhered to and sign the report prepared for the AGM thereafter. The Chairman of the Board will present the report for approval of the AGM.
6. The Board of Trustees of the GSM Endowment Fund have the discretion to increase the initial principal amount, subject to approval of a majority of members present at an Annual General Meeting of the Society.
7. The GSM Council will appoint the GSM Endowment Fund Chairman for a period of three years, subject to approval of a majority of members present at the AGM. The next appointments are before the AGM of 2020, 2023, 2026, 2029, 2032 etc. The AGM will also approve the appointment of at least three independent Full Members in good standing in 2020, 2023, 2026, 2029, 2032 etc.

NOMINATION COMMITTEE REPORT

NOMINATION COMMITTEE REPORT COUNCIL FOR 2018/2019

Upon the closing of nomination, only single nominations were received for each of the positions of President, Vice President, Secretary, Treasurer, Assistant Secretary and Editor. There were only two nominations for the four 2-year Councillor positions.

President	:	Mr Abd Rasid Jaapar (Geomapping Technology)
Vice –President	:	Dr Che Aziz Ali (UKM)
Immediate Past President	:	Dr Mazlan Madon (Consultant)
Secretary	:	Dr Lim Choun Sian (UKM)
Assistant Secretary	:	Mr Askury Abd Kadir (UTP)
Treasurer	:	Mr Ahmad Nizam Hasan (GeoSolution Resources)
Editor	:	Prof Dr Wan Hasiah Abdullah (UM)
Councillors (1 year) 2017/2019	:	Mr Tan Boon Kong (Consultant) Dr Nur Iskandar Taib (UM) Mr Nicholas Jacob (JKR) Dato' Yunus Abdul Razak (SEADPRI-UKM)
Councillors (2 year)	:	Mr Ahmad Tariq Ahmad Ziyad (Orogenic Resources Bhd) Mohd Hariri Arifin (UKM) vacant vacant

Certified by



.....
Dr Azman Abd Ghani (UM)



.....
Dr Ng Tham Fatt (UM)



.....
Dr Mazlan Madon
Nomination Committee Chairman
30th October 2017

CERAMAH TEKNIK TECHNICAL TALK

A play-based evaluation of a deepwater Sabah exploration area: Prospect maturation and implications for remaining prospectivity

Siti Aishah Abdullah

Date: 11 April 2018

Venue: Bilik Mesyuarat Program Geologi, Bangunan Geologi, FST, Universiti Kebangsaan Malaysia, Bangi

SITI AISHAH ABDULLAH, STEVEN M. BARKER, JOHN JONG, YOSHIAKI WATANABE, DAYANG

AIMI NURAINI AWANG BAKAR, MOHD. ASRAF KHAMIS

JX Nippon Oil & Gas Exploration (Deepwater Sabah) Limited

Abstract: This study presents a play-based evaluation of the southern part of the deepwater NW Sabah fold-thrust belt, a key exploration area in Malaysia. The key objective was adding value to the existing database through an integrated approach. This goal was achieved by analysing four critical geological risk elements: reservoir presence, structural evolution, top seal integrity, and timing of hydrocarbon charge and migration, to identify prospective areas for future exploration by integrating all available geological, geophysical and geochemical information into a consistent petroleum system framework. Using the basin-play-prospect maturation workflow, data spanning the geophysical domain (with inputs such as seismic evaluation, structural mapping and attribute analysis) to the geological realm (such as well correlations, fairway mapping, sedimentological studies, biostratigraphic investigations and source rock maturation modelling), are combined with structural kinematic evolution to generate detailed play-based element maps. The application of the tried and tested play-based evaluation methodology from basin evaluation through to prospect maturation has been carried out. This has led to a comprehensive play element analysis yielding a composite risk segment map within a consistent petroleum system framework. In addition, the study has provided sensible explanations for dry hole analysis, an important reality check, but most importantly it has generated a fresh insight into the overall prospectivity of the study area. This enhanced multi-discipline analysis is beneficial for reducing exploration risk for future expenditure in a time of depressed oil prices that calls for a more innovative approach for deepwater exploration. In summary, integration of available data and the application of new in-house ideas and solid geoscientific knowledge has added value through the generation of increased prospectivity, however for further ground-truthing the real litmus test has to come from future drilling.

Keywords: deepwater Sabah, play-based exploration, petroleum system, risk segment

CERAMAH TEKNIK TECHNICAL TALK

Infrared thermography: Introductory and possible research application

Dr. Fathoni Usman

Date: 18 April 2018

Venue: Bilik Mesyuarat Program Geologi, Bangunan Geologi, FST, Universiti Kebangsaan Malaysia, Bangi

This presentation will deliver the introductory of infrared thermography (IRT) imagery. The IRT is a branch of remote sensing measuring radiant temperature of object's surface. The application of infrared thermography has become part of non-destructive test and evaluation (NDT&E) in industry and its application apparently increase for various small to large scale objects. The measurement of apparent surface radiant temperature gave information on temperature anomalies and condition beneath the investigated object or site. The IRT is not a magical tool which instantly gives result. There are parameters affecting the measurement i.e. emissivity and reflected temperature. On site investigation, the diurnal cycle and angle of view play other roles in the process to get reliable data. Selection of IRT camera will become important for specific investigation tasks. The temperature range, thermal sensitivity and resolution are critical parameters in selecting the thermography camera. In this presentation application of the IRT for NDT&E of shotcrete tunnel lining and other study on rock failure, ground water seepage and slope failure characterization will be presented.



PERSATUAN GEOLOGI MALAYSIA
GEOLOGICAL SOCIETY OF MALAYSIA



NATIONAL GEOSCIENCE CONFERENCE 2018

GEORESOURCES DEVELOPMENT
FOR A SUSTAINABLE FUTURE
Bayview Hotel
Georgetown, Penang
18 - 19 SEPTEMBER 2018

SHORT-COURSE ON ADVANCE BLASTING TECHNOLOGY



FIRST CIRCULAR

ACCOMMODATION
Accommodation is at the participant's own expense. Participants are advised to make early room reservations.

For hotel reservation, please contact the hotel:
Bayview Hotel, Georgetown
Email: bayviewgeorgetown@bayviewhotels.com
Website: <https://bhgp.bayviewhotels.com>

REGISTRATION

Fee (RM)	Conference		Conference & shortcourse
	Members	Non-members	
Participants	650	800	1150
Members	400	550	1300
Students	550	700	850

All intending participants are advised to register early to facilitate the planning of the Conference. Registration fees will cover conference material, lunch and refreshment.

For limited seats only. Save RM50 & register before 15 July 2018.

Payment to be made to the NGC2018 Conference Secretariat (GSM/USM) before 31 August 2018.

Topics/areas of interest (Inexhaustible to) :

- Mineral exploration
- Archaeology
- Geophysics and geochemistry
- Hydrogeology
- Petroleum geology
- Geohazards and engineering geology
- Mining and quarrying
- Geomechanics
- Mineral processing
- Remote sensing
- Geoenvironment

CALL FOR PAPERS

Theme:
**Georesources Development
for a Sustainable Future**

PERSATUAN GEOLOGI MALAYSIA
GEOLOGICAL SOCIETY OF MALAYSIA

NATIONAL GEOSCIENCE CONFERENCE 2018

The Geological Society of Malaysia is pleased to announce that the National Geoscience Conference 2018 (**NGC2018**), 31st of the annual conferences, will be held at the Bayview Hotel, Georgetown, Penang from 18th to 19th September 2018. The Conference is a premier geoscientific event in Malaysia, which is well attended by geoscientists from academia as well as the public and private sectors. NGC2018 is co-organized with the Minerals & Geoscience Department Malaysia (JMG) and Universiti Sains Malaysia, Penang.

Programme

The technical program of NGC2018 consists of oral and poster presentations on all aspects of Geoscience, Environments and Technology related to the theme. Presentations will be delivered by keynote speakers on topics of relevance to the theme and interest to the nation. There will be a one-day post-NGC2018 fieldtrip to Gunung Jerai Geopark, Kedah

As we move forward through the modern era, the practice of science and technology is omnipresent. Knowledge of the earth's systems and processes, together with the application of technology has improved our quality of life through the utilization and management of the earth's natural resources such as rocks, minerals, petroleum, natural gas and groundwater. The use of technology in blasting, geosciences can generate creative and innovative solutions to address current environmental issues. Practical application through these approaches may create new horizon and opportunities that can be adopted for a better future.

Short-course

A One day shortcourse on Advance Blasting Technology is planned on 2nd day of conference. Details will be announced in the next circular.

Fieldtrip

A post-conference fieldtrip to Gunung Jerai Geopark, Kedah and Fort Cornwallis, Sungai Batu & Guar Kepah, Penang is planned. Details will be announced in the next circular.

Deadlines

Full Abstract submission : **1st June 2018**
 Payment/Registration : **15th July – 1st September 2018**
 Full paper submission : **31st July 2018**

For further detail about NGC2018 and Manuscript preparation and submission please visit the following websites :

<http://ngc2018.eng.usm.my>
<http://material.eng.usm.my>
<http://www.gsm.org.my>

Once again, we seek your support to ensure the success of NGC2018. Participants are invited to present papers on original research either in English or Bahasa Malaysia for the Technical Sessions. Contributors may submit more than one paper, however the Organising Committee has the right to select only one paper by any first author for oral presentations, while the rest will be for poster presentations. Please come and share your experiences, ideas and expertise for the benefit of our country and future generations.

Those who would like to present papers are required to submit an extended abstract. The extended abstract should be between 500 to 750 words long, can have up to 3 figures and/or tables and must have at least 3 references. Template for extended abstract should follow the Bulletin of the Geological Society of Malaysia. Abstracts of accepted papers will be distributed to all participants of NGC2018. Full paper will be reviewed and published in the Bulletin of the Geological Society of Malaysia (SCOPIUS).

CONTACT :
ngc2018@usm.my

Conference :

geologicalsociety@gmail.com

Assoc. Prof. Dr. Kamar Shah Ariffin
kamarsha@usm.my (04-5996116)

Dr. Hareyani Zabidi
shhareyani.zabidi@usm.my (04-5996124)

Prof. Dato' Mohd Mokhtar Saidin
mmokh@usm.my

Prof. Mohd Nawawi Mohd Nordin
mnawawi@usm.my

En. Hamdan Ariffin
hamdan@img.gov.my

website : <http://material.eng.usm.my>

Short Course :

Dr. Hareyani Bt. Zabidi
shhareyani.zabidi@usm.my (04-5996124)

Assoc. Prof. Dr. Syed Fuad Saiyid Hashim
msyfuad@usm.my

NEW MEMBERSHIP

Full Membership

1. Abdul Hadi Hashim
2. Harry Doust
3. Nor Syazwani Zainal Abidin
4. Nur Hidayah Johar
5. Nur Huda Mohd Jamin
6. Nurul Aida Mohd Ghazali
7. Rodziah Rejab

Associate Membership

1. Fauzul Azim Zainal Abidin
2. Philip Lesslar

Student Membership

1. Ajhmal Abd Razak
2. Chang Shen Chang
3. Hazimah Haspi Harun
4. Low Kean Hong
5. Mark Jinmin
6. Mohamad Arif Che Abd Rahim
7. Muhammad Nazrin Abd Hamid
8. Muhammad Taquiuddin Zakaria
9. Mutari Lawal
10. Sumiita Devi Panirselvan
11. Tajudeen Olugbenga Adeeko

CHANGE OF ADDRESS

Allan Filipov
EMGS,
Suite 7.2, 7th Floor, East Wing,
Rohas Pure Circle, No. 9, Jln. P. Ramlee,
50250 Kuala Lumpur, Malaysia

Alsharef Abdassalam Albaghdady
P.O. Box 82975,
Central Post Office,
Azzawia Street,
Tripoli, Libya

Badee Abdulqawi Hamood Alshameri
13, Jalan Melewar 3, Taman Melewar,
86400 Parit Raja, Batu Pahat,
Johor, Malaysia

David A. Stanbrook
Murphy Exploration & Production Company,
9805 Katy Freeway,
Suite G-200,
Houston, Texas 77024,
USA

Faridah Hanim Abu Bakar
B-03-06, Taman Cahaya Apartment,
Jalan Cahaya 14,
68000 Ampang,
Selangor

Kazuo Nakayama
c/o Fukada Geological Institute,
2-13-12 Honkomagome,
Bunkyo-ku,
Tokyo 113-0021

Lee Kiun You
No. 1, Lorong Albion 3,
Taman Albion,
Jalan Pulutan, Menggatal,
88450 Kota Kinabalu,
Sabah

Mohd Shafeea Leman
45, Jalan Kajang Jaya,
Taman Kajang Jaya,
43000 Kajang, Selangor

ADDRESS WANTED

1. David Gordon Bowen

UPCOMING EVENTS

August 12-17, 2018: Goldschmidt 2018, Boston, Massachusetts, US. More information can be obtained from <https://goldschmidt.info/2018/>.

August 13-14, 2018: 1st International Conference on Geosciences (ICG), under the banner of World Engineering, Science and Technology Congress (ESTCON 2018), Kuala Lumpur, Malaysia. Further information at: <http://estcon.utp.edu.my/icg>.

August 13-14, 2018: 5th International Conference on Geological and Environmental Sustainability, Bali, Indonesia. More details at <https://geology.conferenceseries.com/>.

August 13-17, 2018: “Mineral Evolution and Mineral Ecology: Changes in Species Diversity and Complexity in Space and Time” at XXII International Mineralogical Association meeting, Melbourne, Australia. More details at <https://www.ima2018.com/>

August 19-22, 2018: Conjugate Margins Conference, Halifax, Nova Scotia. Visit <http://conjugatemargins.com/2018/> for more information.

August 20-21, 2018: Asia Petrochemical Industry Conference (APIC 2018), Kuala Lumpur, Malaysia. Details at: <http://www.apic2018.org.my/>.

August 22-23, 2018: Latin America & Caribbean Region Energy Opportunities Conference & Exhibition, Cartagena, Columbia. Questions can be addressed to: AAPG Latin America and Caribbean Office, +571.551.1182 – Colombia, +1.281.886.8625 – USA.

August 27-30, 2018: Offshore North Sea Conference (ONC), Stavanger, Norway. Visit website at: <http://www.ons.no/> for information.

August 29-30, 2018: Machine Learning & AI Upstream Onshore Oil & Gas 2018, Houston, Texas. Details at www.machinelearning-ai-upstream-congress.com.

September 5-6, 2018: AAPG Energy Transition Forum – A New Era in Geoscience, Amsterdam, The Netherlands. Visit website: <https://energytransition.aapg.org/2018/About/About-the-Conference> for further details.

September 6-8, 2018: GEO India, Noida, India. Further information is available at: <http://www.apgindia.org/geo-india-2018>.

September 12-13, 2018: International Conference on Oil & Gas, Singapore. Visit <https://oil-gas.pulsusconference.com/> for more details.

September 17-19, 2018: 10th Asia Pacific Congress on Oil and Gas Conference & Exhibition, Beijing, China. Contact: Conferenceseries Ltd., Tel: +1 650 889 4686, oilandgas@enggconferences.com or visit <http://oil-gas.chemicalengineeringconference.com>

September 18-19, 2018: National Geoscience Conference, Penang, Malaysia. Visit websites: <http://ngc2018.eng.usm.my> or <http://www.gsm.org.my> for further information.

September 18-20, 2018: 5th Annual Well Site Facilities Onshore Summit 2018, Houston, Texas. Visit <http://www.facilities-design-onshore.com/> for more details.

September 27-28, 2018: Back to the Future - the Past and Future of Oil and Gas Production in the Asia Pacific Region Conference, Bangkok, Thailand. Contact Programs Manager, AAPG Asia Pacific Region, Tel. No. +65 96536728 for information.

September 27-28, 2018: World Congress on Oil, Gas and Petroleum Refinery, Abu Dhabi, UAE. Details at: <https://petroleumrefinery.conferenceseries.com/media-partner.php>.

October 1-5, 2018: Short course on Application of Diffusion Studies to the Determination of Timescales in Geochemistry and Petrology, Ruhr-Universitaet Bochum, Germany. More details are provided at <http://www.gmg.rub.de/petrologie/>

October 10-11, 2018: Seismic Characterisation of Carbonate Platforms and Reservoirs Conference, London, UK. Contact email address: georgina.worrall@geolsoc.org.uk.

October 10-12, 2018: 9th International Conference on Asian Marine Geology (ICAMG-9), Shanghai. Visit <https://icamg-9.tongji.edu.cn> for further details.

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