Sutton Forest Quarries Pty Ltd

ABN 66 158 999 994

Geology and Resource Estimates

Specialist Consultant Studies Compendium

Volume 2, Part 9

Prepared by

Graham Lee & Associates Pty Ltd

June 2016

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ABN 66 158 999 994

Geology and Resource Estimates

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Ref No: GLA2016-01

June 2016

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REPORT No GLA2016-01

FRIABLE SANDSTONE DEPOSIT INVESTIGATION

WITH RESOURCE ESTIMATES

NEAR SUTTON FOREST

NSW

Report Prepared For Sutton Forest Quarries Pty Ltd

Graham Lee
BSc, FAusIMM, CP (Geo)
June 2016

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BACKGROUND

A preliminary report on this Proposal was prepared for the client in 2013, the results and findings from it have been incorporated into this updated 2016 report. This document is intended for company internal purposes, rather than for investment decision making. It aims to provide a complete geological data compilation for: technical assessment, project planning and implementation, and other internal company operations.

The document has been prepared by a competent person with more than 5 years relevant experience in construction materials, and in similar styles of mineral occurrence to that encountered at Sutton Forest. All estimates in this document are reported under the JORC Code 2012, however Table 1 of the Code has been omitted from this document.

EXECUTIVE SUMMARY

A nine hole drilling programme was conducted in two phases on a proposed friable sandstone extraction site located on the western side of the Hume Highway near Sutton Forest, south of Moss Vale, NSW.

Drilling in 2012 comprised three diamond core holes totalling 130.5m and four open holes totalling 147.7m. Later, in 2015 two more holes were drilled, each as an open hole to the approximate elevation at the end of hole of the previously drilled holes and then cored to the base of the Hawkesbury Sandstone unit for a total of 116.2m, of which 58.9m was cored. All holes are located within the area defined as having potential for development of an extraction pit.

The core drilling gave satisfactory results, with the main short-coming being core losses in zones associated with the most friable sandstone and loose sand intervals.

The open hole drilling was not as well suited to this deposit, particularly once the groundwater table was intersected. While sample recovery was generally satisfactory above the water table, there is potential for sample contamination in these uncased holes. Below the water table, sample recovery was quite variable and significant contamination was likely, demonstrated by the sample volume variations and the need to inject additional water in order to effectively clear the hole as drilling advanced. Results from testing of the open drill hole samples showed:

i) in all four open holes there is a trend to samples generally being finer with depth; and

ii) the drilling seems to have preferentially lifted smaller particles, especially -0.075mm grains; with the coarser particles not coming to the surface in the return air stream. It is also possible that some coarser particles were broken by the bit during drilling.

Testing of 17 samples from the 2012 core determined the bulk density of the sandstone to be 2.25t/m^3; this was rounded to 2.2t/m^3 for resource estimation.

The Sutton Forest resource is contained within a pit outline covering approximately 47ha to which is added sandstone to be recovered from the wash plant site earthworks (12ha). Within this outline, the sandstone resources have been classified as Indicated Resources. The estimates are presented in **Table 1.1** for each 10m bench within the proposed pit.

Based on the core drill hole lithology logs and tested samples, after making allowances for rejection of lump ironstone (2.5%), and the clay/shale (1.4%) the yield sandstone+sand+core loss = 96%. The Indicated Resource of raw sandstone within both the defined extraction pit to an elevation of 630m AHD and wash plant site is estimated to be **37 million tonnes**.

Washed size grading tests were completed on 15 samples of core from the 2012 drilling after light crushing to liberate the grains, and also on 15 samples of open hole cutting samples. In 2016, core from SFQDDH4 was tested by washed size grading in 24 x 1m intervals, while core from the earlier drilled SFQ-DDH1 (44 x 1m) and SFQ-DDH3 (31 x 1m) was also tested. This was followed in 2016 by size gradings on 5m washed composite (‘product’) samples, and particle density + water absorption tests on the same 5m composites from SFQ-DDH1 (9 x 5m), SFQ-DDH3 (6 x 5m), and SFQ-DDH4 (5 x 5m).

From the core test data, both raw sand and ‘product’ sand mean size gradings are presented for the Indicated Resources in the deposit. Results are summarised in **Table 1.2**.

Table 1.1
Total Raw Sandstone Resource Estimates

Bench (m AHD)	Sandstone (Inc FeStone+ Clay/Shale) (m^3)	Density (t/m^3)	Sandstone (Inc FeStone+Clay/Shale) Tonnes (t)	Sandstone Less Fe Stone & Clay/Shale (%)	Sandstone Less Fe Stone & Clay/Shale (t)
700-710	78 825	2.2	173 415	96.0	166 478
690-700	564 325	2.2	1 241 515	96.0	1 191 854
680-690	2 097 500	2.2	4 614 500	96.0	4 429 920
670-680	2 639 900	2.2	5 807 780	96.0	5 575 469
660-670	2 901 050	2.2	6 382 310	96.0	6 127 018
650-660	2 965 125	2.2	6 523 275	96.0	6 262 344
640-650	2 816 050	2.2	6 195 310	96.0	5 947 498
630-640	2 582 125	2.2	5 680 675	96.0	5 453 448
Sub-Total	**16 644 900**				
Less Soil	**590 000**				
Total	**16 194 400**	**2.2**	**35 627 680**	**96.0**	**34 202 573**
Sandstone (Rounded)			**36 Million**		**34 Million**

Table 1.2
Average Raw and Product Size Gradings for Core Samples
(% Passing – Data Used for Resource Estimation)

Aperture (mm)	**+6.7mm Lumps**	**6.7**	**4.75**	**2.36**	**1.18**	**0.600**	**0.425**	**0.300**	**0.150**	**0.075**
Raw										
SFQ-DDH1 (2012)	3	97	96	93	88	78	61	41	20	14
SFQ-DDH2 (2012)	3	97	96	93	87	75	57	37	19	14
SFQ-DDH3 (2012)	3	97	96	94	89	80	66	43	19	13
SFQ-DDH4 (2016)	0	100	97	88	73	46	29	16	8	5
Average	*2.3*	*97.8*	*96.3*	*92.0*	*84.3*	*69.8*	*53.3*	*34.3*	*16.5*	*11.5*
Product (all -6.7 + 0.075mm)										
SFQ-DDH1 (2012)Calculated	0	100	99	95	89	77	57	33	7	0
SFQ-DDH2 (2012)Calculated	0	100	99	95	88	74	52	28	5	0
SFQ-DDH3 (2012)Calculated	0	100	99	96	91	80	63	36	7	0
SFQ-DDH4 (2016)	0	99	97	87	72	45	27	13	3	0
Average	*0.0*	*99.8*	*98.3*	*93.4*	*84.9*	*68.8*	*49.6*	*27.2*	*5.8*	*0.0*

From the size grading of the raw sandstone in **Table 1.2,** the wash plant losses will be: 2.3% oversize (+6.7mm) and 11.5% fines (-0.075mm) for a total estimated recovery of 86.2% after screening and washing. Presented in **Table 1.3** is the expected product sand resource estimate.

Table 1.3
Product Sand Resource Estimate
(Assuming all +6.7mm and –0.075mm material is removed)

	Raw sandstone (t)	**Expected % Yield**	**Product (Million t)**	**Sand Product Rounded**
Sand	34 202 573	86.2	29 482 618	29 Mt
Waste		13.8	4 719 955	
Total		100	34 202 618	

The Sutton Forest sandstone resource within the defined proposed extraction pit area is well suited to the production of fine-grained concrete aggregates as defined by AS2758.1. From this investigation, it is concluded that a raw sandstone resource comprising of approximately 37 million tonnes (including grey shale at 650mAHD) occurs within the proposed pit. After rejecting ironstone and other clay/shale materials, the raw sandstone available for wash plant feed will be approximately 34 million tonnes. With a wash plant yield of 86.2% the resources will produce in the order of 29 million tonnes of sand. Extraction waste and wash plant rejects will comprise a total of approximately 7.7 million tonnes to be placed into the pit void as backfill.

1. INTRODUCTION

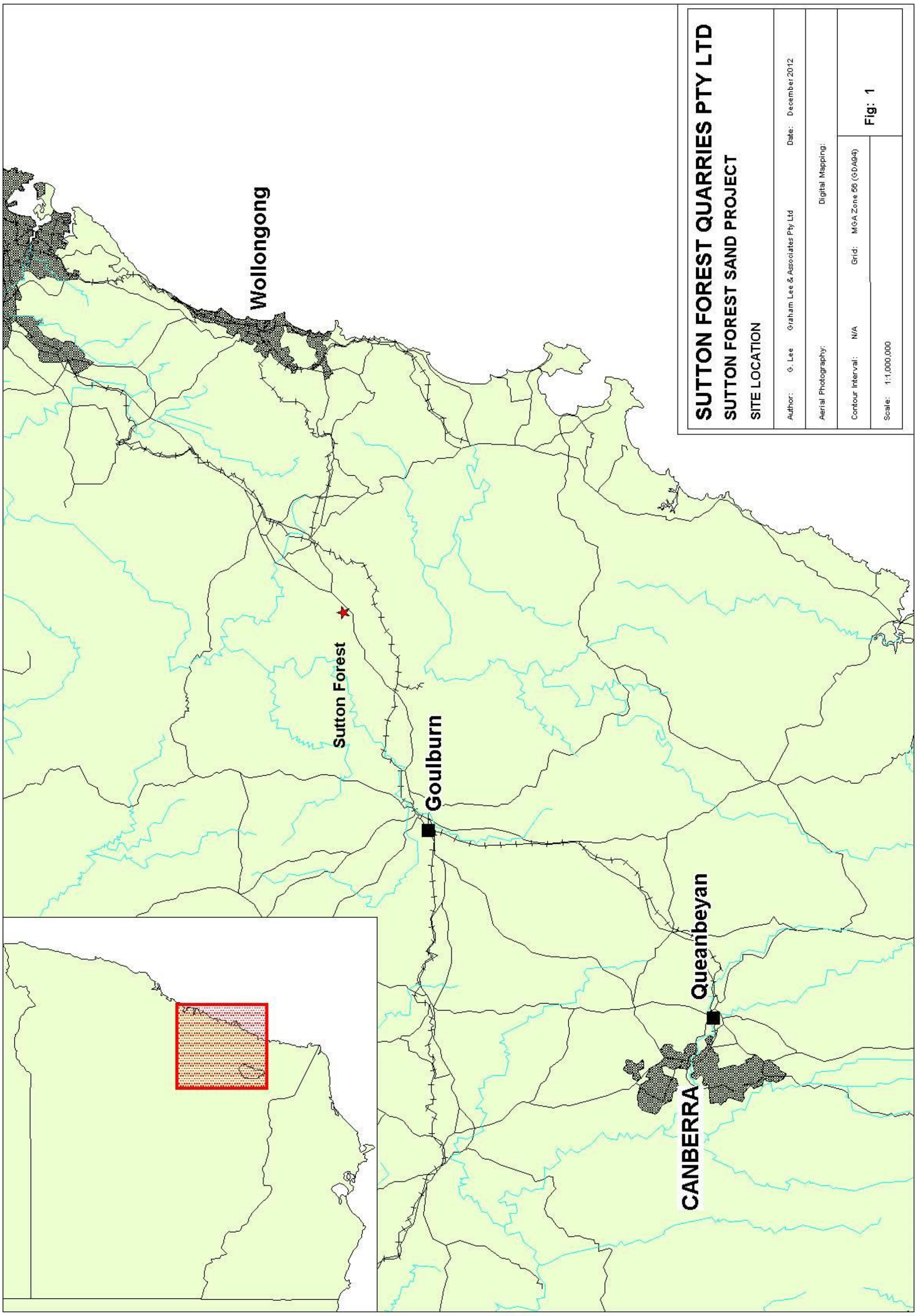
Sutton Forest Quarries Pty Ltd (SFQ) is investigating the feasibility of producing sand from a property on the western side of the Hume Highway near Sutton Forest, in the Southern Highlands of NSW. The site is located about 20km south of Moss Vale, see **Figure 1**.

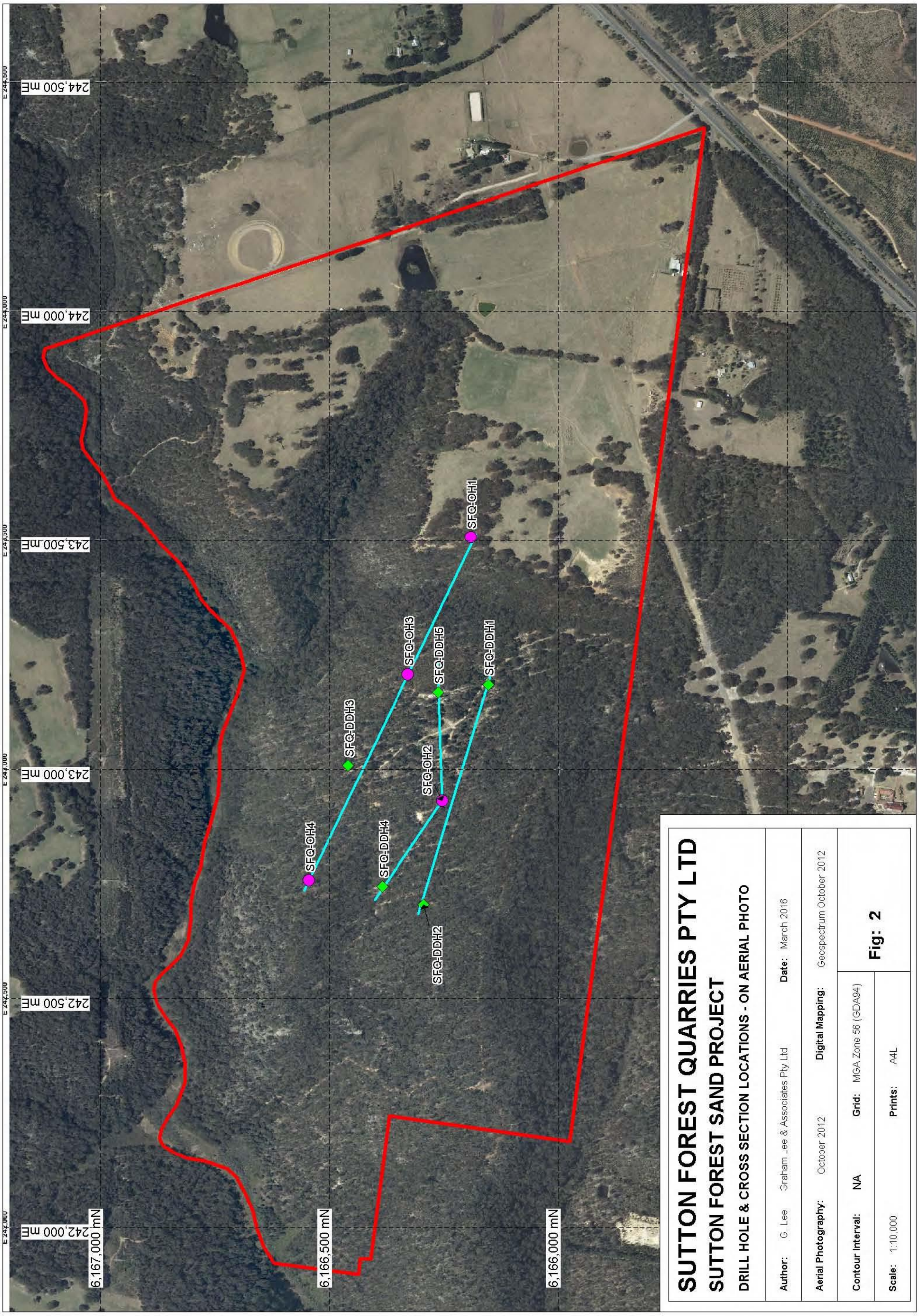
The property ‘The Farm’ (Lot 4 DP 253435), is a private landholding, located within the catchment of Long Swamp Creek which drains generally in a westwards direction from the Hume Highway, initially into Paddys River and then into the Wollondilly River.

The proposed extraction area on the property is sited on the ridge system along the southern side of Long Swamp Creek and generally above the 660m contour. Long Swamp Creek adjacent to the proposed extraction area occurs at elevations of approximately 620m AHD to 625m AHD, i.e. 5m to 10m below the proposed base of extraction within the extraction area. Most of the extraction area has previously been cleared and is now vegetated with native re-growth, and in the eastern-most part of the Site is cleared grazing land. A small previous extraction pit is located near the southern boundary of the property and this area now comprises a slightly undulating floor containing a small dam. A natural gas pipeline and water supply pipeline are located in an easement crossing the south-eastern corner of the property and therefore restrict extraction and development in this part of the property.

The proposed extraction pit covers an area of 47ha. Adjacent to the eastern end of the pit a wash plant will be constructed covering an area of 12ha and from this site some sandstone will be recovered during the initial site development and stockpile for later feed to the wash plant.

Two drilling investigations were conducted in order to gain an understanding of the distribution and quality of the friable Hawkesbury Sandstone forming the potential resource, and which it is proposed will provide the future raw feed for a wash plant. The first drilling was carried out between 9 October and 11 November 2012 and was supervised by the writer; while the second drilling was undertaken in 2015 under the direction of a potential equity partner. **Figure 2** presents an aerial photograph showing the boundary of the property and the locations of the drill holes.


SUTTON FOREST QUARRIES PTY LTD
SUTTON FOREST SAND PROJECT
SITE LOCATION
Author: G. Lee Graham Lee & Associates Pty Ltd
Date: December 2012
Aerial Photography:
Digital Mapping:
Contour Interval: N/A
Grid: MGA Zone 56 (GDA94)
Scale: 1:1,000,000
Fig: 1
Wollongong
Sutton Forest
Goulburn
Queanbeyan
CANBERRA


244,500 mE
244,000 mE
243,500 mE
243,000 mE
242,500 mE
242,000 mE
6,167,000 mN
6,166,500 mN
6,166,000 mN
SFQ-OH1
SFQ-OH2
SFQ-OH3
SFQ-OH4
SFQ-DDH1
SFQ-DDH2
SFQ-DDH3
SFQ-DDH4
SFQ-DDH5
SUTTON FOREST QUARRIES PTY LTD
SUTTON FOREST SAND PROJECT
DRILL HOLE & CROSS SECTION LOCATIONS - ON AERIAL PHOTO
Author: G. Lee Graham Lee & Associates Pty Ltd
Date: March 2016
Aerial Photography: October 2012
Digital Mapping: Geospectrum October 2012
Contour Interval: NA
Grid: MGA Zone 56 (GDA94)
Scale: 1:10,000
Prints: A4L
Fig: 2

2. GEOLOGY

2.1 REGIONAL GEOLOGY

The sandstone resources on the property belong to the Hawkesbury Sandstone deposited during the Triassic Period (199 to 252 million years ago). Hawkesbury Sandstone is the predominant sandstone unit outcropping in the region surrounding Sydney. In some locations, the Hawkesbury Sandstone does have lenses of pale to dark grey shale interbedded within the generally massive sandstone.

In the south-western parts of the Sydney Basin, close to the margin of the depositional basin, strata is often thin and the Hawkesbury Sandstone directly, and unconformably, overlies either the Illawarra Coal Measures or the Shoalhaven Group. In the area surrounding the property, the Narrabeen Group sediments and all, or the top part, of the Illawarra Coal Measures do not exist.

2.2 SITE GEOLOGY

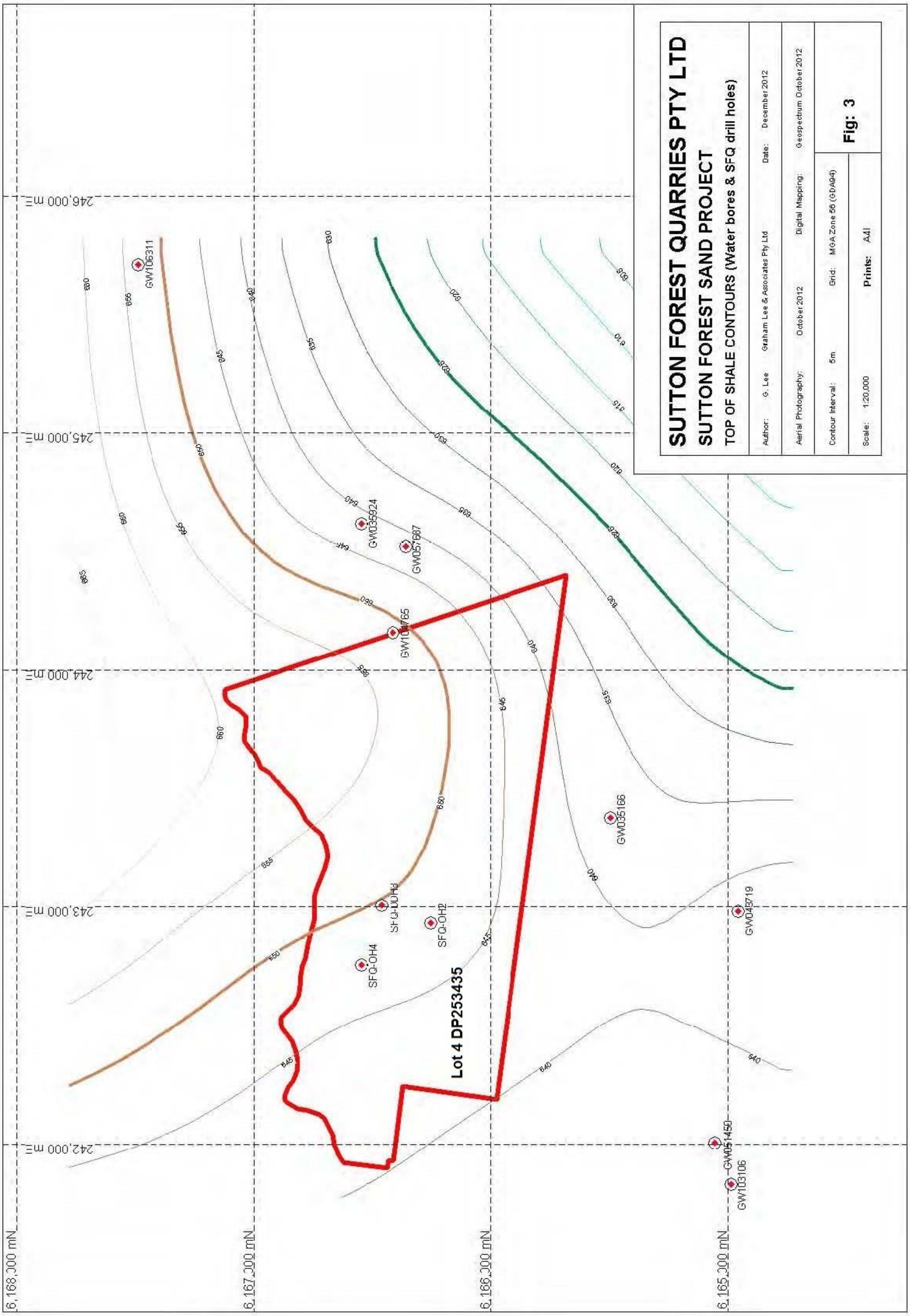
Proposed sandstone extraction will be from the friable Hawkesbury Sandstone, along a relatively flat plateau and adjoining ridge line areas.

Based on the diamond drilling, the Hawkesbury Sandstone comprises friable variously pale-coloured sandstones and clayey sands, and thin pale greyish coloured clay, with darker grey shale interbedded at the bottom of some of the drill holes.

Examining the logs available from nearby water bores that have intersected a grey shale unit, together with the three drill holes on the property that also intersected grey shale, a contour plan for the top of the shale has been prepared. This is presented as **Figure 3**. It shows the top of the shale to be dipping to the south with the axis of a gentle south plunging anticline structure located just east of the drilled area. Some of the water bores do not record a shale intersection and this may be due to either a deficiency in the bore logging, or that the shale does not occur at the site of these bores; while some of the recently completed drill holes for SFQ also have not interested the grey shale unit, thereby reflecting the often localised lensoidal nature of the shale unit.

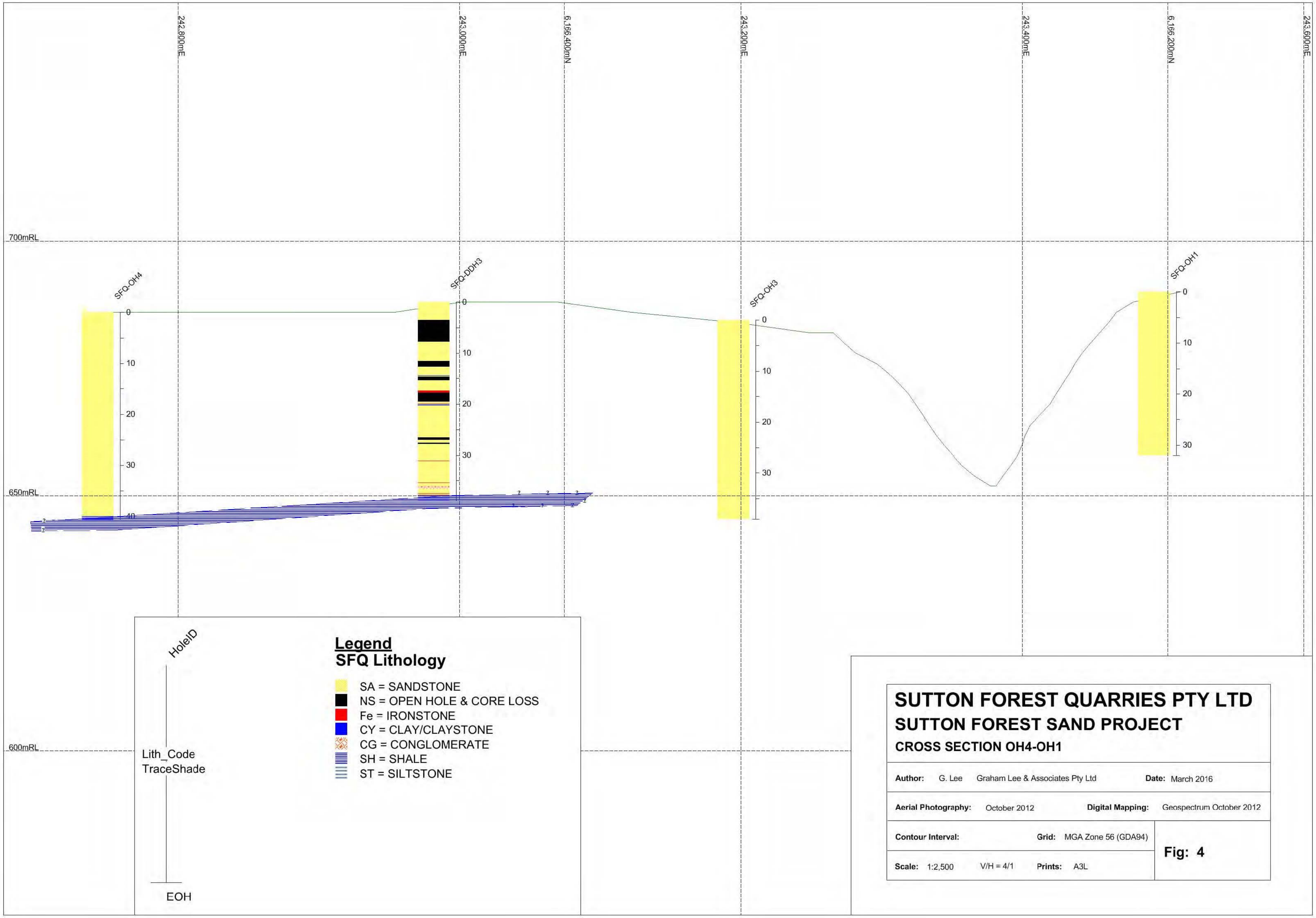
In preparing **Figure 3**, some options were examined, both including and excluding the drill holes on the property, i.e. water bores only, and water bores plus SFQ drill holes. Both of these options showed similar trends with a southerly dip for the top of the shale unit. When the SFQ drill holes were included only the details changed, but the contoured depths remained substantially the same.

This grey shale unit is also shown on the cross sections (**Figures 4, 5** and **6**) for the three SFQ drill holes that intersected it. These cross sections also record that drill holes SFQ-DDH1, SFQ-DDH2, and SFQ-OH3 all failed to penetrate into the top of the shale unit intersected in other nearby holes, and thus if this shale exists at these locations it must be deeper than the end of these holes. The implication is that either; the shale unit only fills the low parts of a meandering stream, or that the surface between the shale and the sandstone is an unconformable erosion surface with significant relief in the order of 5m, or more. There is no evidence in the SFQ drill core to suggest that a significant unconformity exists, and thus deposition in a meandering stream is the most likely explanation for the occurrence of this shale unit.


SUTTON FOREST QUARRIES PTY LTD
SUTTON FOREST SAND PROJECT
TOP OF SHALE CONTOURS (Water bores & SFQ drill holes)
Author: G. Lee Graham Lee & Associates Pty Ltd
Date: December 2012
Aerial Photography: October 2012
Digital Mapping: Geospectrum October 2012
Contour Interval: 5m
Grid: MGA Zone 56 (GDA94)
Scale: 1:20,000
Prints: A4l
Fig: 3
Lot 4 DP253435
246,000 mE
245,000 mE
244,000 mE
243,000 mE
242,000 mE
6,168,000 mN
6,167,000 mN
6,166,000 mN
6,165,000 mN
GW106311
GW035924
GW057687
GW104765
GW035166
GW043719
GW051450
GW103106
SFQ-DDH3
SFQ-DH2
SFQ-DH4

It is therefore suggested, that the grey shale unit fills the low areas in such a meandering stream that is surrounded along the sides by higher sand deposits forming banks that now present as a vertically continuous sandstone sequence in drill holes.

Drill holes SFQ-DDH 4 and SFQ-DDH5 both intersected the grey siltstone at the top of the Permian Berry Formation as shown on the cross-section **Figure 6**. The uppermost 0.3m of the Berry Formation in both holes comprises a siltstone with numerous 1-2mm small cavities and showing bioturbation which largely obliterates the bedding; this is interpreted as being a paleo-soil horizon. Overlying the Berry Formation is a sequence of coarse-grained sandstone and quartz pebble conglomerate with particles generally to about 50mm maximum diameter. The Triassic Hawkesbury Sandstone (deposited 247 to 242 million years ago) shows little evidence of any erosion along the contact with the top of the older Berry Formation (deposited 265 million years ago) even though there is a time gap of some 18 million years. Based on the information presented in **Figure 6,** the top of the Berry Formation has an apparent dip at a low angle (approx. 0.5°) to the south.


242,800mE
243,000mE
6,166,400mN
243,200mE
243,400mE
6,166,200mN
243,600mE
700mRL
650mRL
600mRL
SFQ-OH4
SFQ-DDH3
SFQ-OH3
SFQ-OH1
Legend
SFQ Lithology
SA = SANDSTONE
NS = OPEN HOLE & CORE LOSS
Fe = IRONSTONE
CY = CLAY/CLAYSTONE
CG = CONGLOMERATE
SH = SHALE
ST = SILTSTONE
HoleID
Lith_Code
TraceShade
EOH
SUTTON FOREST QUARRIES PTY LTD
SUTTON FOREST SAND PROJECT
CROSS SECTION OH4-OH1
Author: G. Lee Graham Lee & Associates Pty Ltd
Date: March 2016
Aerial Photography: October 2012
Digital Mapping: Geospectrum October 2012
Contour Interval:
Grid: MGA Zone 56 (GDA94)
Scale: 1:2,500 V/H = 4/1
Prints: A3L
Fig: 4

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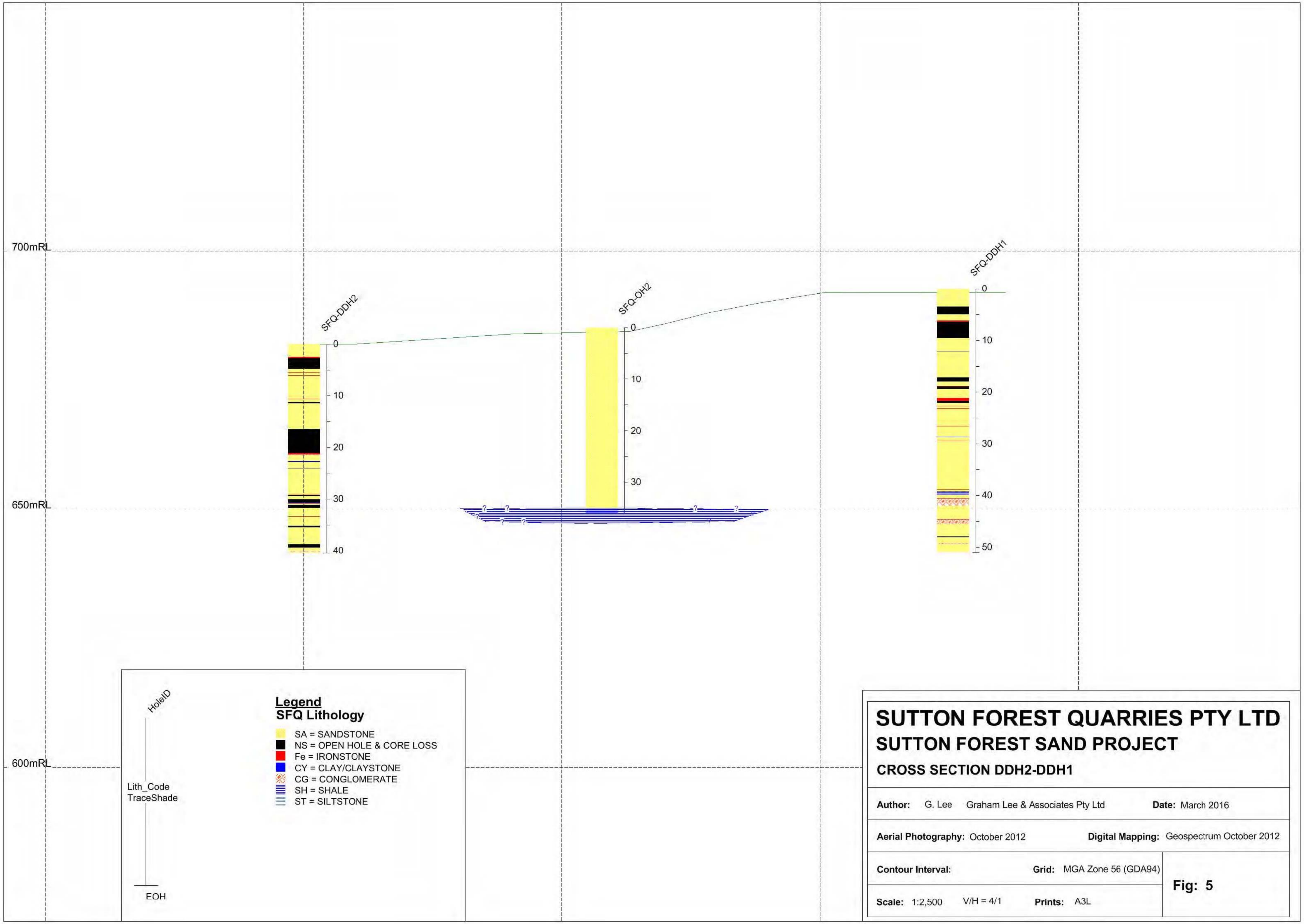

SUTTON FOREST QUARRIES PTY LTD

SUTTON FOREST SAND PROJECT

CROSS SECTION DDH2-DDH1

Author: G. Lee Graham Lee & Associates Pty Ltd	**Date:** March 2016	
Aerial Photography: October 2012	**Digital Mapping:** Geospectrum October 2012	
Contour Interval:	**Grid:** MGA Zone 56 (GDA94)	**Fig: 5**
Scale: 1:2,500 V/H = 4/1	**Prints:** A3L	

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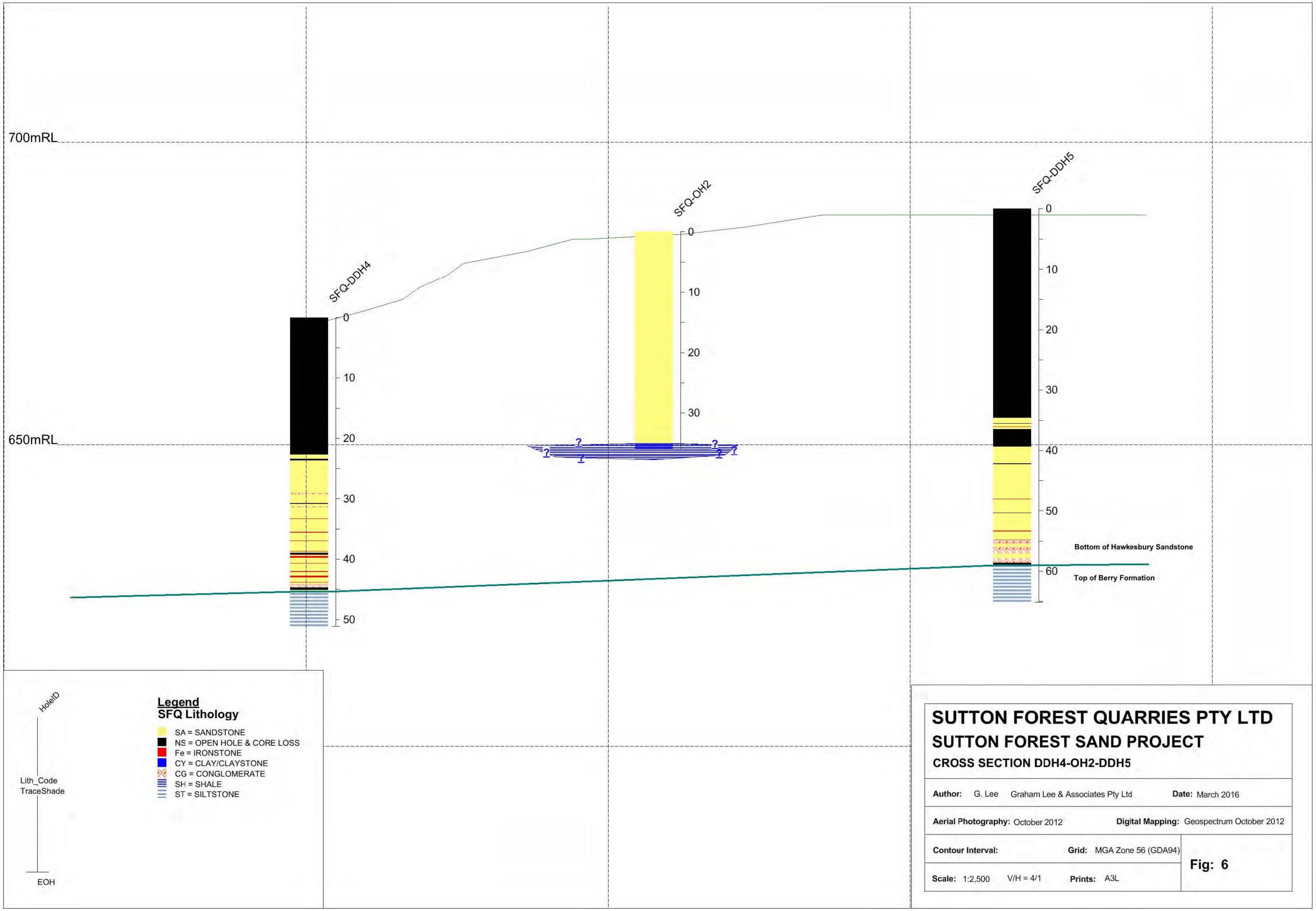
700mRL
650mRL
SFQ-DDH4
SFQ-OH2
SFQ-DDH5
0
10
20
30
40
50
60
Bottom of Hawkesbury Sandstone
Top of Berry Formation
HoleID
Lith_Code
TraceShade
EOH
Legend
SFQ Lithology
SA = SANDSTONE
NS = OPEN HOLE & CORE LOSS
Fe = IRONSTONE
CY = CLAY/CLAYSTONE
CG = CONGLOMERATE
SH = SHALE
ST = SILTSTONE
SUTTON FOREST QUARRIES PTY LTD
SUTTON FOREST SAND PROJECT
CROSS SECTION DDH4-OH2-DDH5
Author: G. Lee Graham Lee & Associates Pty Ltd
Date: March 2016
Aerial Photography: October 2012
Digital Mapping: Geospectrum October 2012
Contour Interval:
Grid: MGA Zone 56 (GDA94)
Scale: 1:2,500 V/H = 4/1
Prints: A3L
Fig: 6

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3. PREVIOUS INVESTIGATIONS

There have been no previous geological investigations conducted into the friable sandstone resources occurring on the property near Sutton Forest.

Prior to the investigations, there has been some sand extraction from a site adjacent to the southern boundary of the proposed new operating pit. This old pit covers an area of approximately 2ha and has maximum face height of about 10m; and based on an assumed former surface a rough estimate by this writer is that it probably produced in the order of 150,000 tonnes of sand. However, there is no record of the actual sand quantity removed, or the purpose for which this sand was used.

4. INVESTIGATIONS

4.1 SURVEY

The approximate drill hole collar positions were located prior to drilling using a hand held GPS and the sites were marked on the ground. All collars were surveyed using Map Grid of Australia (MGA) co-ordinates and the GDA94 datum.

Prior to drilling, the sites were subjected to archaeological and flora studies, and where necessary they were shifted to avoid adverse impacts upon either Aboriginal heritage sites or threatened plants or ecological communities.

Upon completion of all drilling, the actual collars were surveyed again using a hand held GPS with horizontal accuracy generally better than +/-10m, which based on past survey comparison data is mostly better than +/-5m. Collar elevations were taken from contoured project photogrammetry and contour mapping. Survey results are included in **Appendix 1**.

Collar locations and the total depth of the drill holes are listed in **Table 4.1**. **Figure 2** shows collar locations overlain onto an aerial image background.

Table 4.1
Summary of Drill Holes

DRILL HOLE	TOTAL DEPTH (m)	MGA Zone 56 mE	MGA Zone 56 mN	COLLAR RL (m AHD)
SFQ-DDH1	51.1	243185	6166154	692.7
SFQ-DDH2	40.5	242705	6166295	682.0
SFQ-DDH3	38.9	243009	6166460	688.0
SFQ-DDH4	65.1	242745	6166385	671.0
SFQ-DDH5	51.1	243168	6166263	689.0
SFQ-OH1	32.0	243507	6166192	690.0
SFQ-OH2	36.0	242932	6166254	685.2
SFQ-OH3	39.0	243207	6166329	684.5
SFQ-OH4	40.7	242758	6166545	686.0

4.2 2012 DRILLING

Drilling was undertaken by Southern Tablelands Drilling from Berrima, NSW. The drill used was a Pioneer Mole rig, see **Photograph 1**. The same rig was used for both coring and open holes. The contractor was selected and commissioned by SFQ. Operations commenced on 9 October and were completed on 11 November 2012.

Diamond coring was undertaken using an HQ3 bit and triple tube core barrel. All core recovered was boxed, logged, and photographed.

Open hole drilling used a 99mm OD polycrystalline diamond button bit, which is shown in **Photograph 2**. Cuttings returned to the surface through a T piece set into the hole collar and were collected into a cyclone before bagging.

Photograph 1 Pioneer Mole rig during diamond core drilling at Sutton Forest

Photograph 2 PCD button bit used for open hole drilling at Sutton Forest

Conventional circulation was used for the open hole drilling, which means that the cuttings returning from the face of the hole came to the surface outside of the drill string and could abrade and/or coat the friable sandstone exposed on the sides of the hole. For gross lithology changes (such as determining sandstone and shale boundaries) the drilling method and samples were adequate, but for determining sand quality, the samples were of variable usefulness.

Generally, there was a small amount of contamination from the sides of the hole for samples collected above the water table; however, once water was encountered in the hole it became necessary to inject additional water in order to advance the hole and the samples returned were mostly quite contaminated. In summary, from above the water table samples were of fair to good quality; while from below the water table they were poor quality in terms of being representative of the interval that had been drilled and being useful for determining sand quality. Further comment on drilling is made later in Section 7 Discussion in regards to test sample results for the open hole samples.

The writer of this report supervised drilling and logged all samples recovered from the 2012 holes.

4.3 2015 DRILLING

The 2015 drilling was also conducted by Southern Tablelands Drilling using the same rig and set up as was employed in 2012. Operations commenced on 27 January and were completed on 13 February 2015. Supervision was undertaken by Benedict Sands Pty Ltd (Mittagong Sands Pty Ltd) under an agreement with Sutton Forest Quarries Pty Ltd. Subsequent to the drilling, the writer was later engaged by Sutton Forest Quarries Pty Ltd to log the cores from the 2015 drilling and to prepare an updated report incorporating all of the new information including the laboratory analysis of drill hole samples.

The two 2015 diamond cored holes (SFQ-DDH4 and SFQ-DDH5) were drilled as open holes (using a PCD bit) to the approximate elevation at the end of the three previously drilled diamond cored holes and then were drilled using a HQ3 core barrel to the end of hole.

4.4 DATA COMPILATION

Data generated from both drilling programmes was compiled into Excel spreadsheets comprising collar, survey, and lithological information; to enable generation of MapInfo files for producing the figures presented in this report.

4.5 SAMPLE TESTING

4.5.1 Bulk Density Testing

Testing was undertaken on a selection of drill core samples from various lithology types, to determine the bulk density of the materials. In selecting samples, only the harder more competent sandstone could be used as the friable sandstones would not stand up to the handling needed to complete the testing. The bulk density values are utilised for calculating raw sandstone mass of the deposit. **Table 4.2** lists the 17 intervals tested. Of these samples, 16 represented potential sand plant feed materials and one sample was ironstone which would be expected to be rejected as lump oversize at the screen to the plant.

Table 4.2
Bulk Density Test Samples

DRILL HOLE	DEPTH (m)	CORE LENGTH (mm)	LITHOLOGY	USE
SFQ-DH1	13.7	285	Sandstone.	Feed
	21.4	130	Fe cemented sandstone (ironstone).	Waste
	24.3	270	Hard sandstone.	Feed
	27.2	135	Sandstone.	Feed
	33.1	310	Sandstone.	Feed
	42.3	185	Sandstone.	Feed
	46.1	256	Sandstone.	Feed
SFQ-DDH2	9.3	345	Hard sandstone.	Feed
	13.2	312	Sandstone.	Feed
	23.5	135	Sandstone.	Feed
	26.7	130	Sandstone.	Feed
	33.9	130	Sandstone.	Feed
	37.1	112	Sandstone.	Feed
SFQ-DDH3	11.1	100	Sandstone.	Feed
	21.3	190	Hard sandstone.	Feed
	32.0	265	Hard sandstone.	Feed
	35.7	255	Sandstone.	Feed

Samples used for bulk density testing were later included into the samples tested to determine washed size gradings, since the density testing is non-destructive.

4.5.2 Size Gradings on 2012 Drill Core Composites

Generally, only those samples of core that may have potential, based on the visual lithological logging, for future extraction and processing to yield a construction sand product were tested. Core lithologies comprising thicker ironstone and the thicker mostly clay and shale were excluded. Where possible, the thicker core loss zones were excluded, except where the loss interval appeared to be spread in between recovered pieces of core, as with the upper most two intervals of SFQ-DDH3 (see **Table 4.3**).

Testing in 2013 was conducted on composited samples of the 2012 core to generally represent up to 10m working sections in any future extraction pit. **Table 4.3** lists the intervals tested, which total 15 composites. Along with details of the lithology of the samples tested, **Table 4.3** also presents the core loss in metres, and recovery as a percentage of the interval tested. Except for the top two intervals from SFQ-DDH3 with 55% and 56% core recovery, all other intervals had high (>80%) core recoveries.

Table 4.3
2012 Core Test Samples - Washed Sieve Analysis

DRILL HOLE	DEPTH (m)	INTERVAL (m)	LITHOLOGY	CORE LOSS (m)	CORE RECOVERY (%)
SFQ-DDH1	9.53 to 18.1	8.57	Fine-medium sandstone	0.84	90
	18.10 to 23.25	5.15	Fine-med sandstone with Fe bands & core loss	0.94	82
	23.25 to 32.52	9.27	Fine-medium sandstone, grey clayey	0	100
	32.52 to 42.06	9.54	Fine-medium sandstone, grey clayey	0.11	99
	42.06 to 51.09	9.03	Coarse sandstone, pale orange	0.16	98
SFQ-DDH2	4.78 to 8.69	3.91	Fine-medium friable sandstone	0.03	99
	8.69 to 16.44	7.75	Fine-medium sandstone	0.19	98
	21.40 to 24.05	2.65	Medium sandstone	0.0	100
	24.05 to 29.06	5.01	Medium sandstone	0.08	98
	32.50 to 40.49	7.99	Coarse sandstone, some core loss	0.92	88
SFQ-DDH3	2.5 to 14.3	11.8	Fine-medium sandstone & core loss	5.35	55
	14.49 to 20.12	5.63	Grey clayey sandstone & core loss	2.46	56
	20.27 to 25.63	5.36	Grey clayey sandstone	0	100
	25.63 to 33.10	7.47	Fine-medium sandstone	0.68	91
	33.10 to 37.79	4.69	Coarse sandstone	0	100

All core testing from the 2012 drilling was conducted by the Testrite (Coffey) laboratory at Concord West in March 2013. The testing procedure adopted was as follows.

1. Core was delivered to the laboratory in trays marked up into sample intervals.
2. For each sample as received, remove from the core tray. Split core longitudinally (down the core axis) and return one half to the core tray for reference. The other half to be used for testing.
3. Lightly crush each sample in a jaw crusher, then mix and split out an approximate 5kg representative portion. Re-bag the residue of each sample and retain for possible further work.
4. Further liberate particles to disaggregate any particles comprising composite aggregates of grains, so that individual grains are separated but not broken. Mix each sample, and remove the working sample required for testing. Retain the remainder of each composite for later possible testing.
5. Screen at approximate either 9.5mm or 6.7mm to remove any large pebbles and ironstone lumps, break up any friable sandstone lumps so they pass through the 9.5mm or 6.7mm sieve, weigh the oversized material, which would be rejected as screen oversize in the wash plant.
6. On the material passing 9.5mm or 6.7mm, treat by washed sieve analysis according to AS1141.11.1.

Report results before the follow-up testing of the open hole samples proceeds.

4.5.3 Size Gradings on Drill Core 1m Samples – 2016 Testing

Half split of the cores from SFQ-DDH1 and SFQ-DDH3 drilled in 2012, and the full core from SFQ-DDH4 drilled in 2015 was delivered to Network Geotechnics laboratory at Oak Flats for washed size grading tests. The list of samples tested as 1.0m intervals is presented in **Appendix 3b** in front of the results.

Test work comprised:

1. Crush core using a jaw crusher.
2. Screen using 9.5mm and 4.75mm sieves.
3. The material retained on the 9.5mm sieve is re-crushed using a roll mill, then screened again on 9.5mm and 4.75mm sieves. Repeat steps 2 and 3 until all material passes the 9.5mm sieve.
4. The material retained on the 4.75mm sieve is further crushed to break up the aggregates. Any hard quartz pebbles separated and added to the combined -4.75 mm fractions.
5. Combine all -4.75mm fractions.
6. Split out a working sample for size grading by AS 1411.11.1 washed size grading.

If aggregates are still present in the sample after splitting, then lightly grind using a mortar and pestle until the particles comprising the aggregates are liberated before the washing commences.

4.5.4 Size Gradings on Drill Core 5m Washed Composites – 2016 Testing

Washed sand samples from SFQ-DDH1, SFQ-DDH3, and SFQDDH4 were subjected to sieve analysis testing as a means of determining product sand size gradings. Composites were prepared to represent 5m drill hole intervals and were tested by Network Geotechnics. The list of samples composited is shown in **Table 4.4**.

1. The individual size fractions from the washed size grading were kept.
2. Combine the individual size fraction samples according to the list presented in **Table 4.4**. Note, the minus 75 micron material removed from the original sample by washing was not included into the composite.
3. A size grading was undertaken on the 5m composited interval samples in accordance with AS 1141.11.1 without washing.

Table 4.4
2016 - Samples Composited for 'Product' Sand Gradings

DRILL HOLE	DEPTH (m)	INTERVAL (m)	COMMENT
SFQ-DDH1	5.0 to 7.0	2.0	5m OF COMBINED SAMPLES
SFQ-DDH1	9.0 to 12.0	3.0	
SFQ-DDH1	12.0 to 17.0	5.0	
SFQ-DDH1	17.0 to 22.0	5.0	
SFQ-DDH1	22.0 to 27.0	5.0	
SFQ-DDH1	27.0 to 32.0	5.0	
SFQ-DDH1	32.0 to 37.0	5.0	
SFQ-DDH1	37.0 to 42.0	5.0	
SFQ-DDH1	42.0 to 47.0	5.0	
SFQ-DDH1	47.0 to 51.0	4.0	
SFQ-DDH3	2.0 to 4.0	2.0	5m OF COMBINED SAMPLES
SFQ-DDH3	8.0 to 11.0	3.0	
SFQ-DDH3	11.0 to 16.0	5.0	
SFQ-DDH3	16.0 to 21.0	5.0	
SFQ-DDH3	21.0 to 26.0	5.0	
SFQ-DDH3	26.0 to 31.0	5.0	
SFQ-DDH3	31.0 to 36.0	5.0	
SFQ-DDH4	22.0 to 27.0	5.0	
SFQ-DDH4	27.0 to 32.0	5.0	
SFQ-DDH4	32.0 to 37.0	5.0	
SFQ-DDH4	37.0 to 42.0	5.0	
SFQ-DDH4	42.0 to 46.0	4.0	

4.5.5 Particle Density and Water Absorption on Drill Core 5m Washed Composite Samples – 2016 Testing

The composited samples listed in **Table 4.4** were subjected to particle density and water absorption tests conducted by Network Geotechnics. The specific tests were as follows.

1. Particle density (SSD)
2. Particle density (dry)
3. Apparent particle density
4. Water absorption

4.5.6 Size Gradings on 2012 Open Drill Hole Composites

Open hole samples were selected for compositing on the basis of lithology and sample quality. The top interval from 0 to 1.0m was not tested because it was a small drill sample and included the soil which will be set aside for rehabilitation. Below 1.0m, the samples recovered from a dry drill hole were generally of more uniform size and were composited into intervals of 6 to 8m. The deeper samples from below the water table were of variable size and only one sample from each of the wet holes was tested, as an 8m or 9m interval from the intersection of water during drilling. Since the open hole drilling method largely liberated the sand particles, there was no requirement for light crushing to liberate composite grains in the sample preparation. The open hole samples tested are presented in **Table 4.5**.

Table 4.5
2012 Open Hole Test Samples - Washed Sieve Analysis

Drill hole	Depth (m)	Interval (m)	Lithology	Comments
SFQ-OH1	1.0 to 8.0	7.0	Sand	Dry samples
	8.0 to 15.0	7.0	Sand	Dry samples
	15.0 to 23.0	8.0	Sand	Dry samples
	23.0 to 32.0	9.0	Sand	Small wet samples
SFQ-OH2	1.0 to 8.0	7.0	Sand	Dry samples
	8.0 to 15.0	7.0	Sand	Dry samples
	15.0 to 21.0	6.0	Sand	Dry samples
	21.0 to 29.0	8.0	Sand	All samples wet various sizes
SFQ-OH3	1.0 to 8.0	7.0	Sand	Dry samples
	8.0 to 14.0	6.0	Sand	Dry samples
	14.0 to 20.0	6.0	Sand	Dry samples
	20.0 to 29.0	9.0	Sand	All samples wet various sizes
SFQ-OH4	1.0 to 9.0	8.0	Sand	Dry samples
	9.0 to 17.0	8.0	Sand	Dry samples
	17.0 to 21.0	4.0	Shale lenses	Dry samples - NOT TESTED
	21.0 to 29.0	8.0	Sand	Dry samples

All open hole sample testing was conducted by the Testrite (Coffey) laboratory at Concord West in March 2013. The testing procedure adopted involved the following.

1. Sample bags were delivered to the laboratory.
2. Screen at approximate either 9.5mm or 6.7mm to remove any large pebbles and ironstone lumps, break up any friable sandstone lumps so they pass through the 9.5mm or 6.75mm sieve, weigh the oversized material, which would be rejected as screen oversize in the wash plant.

On the material passing 9.5mm or 6.75mm, treat by washed sieve analysis according to AS1141.11.1 and AS1141.12.

5. RESULTS

5.1 SURVEY DATA

Drill hole collar survey data is presented in **Appendix 1** of this report and **Figure 2** shows the locations of drill holes overlain onto the aerial photograph of the site. Three cross sections lines are also shown on this figure.

5.2 DRILL HOLE LITHOLOGY LOGS

Drill hole lithology log information is presented in **Appendix 2** of this report. Graphic presentations, photographs of the core, and written descriptions are included for each of the five DDHs, while only the written logs are included for the four open holes.

5.3 SAMPLE TEST RESULTS

Appendix 3 presents the tested intervals, together with the laboratory reports in the order presented below, for:

- The bulk density samples listed in **Table 4.2** results included in **Appendix 3a**;
- The particle size grading for the core composite samples from the 2012 drilling as listed in **Table 4.3** results included in **Appendix 3b**;
- The 2016 particle size grading results for the core 1m individual samples from the drill core as listed in **Table 4.4** results included in **Appendix 3b**;
- The 2016 particle size grading for the washed core composite samples from SFQ-DDH1, SFQ-DDH3, and SFQ-DDH4 as listed in **Table 4.4** with results included in **Appendix 3b**;
- Particle density and water absorption for the 2016 washed core composite samples from SFQ-DDH1, SFQ-DDH3, and SFQ-DDH4 as listed in **Table 4.4** with results included in **Appendix 3b**; and
- The particle size grading for the 2012 open hole composite samples listed in **Table 4.5** with results included in **Appendix 3b**.

5.3.1 Bulk Density

Table 5.1 summarises the bulk density results for the total 3.545m of core tested and at the foot of the table gives some statistical information for these results. The most important information is the density of the sandstone (excluding ironstone) that will potentially form feedstock to the wash plant, which is represented by 3.415m of sandstone; with both a mean, and a mean weighted for sample length, of 2.25t/m^3. For resource calculation purposes, a bulk density of 2.2t/m^3 is used.

Table 5.1
Bulk Density Results

Drill Hole	Depth (m)	Core Length (mm)	Bulk Density (t/m^3)	Lithology	Use
SFQ-DH1	13.7	285	2.12	Medium-grained sandstone, clay+light Fe matrix, purple banded.	Feed
SFQ-DH1	21.4	130	2.86	Fe cemented sandstone **(ironstone)**. Waste material.	Waste
SFQ-DH1	24.3	270	2.26	Hard fine-grained sandstone, grey.	Feed
SFQ-DH1	27.2	135	2.09	Medium-grained sandstone, clay+light Fe matrix, orange.	Feed
SFQ-DH1	33.1	310	2.48	Hard fine-grained sandstone, grey.	Feed
SFQ-DH1	42.3	185	2.27	Medium-grained sandstone, clay+light Fe matrix, orange.	Feed
SFQ-DH1	46.1	256	2.13	Coarse-medium-grained sandstone, clay matrix, grey.	Feed
SFQ-DDH2	9.3	345	2.21	Hard fine-grained sandstone, grey.	Feed
SFQ-DDH2	13.2	312	2.18	Medium-grained sandstone, clay+light Fe matrix, orange.	Feed
SFQ-DDH2	23.5	135	2.45	Fine grained sandstone, clayey, grey.	Feed
SFQ-DDH2	26.7	130	2.18	Medium-grained sandstone, clay+light Fe matrix, orange.	Feed
SFQ-DDH2	33.9	130	2.29	Coarse-medium-grained sandstone, clay+light Fe matrix, orange.	Feed
SFQ-DDH2	37.1	112	2.29	Coarse-medium-grained sandstone, clay matrix, grey-amber.	Feed
SFQ-DDH3	11.1	100	2.13	Friable sandstone, with Fe+clay matrix, pale orange. (May be too soft to test)	Feed
SFQ-DDH3	21.3	190	2.20	Hard, fine-grained sandstone, pale grey.	Feed
SFQ-DDH3	32.0	265	2.31	Hard, fine-grained sandstone, pale grey.	Feed
SFQ-DDH3	35.7	255	2.33	Coarse-medium-grained sandstone, clay+light Fe matrix, orange.	Feed
Total - sandstone only		3415			
Max			2.86		
Min			2.13		
Mean - sandstone only			2.25		
Mean w'td for length – sandstone only			2.25		

5.3.2 Size Gradings on 2012 Drill Core Composites

Table 5.2 presents a summary of the washed size gradings for the 15 composite core samples tested. At the foot of this table, the weighted mean grading for the part of the resource represented by the cored drill holes is presented. The weighting applied in determining this mean value is the quantity that the particular drill core sample interval represents in the total of the tested core intervals.

The grading data presented in **Table 5.2** represents the full sample, with the breakdown of the +6.7mm fraction recorded in full in the laboratory reports of **Appendix 3b**.

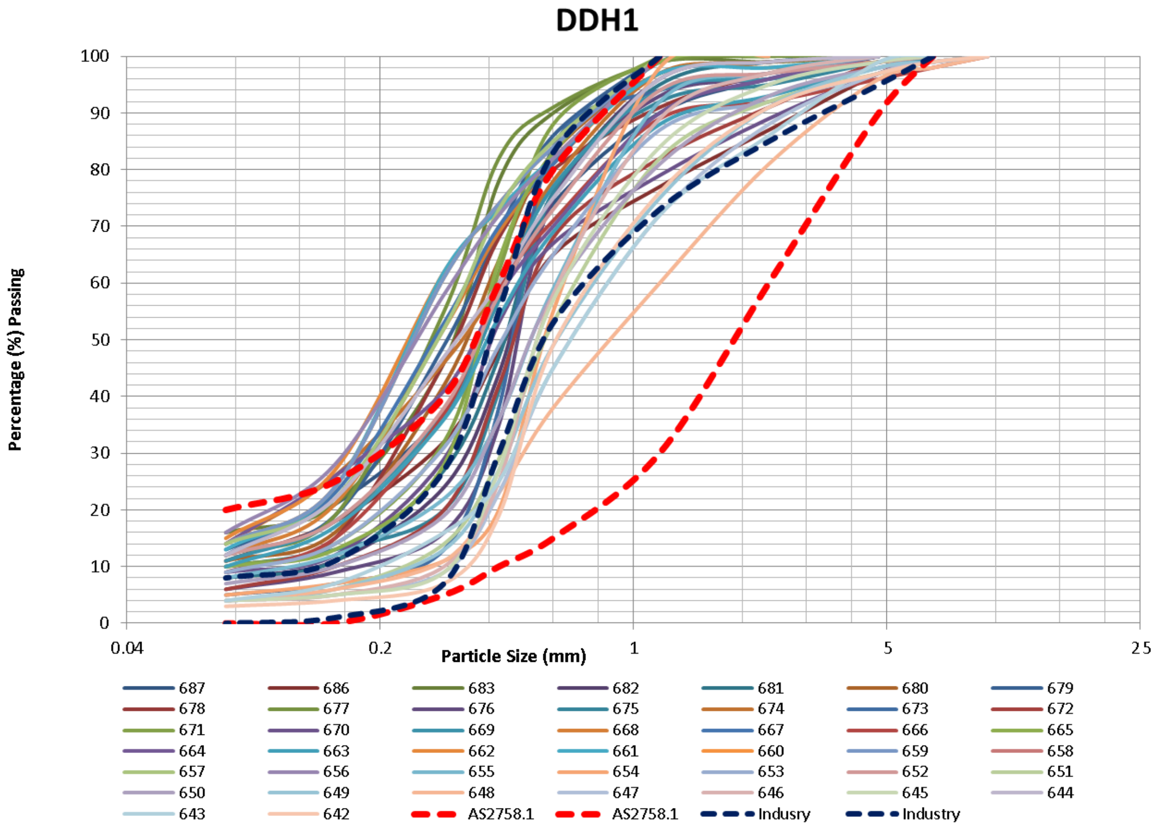
Table 5.2
2012 - Core Samples Washed Size Grading Results
% Passing Aperture

Hole	Lumps	Aperture (mm)								
	(+6.7mm)	6.7	4.75	2.36	1.18	0.600	0.425	0.300	0.150	0.075
SFQ-DDH1 (9.53-18.10m)	0	100	100	99	97	87	74	52	24	17
SFQ-DDH1 (18.10-23.25m)	7	93	92	90	88	82	55	33	20	14
SFQ-DDH1 (23.25-32.52m)	0	100	99	98	94	87	80	59	28	18
SFQ-DDH1 (32.52-42.06m)	6	94	93	89	82	68	54	39	18	12
SFQ-DDH1 (42.06-51.09m)	4	96	94	90	80	64	42	24	12	8
SFQ-DDH2 (4.78-8.69m)	6	94	93	90	87	93	78	56	18	13
SFQ-DDH2 (8.69-16.44m)	0	100	100	98	95	89	76	42	18	12
SFQ-DDH2 (21.40-24.05m)	7	93	90	83	73	64	59	52	35	23
SFQ-DDH2 (24.05-29.06m)	4	96	95	90	75	44	30	20	15	13
SFQ-DDH2 (32.50-40.49m)	4	96	96	95	91	74	46	30	17	13
SFQ-DDH3 (2.50-14.30)	2	98	98	97	93	82	71	46	16	11
SFQ-DDH3 (14.49-20.12)	2	98	97	93	87	77	71	57	27	18
SFQ-DDH3 (20.27-25.63)	6	94	93	90	84	78	57	30	22	14
SFQ-DDH3 (25.63-33.10)	4	96	96	91	84	71	61	45	21	12
SFQ-DDH3 (33.10-37.79)	3	97	96	96	95	92	67	29	13	10
Weighted mean %passing	**3.2**	**96.8**	**96.1**	**93.5**	**88.1**	**77.3**	**62.1**	**41.2**	**19.6**	**13.3**

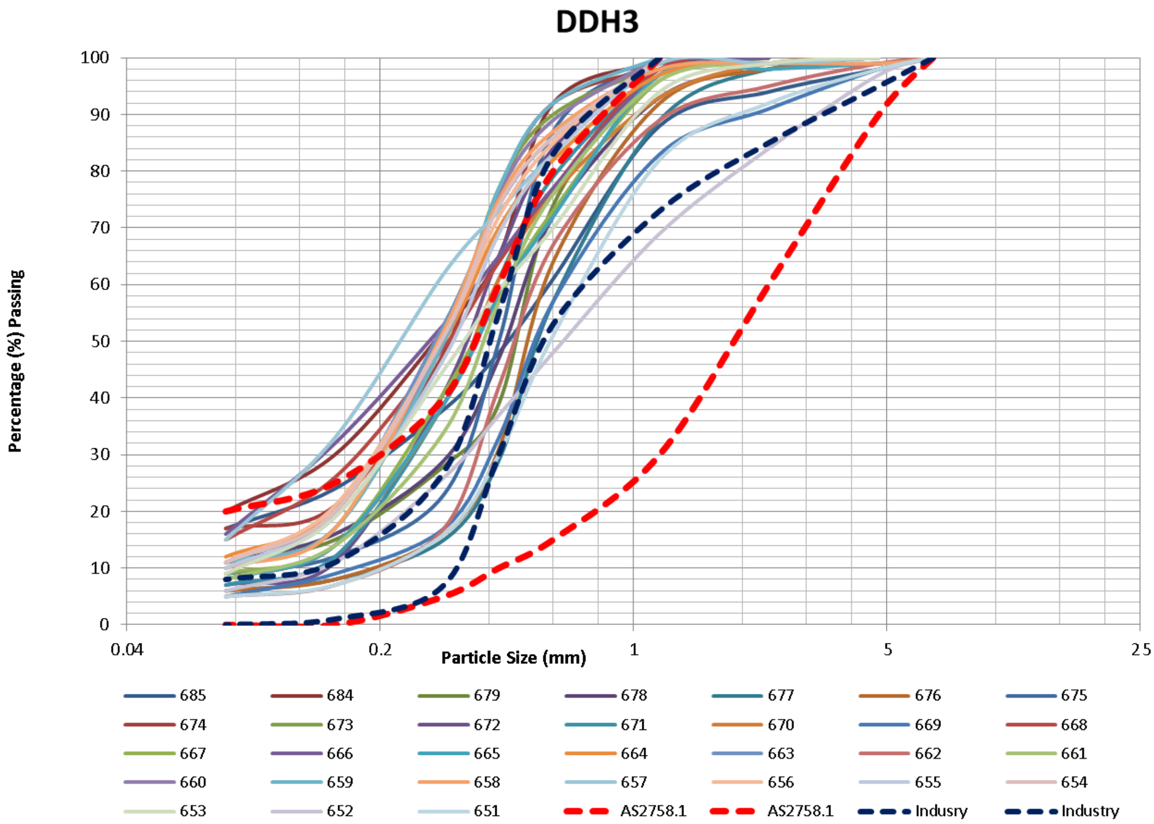
5.3.3 Size Gradings Drill Core 1m Samples – 2016 Testing

Results for the 1m intervals tested by washed size grading from SFQ-DDH1, SFQ-DDH3, and SFQ-DDH4 are presented graphically in **Graphs 5.1, 5.2** and **5.3** respectively for each of the drill holes. **Graph 5.4** presents the average grading for raw sand for each of the three holes.

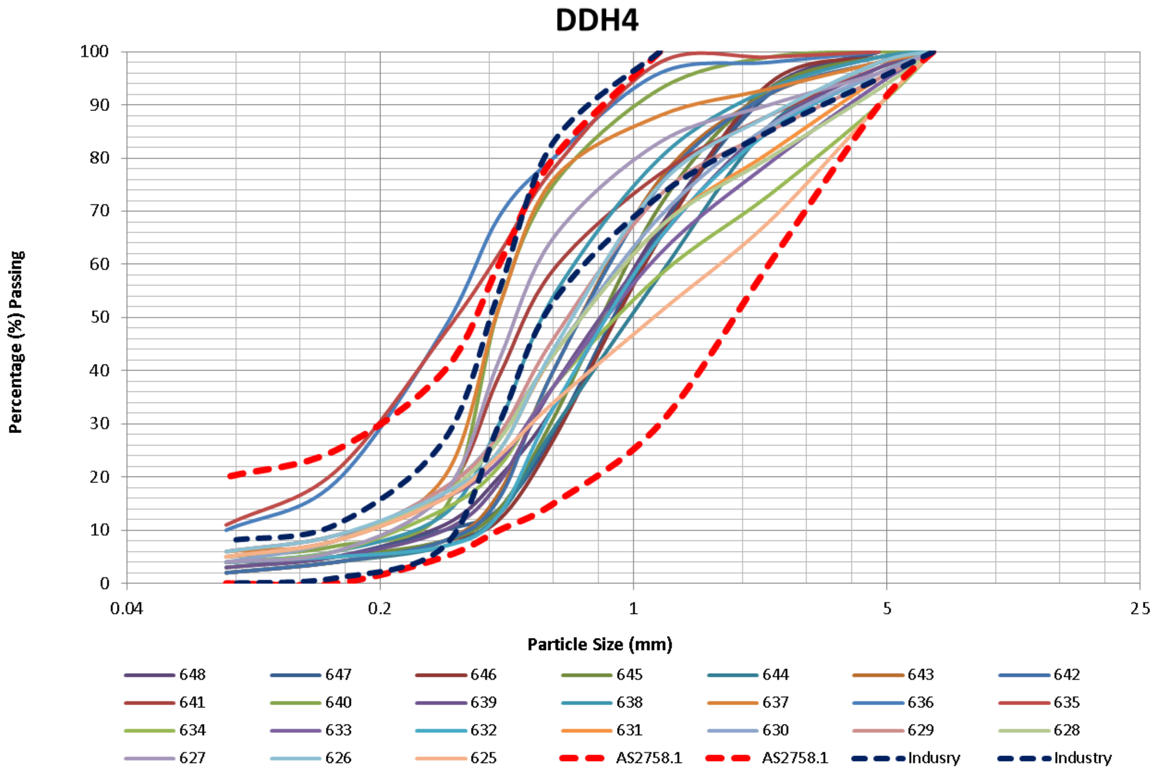
Also plotted on these graphs are the envelopes (maximum and minimum) for AS 2578.1 fine aggregate for use in concrete (red dashed line) and accepted limits for industry supplied fine aggregates (blue dashed line).



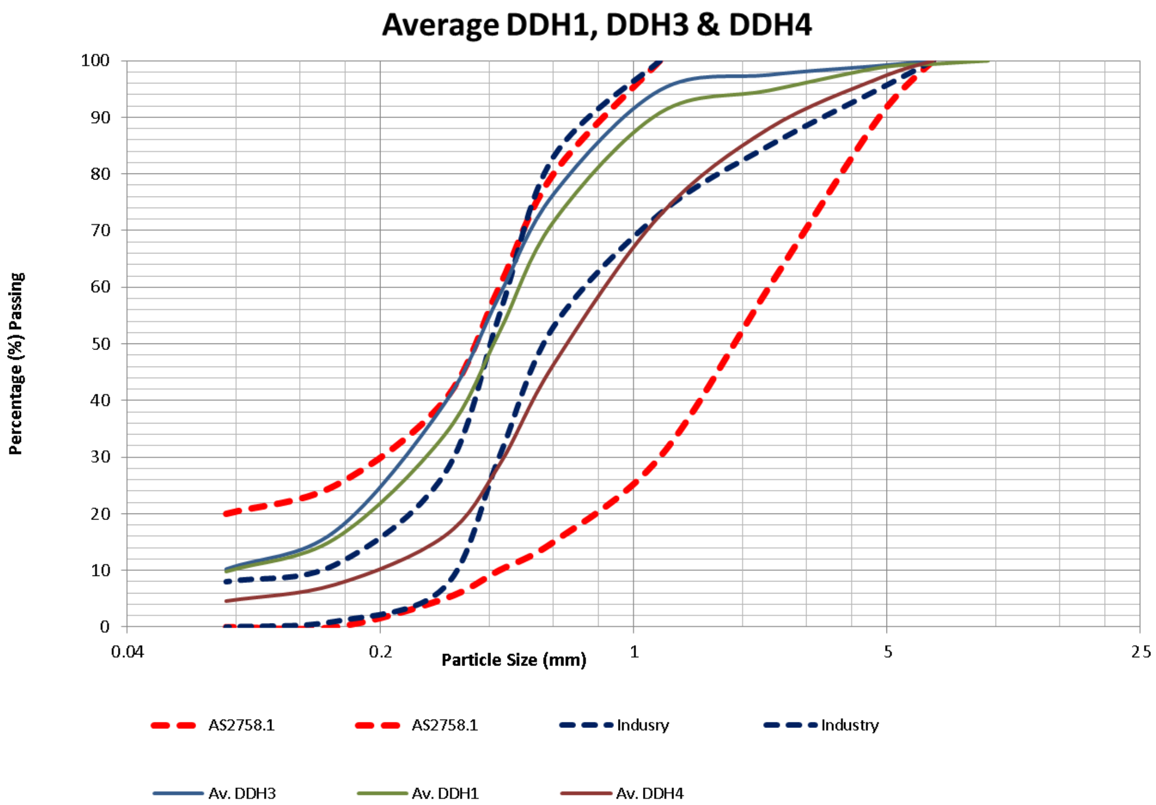
Graph 5.1 **Washed size grading curves for 1m intervals from SFQ-DDH1**



Graph 5.2 **Washed size grading curves for 1m intervals from SFQ-DDH3**



Graph 5.3 **Washed size grading curves for 1m intervals from SFQ-DDH4**

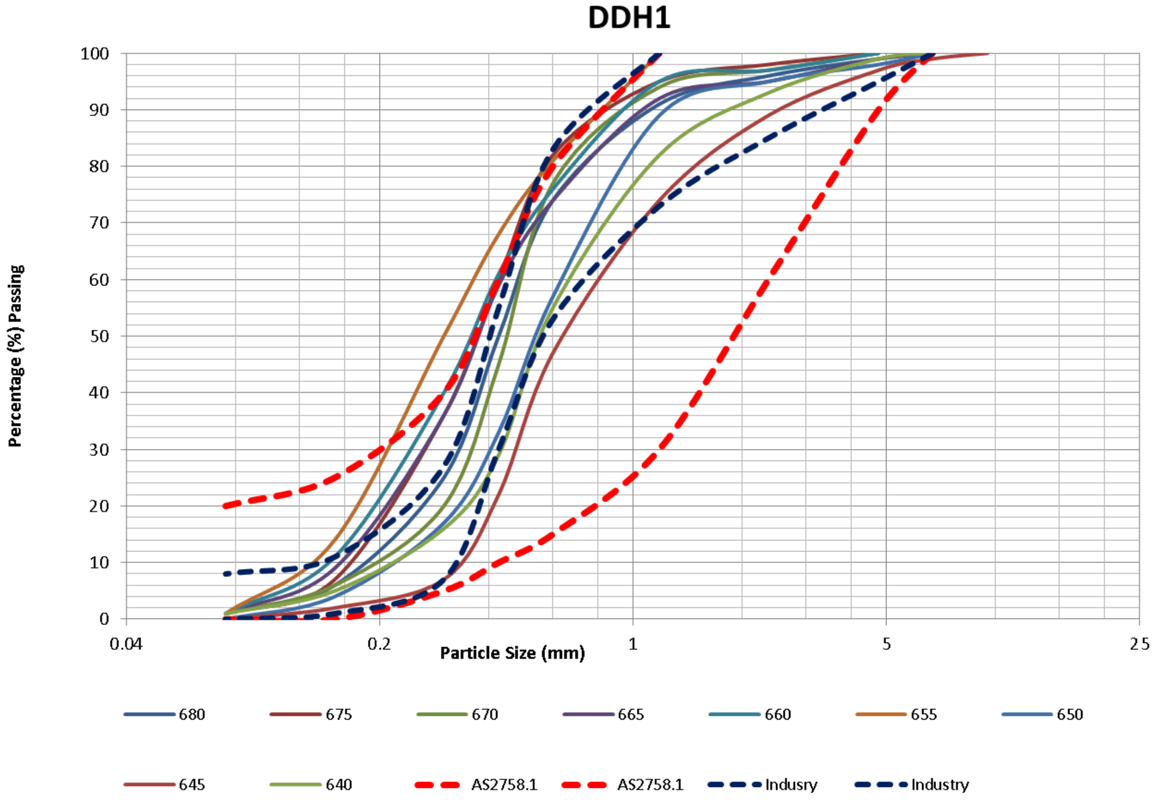


Graph 5.4 **Washed size grading curves for average raw sand calculated from 1m intervals for SFQ-DDH1, SFQ-DDH3, and SFQ-DDH4**

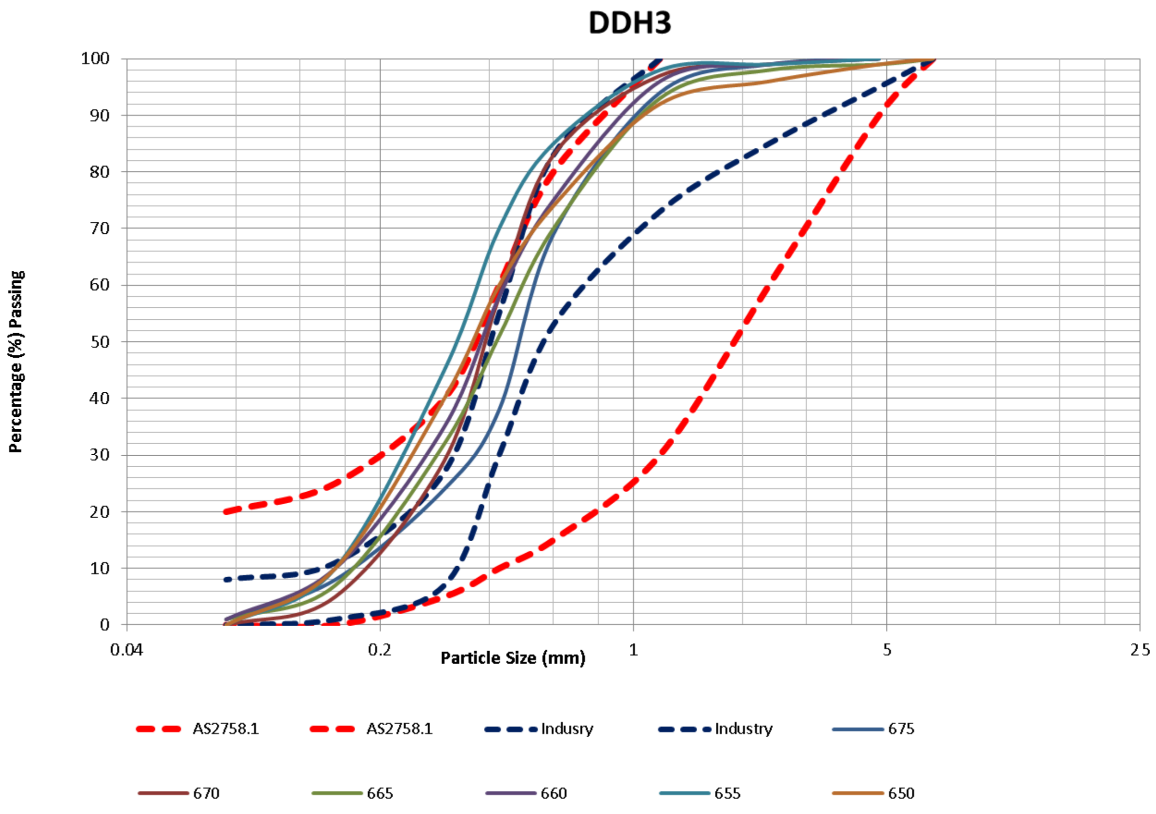
5.3.4 Size Gradings on Drill Core 5m Washed Composites – 2016 Testing

Results for the composited 5m intervals produced from the washed size grading fractions for SFQ-DDH1, SFQ-DDH3, and SFQ-DDH4 are presented graphically below as **Graph 5.5, 5.6** and **5.7** respectively for each of the drill holes.

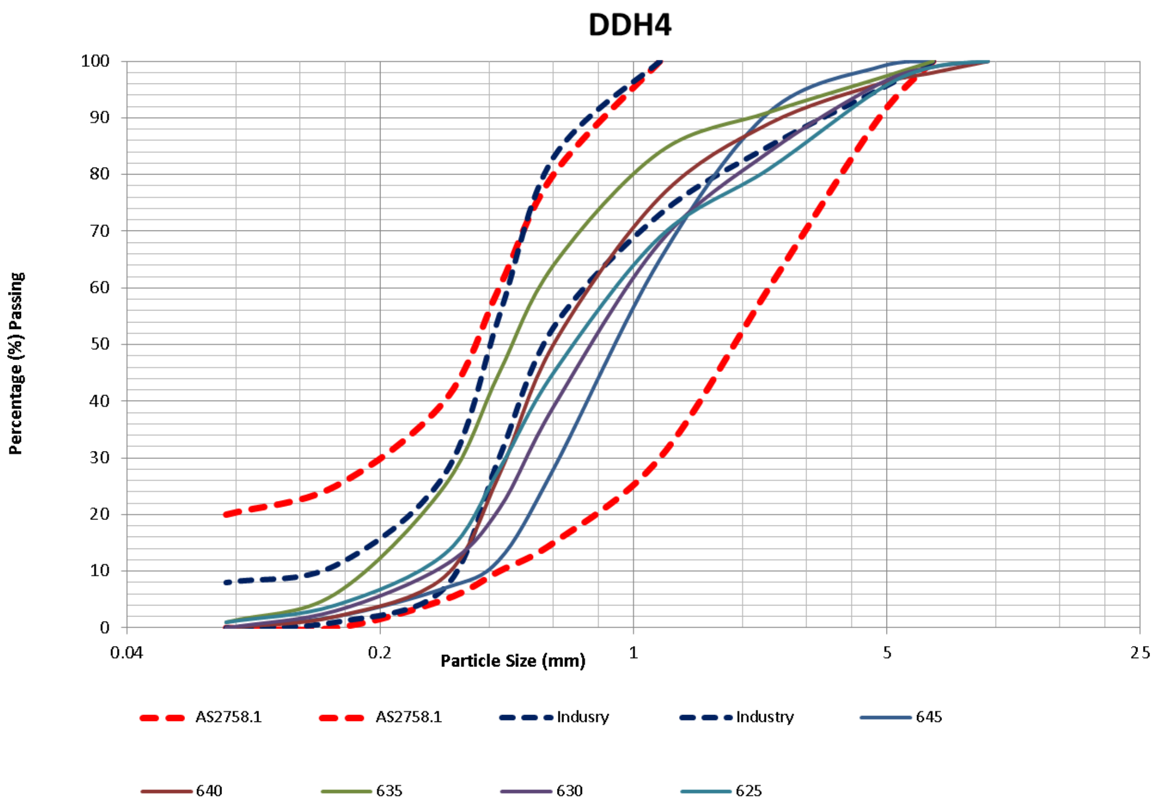
Graph 5.8 presents the average grading for the 'Product' sand from each of the 3 holes.



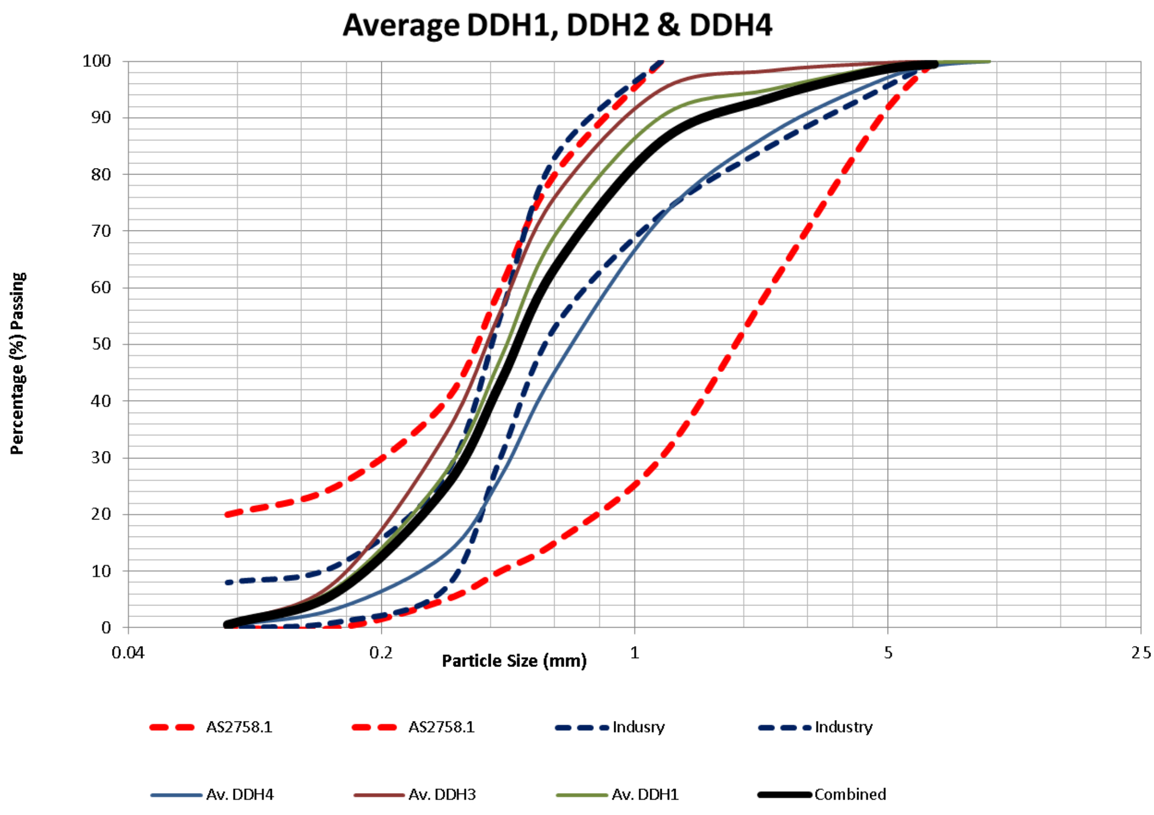
Graph 5.5 Size grading curves for 'Product' 5m composites from SFQ-DDH1



Graph 5.6 **Size grading curves for 'Product' 5m composites from SFQ-DDH3**



Graph 5.7 **Size grading curves for 'Product' 5m composites from SFQ-DDH4**



Graph 5.8 **Size grading curves for average 'Product' calculated from 5m composites from SFQ-DDH1, SFQ-DDH3, SFQ-DDH4.**

5.3.5 Particle Density and Water Absorption Drill Core 5m Washed Composite Samples – 2016 Testing

Results for the particle density and water absorption are set out in **Table 5.3**. The range in values (minimum and maximum) are shown at the foot of the table.

Table 5.3
Particle Density and Water Absorption 2016 Test Results

Drill Hole	Depth (m)	Interval (m)	Particle Density (SSD) (t/m^3)	Particle Density (Dry) (t/m^3)	Apparent Particle Density (t/m^3)	Water Absorption (%)
SFQ-DDH1	5.0 to 7.0	2.0	2.61	2.58	2.66	1.1
SFQ-DDH1	9.0 to 12.0	3.0				
SFQ-DDH1	12.0 to 17.0	5.0	2.59	2.59	2.61	0.4
SFQ-DDH1	17.0 to 22.0	5.0	2.59	2.56	2.64	1.2
SFQ-DDH1	22.0 to 27.0	5.0	2.52	2.48	2.58	1.6
SFQ-DDH1	27.0 to 32.0	5.0	2.57	2.54	2.62	1.3
SFQ-DDH1	32.0 to 37.0	5.0	2.59	2.56	2.63	1.0
SFQ-DDH1	37.0 to 42.0	5.0	2.57	2.53	2.63	1.4
SFQ-DDH1	42.0 to 47.0	5.0	2.59	2.57	2.63	0.9
SFQ-DDH1	47.0 to 51.0	4.0	2.58	2.55	2.63	1.1
SFQ-DDH3	2.0 to 4.0	2.0	2.60	2.56	2.68	1.7
SFQ-DDH3	8.0 to 11.0	3.0				
SFQ-DDH3	11.0 to 16.0	5.0	2.59	2.56	2.63	1.0
SFQ-DDH3	16.0 to 21.0	5.0	2.59	2.56	2.65	1.3
SFQ-DDH3	21.0 to 26.0	5.0	2.52	2.47	2.59	1.8
SFQ-DDH3	26.0 to 31.0	5.0	2.50	2.47	2.56	1.3
SFQ-DDH3	31.0 to 36.0	5.0	2.56	2.51	2.63	1.8
SFQ-DDH4	22.0 to 27.0	5.0	2.59	2.56	2.62	0.8
SFQ-DDH4	27.0 to 32.0	5.0	2.59	2.56	2.63	1.0
SFQ-DDH4	32.0 to 37.0	5.0	2.57	2.54	2.62	1.2
SFQ-DDH4	37.0 to 42.0	5.0	2.57	2.54	2.61	0.9
SFQ-DDH4	42.0 to 46.0	4.0	2.59	2.55	2.66	1.5
Range			**2.50 – 2.61**	**2.47 – 2.59**	**2.56 – 2.66**	**0.4 – 1.8**

5.3.6 Size Gradings on 2012 Open Drill Hole Composites

Table 5.4 presents a summary of the washed size gradings for the 15 composite open hole samples tested. At the foot of this table, the weighted mean grading for the part of the resource represented by the open hole samples is presented. The weighting applied in determining this mean value is the quantity that the particular open hole sample interval represents in the total of the tested open hole intervals.

Table 5.4
Open Hole Samples Washed Size Grading 2012 Results
% Passing Aperture

Hole	Aperture (mm)								
	6.7	**4.75**	**2.36**	**1.18**	**0.600**	**0.425**	**0.300**	**0.150**	**0.075**
SFQ-OH1 (1.0-8.0m)	100	99	99	97	93	86	66	38	28
SFQ-OH (8.0-15.0m)		100	100	99	97	94	80	48	35
SFQ-OH1 (15.0-23.0m)		100	100	99	99	97	85	57	43
SFQ-OH1 (23.0-32.0m) Wet		100	100	99	95	89	80	59	45
SFQ-OH2 (1.0-8.0m)	100	99	98	96	88	70	52	32	23
SFQ-OH2 (8.0-15.0m)		100	100	99	96	93	84	54	39
SFQ-OH2 (15.0-21.0m)		100	100	100	97	93	84	59	42
SFQ-OH2 (21.0-29.0m) Wet		100	100	98	93	48	76	54	40
SFQ-OH3 (1.0-8.0m)		100	99	98	94	81	58	35	24
SFQ-OH3 (8.0-14.0m)		100	99	98	92	83	68	44	31
SFQ-OH3 (14.0-20.0m)		100	100	99	99	97	92	58	42
SFQ-OH3 (20.0-29.0m) Wet		100	100	99	98	96	89	63	48
SFQ-OH4 (1.0-9.0m)	100	99	98	91	85	75	50	36	36
SFQ-OH4 (9.0-17.0m)		100	99	98	95	92	84	61	45
SFQ-OH4 (21.0-29.0m)		100	100	99	89	77	58	36	24
Weighted mean %passing	**100**	**99.8**	**99.5**	**97.8**	**93.8**	**84.9**	**73.2**	**48.9**	**36.7**

See the later report Section 7. Discussion for comments on the open hole sample quality and the above listed test results.

5.4 SHALE

The contoured top surface of the shale unit intersected in some of the drill holes is presented a **Figure 3**. In preparing these contours, nearby water bores that have intersected this same shale unit were included.

5.5 CROSS SECTIONS

Three cross sections presenting the geology through the sandstone resources have been prepared.

Figure 2 shows the locations of the three east-west section lines on plan, while **Figures 4, 5** and **6** each show the stratigraphy of the site presented in cross sections through the drill holes.

6. RESOURCE ESTIMATES

Resources have been estimated for two domains within the property which has been intersected by nine drill holes. Continuity of the main sandstone bearing unit has been demonstrated by the drilling. The two domains comprise:

- The extraction pit, an area of 47ha from where the bulk of the sandstone feed to the wash plant will come.
- The wash plant site, an area of 12 ha from where sandstone will be produced as a result of earthworks for the wash plant construction, and this sandstone will be utilised as the initial wash plant feed material.

The pit area resource domain boundary is shown on **Figure 7** as a blue line with point symbols pointing into the proposed pit. Typical E-W cross sections through the resource are presented as **Figures 8a** and **8b** as well as in **Appendix 4** together with the extraction plans.

6.1 RESOURCE MODEL

A model of the sandstone resources on the property within the proposed extraction pit area was constructed taking into account the following:

Boundaries: The 660m AHD contour along the incised creek system on the lower (northern) side of the resource area. Above the 660m contour, the resource is bounded by joins to approximately the 700m contour along the southern boundary.

Batters: A 1 in 1 (45°) batter has been used for all finished pit walls.

Floor: The extraction is down to 630m AHD. From 660m down to 630m the pit is bounded by a battered wall on all surrounds.

Shale lens: The grey shale lens occurring at about 650m AHD will be removed and placed as waste into one of the fill areas within the completed pit – see **Appendix 4** for details of fill emplacement.

Construction: For estimation, the pit shell created was cut into 10m thick horizontal slices. AMDAD produced the volume estimates based on the pit design – see **Appendix 4** for details.

Lithology: **Table 6.1** summarises the diamond drill hole lithology data used in preparing the resource estimates.

Core loss zones are interpreted as representing the most friable sandstone and have been treated as being 100% sand in the modelled quantity estimates.

The resource to be generated from the plant site earthworks is modelled on the construction area footprint.

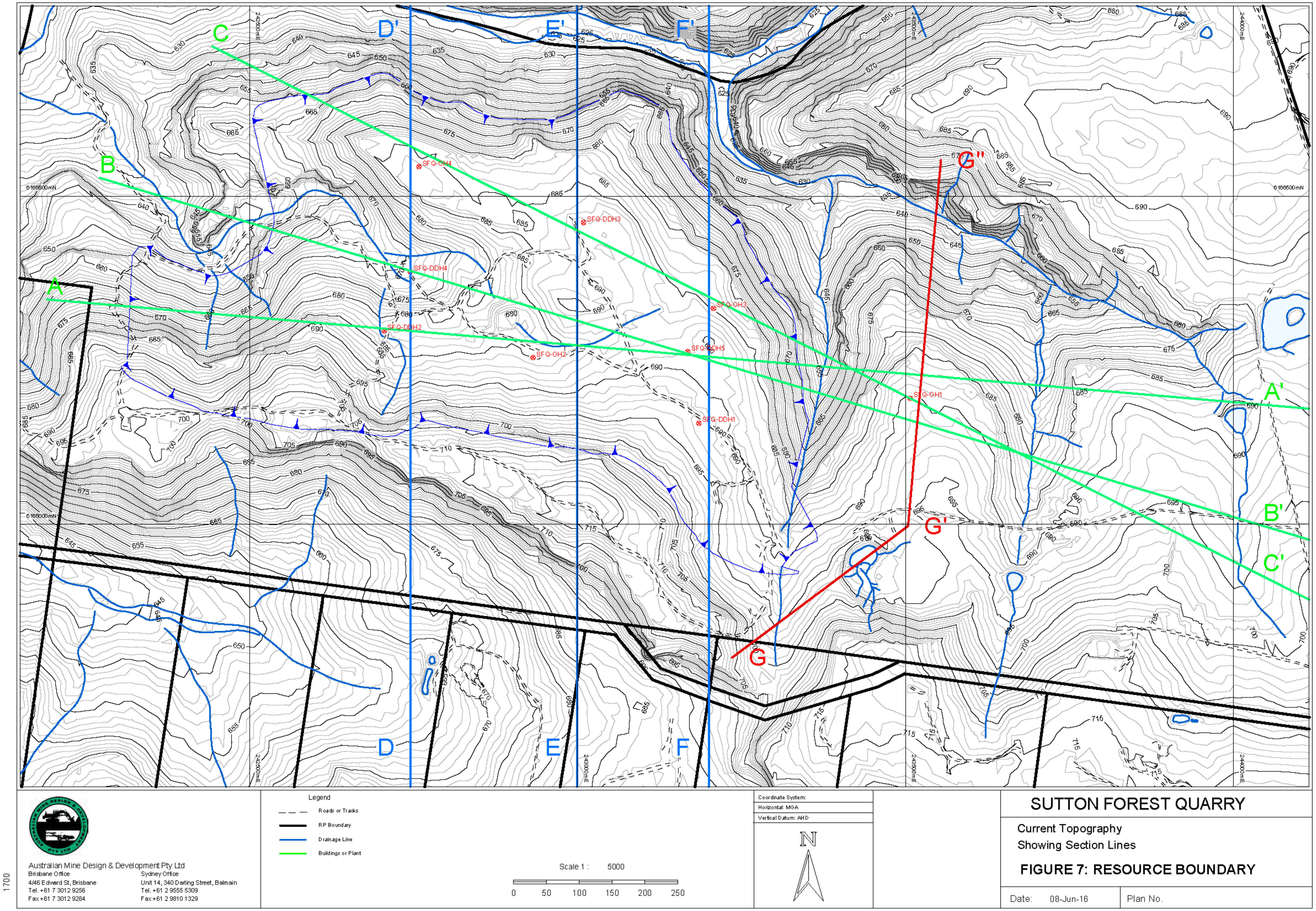


FIGURE 7: RESOURCE BOUNDARY

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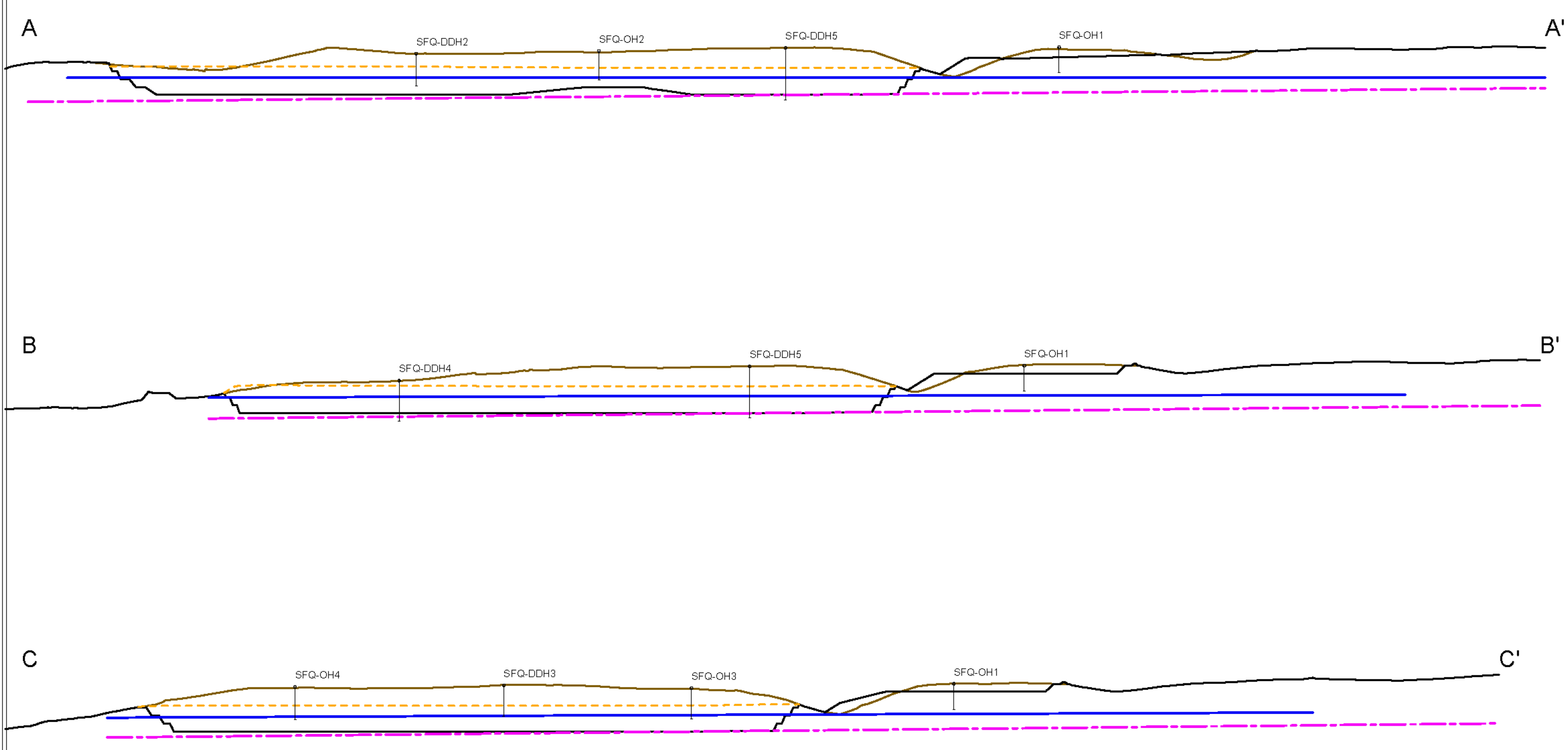

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1700

Legend
- Current Topography
- Final Pit Design
- Final Fill Surface
- Shale Lens
- Base of Sandstone / Top of Berry Siltstone

Scale 1 : 5000

0 50 100 150 200 250

SUTTON FOREST QUARRY

Section Lines
Showing Final Design and Geological Units

FIGURE 8a: CROSS SECTIONS E-W

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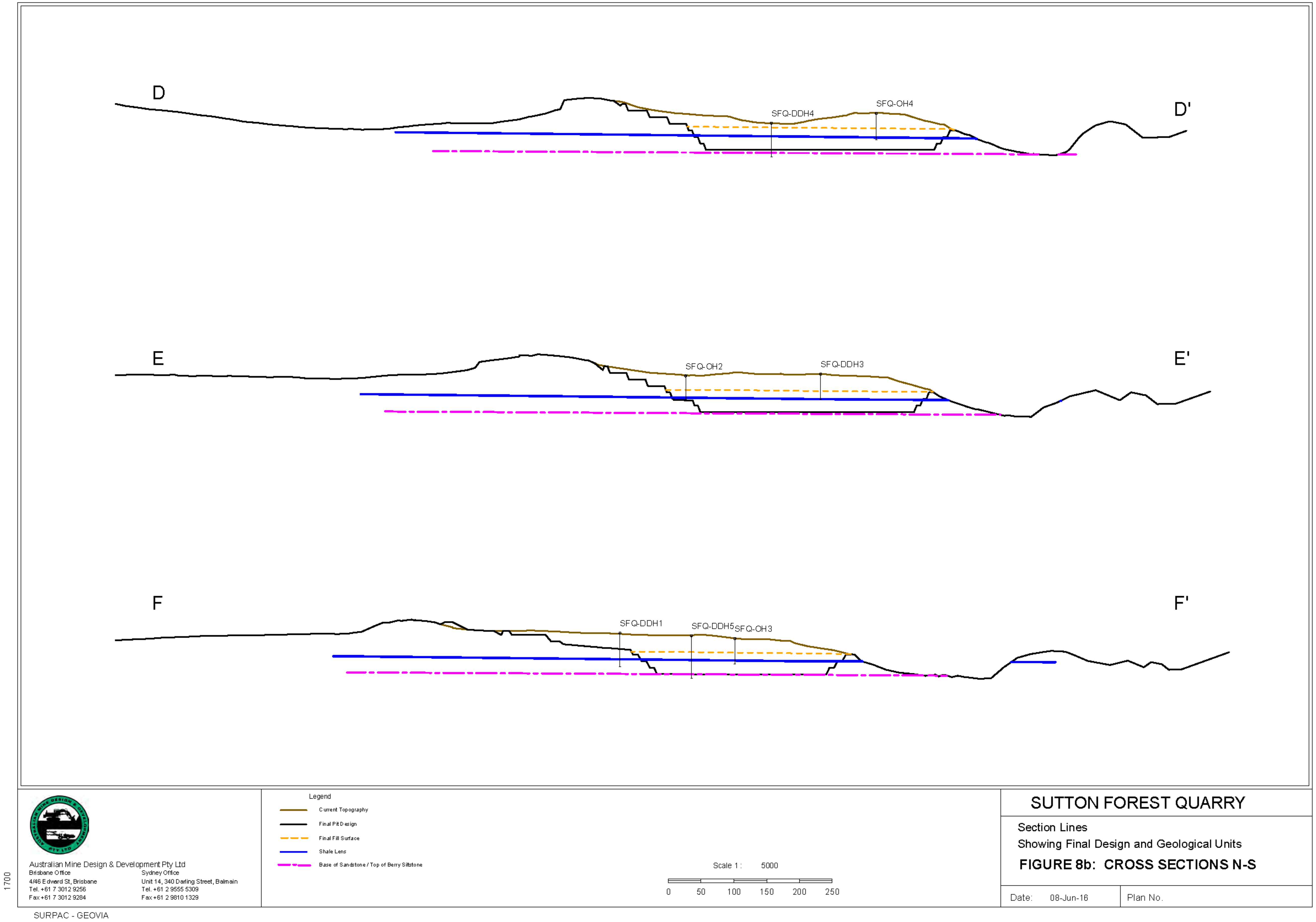
D
D'
SFQ-DDH4
SFQ-OH4
E
E'
SFQ-OH2
SFQ-DDH3
F
F'
SFQ-DDH1
SFQ-DDH5
SFQ-OH3
Legend
Current Topography
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Scale 1 : 5000
0 50 100 150 200 250
SUTTON FOREST QUARRY
Section Lines
Showing Final Design and Geological Units
FIGURE 8b: CROSS SECTIONS N-S
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Table 6.1
Summary of DDH Lithology Data Used for Resource Estimates

Lithotype	SFQ-DDH1	SFQ-DDH2	SFQ-DDH3*	SFQ-DDH4#	SFQ-DDH5#	Total
Hole Total Depth (m)	51.09	40.49	38.90	22.68	24.48	177.6
Fe Stone (m)	1.290	0.950	0.695	1.135	0.315	4.385
Fe Stone (%)	*2.5*	*2.3*	*1.8*	*5.0*	*1.3*	*2.5*
Clay+Shale (m)	0.69	0.34	1.38	0	0.11	2.52
Clay+Shale (%)	*1.4*	*0.8*	*3.5*	*0*	*0.4*	*1.4*
Core Loss (m)	6.68	9.52	8.49	1.12	3.55	29.36
Core Loss (%)	*13.1*	*23.5*	*21.8*	*4.9*	*14.5*	*16.5*
Sand+Sandstone (m)	42.43	29.68	28.33	20.13	20.51	141.08
Sand+Sandstone (%)	*83.0*	*73.3*	*72.8*	*88.8*	*83.8*	*79.4*
Core Loss+Sand+Sandstone (m)	49.1	39.2	36.8	21.3	24.1	170.5
Core Loss+Sand+Sandstone (%)	*96.1*	*96.8*	*94.7*	*93.7*	*98.3*	*96.0*

* Includes grey shale at EOH   # Cored interval only

6.2 LIMITING CRITERIA

In preparing resource estimates, the following limits have been applied to the design of the extraction pit.

Depth: Based on drilling and extraction pit design a depth of 630m AHD. A deduction of 0.5m has been applied to allow for topsoil to be removed and for sandstone to be left un-mined on the floor of the pit. In order to simplify estimation, the 0.5m has been assumed to occur as overburden and is removed from the top surface in the calculations.

Overburden: Apart from the soil allowance, there is no other overburden indicated by the drilling.

Interburden: Is primarily the grey shale lens occurring at about 650m AHD. This material has been modelled separately by AMDAD and is reported as shale waste. Listed in **Table 6.1** are other thin shale beds occurring higher in the drill holes some of which may be removed separately during extraction, these represent about 1.4% of the total drilled intervals.

Ironstone: Since most of the ironstone in the resource is competent and will report as screen oversize in the wash plant, it has been deducted from the resource estimates. The average value presented in **Table 6.1** of 2.5% for the three diamond cored drill holes has been considered as representative of the whole resource.

In situ density: Is based on bulk density test results for various core samples as set out in **Table 5.1** above, and for the sandstone has been determined as being 2.25t/m^3, which in preparing estimates has been rounded down to 2.2t/m^3.

Block: The resource has been treated as a single block and has been sliced into 10m thick horizontal layers for estimation purposes. The grey shale at approximately AHD 650m is treated separately to the sandstone above and below it.

Lithology: Has been determined by visual inspection of the drill hole samples.

6.3 ESTIMATION METHOD

Using the resource model limiting criteria listed above, 10m thick horizontal slices through the extraction pit were created for the resource.

In preparing the estimates, the size grading data was reviewed to ensure that mainly sandstone material was included into the resources. Notwithstanding, some interbedded thin clay layers were incorporated into test samples, especially for those areas where selective removal of the clay to access underlying sandstone would be difficult due to the thin clay seam occurring at that location.

6.4 RAW SANDSTONE RESOURCES ESTIMATES

Resource estimate calculations are included in **Appendix 4**, in which details are presented for the whole resource from the wash plant site (labelled "Site Establishment") and the extraction pit Stages 1 to 6. **Table 6.2** summarises the total raw sandstone resource estimates from both the wash plant site and the extraction pit with the iron stone and thinner clay/shale beds (but not the thick shale lens at approximately 650m AHD) deducted. From **Table 6.1** the sandstone yield after removing the ironstone (2.5%) and thin clay/shale beds (1.4%) is 96%. Also removed is an allowance for 0.5m of topsoil (including other extraction losses) over an area of 590,000m^2, being the surface area of the proposed extraction pit.

Table 6.2
Total Raw Sandstone Resource Estimates

Bench (m AHD)	Sandstone (Inc FeStone+ Clay/Shale) (m^3)	Density (t/m^3)	Sandstone (Inc FeStone+Clay/Shale) Tonnes (t)	Sandstone Less Fe Stone & Clay/Shale (%)	Sandstone Less Fe Stone & Clay/Shale (t)
700-710	78 825	2.2	173 415	96.0	166 478
690-700	564 325	2.2	1 241 515	96.0	1 191 854
680-690	2 097 500	2.2	4 614 500	96.0	4 429 920
670-680	2 639 900	2.2	5 807 780	96.0	5 575 469
660-670	2 901 050	2.2	6 382 310	96.0	6 127 018
650-660	2 965 125	2.2	6 523 275	96.0	6 262 344
640-650	2 816 050	2.2	6 195 310	96.0	5 947 498
630-640	2 582 125	2.2	5 680 675	96.0	5 453 448
Sub-Total	**16 644 400**				
Less Soil	**590 000**				
Total	**16 194 400**	**2.2**	**35 627 680**	**96.0**	**34 202 573**
Sandstone (Rounded)			**36 Million**		**34 Million**

From these estimates the allowances for materials that will not be processed are:

Top soil	=	1,928,000 tonnes
Ironstone & clay/shale	=	1,425,107 tonnes
Grey shale at 650m AHD	=	306,900 tonnes
Total non-processed materials	=	**3,030,007 tonnes**
Rounded	=	**3.0 million tonnes**

These materials will form part of the fill placed back into the completed extraction pit.

The total estimates shown in **Table 6.2** are considered for reporting purposes as Indicated Resources, as defined by the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code (20124)).

Continuity of the sandstone bearing zone within the bounds of the resource domain has been established by the 2012 and 2015 drilling. The sandstone has been classed as "Resources" rather than "Reserves" because extraction approvals have not yet been obtained and it is yet to be determined if any part(s) of the resources will be subject to restrictions on extraction. As stated later in this report, further drilling on a closer grid would be appropriate as a part of any future up-grading of these Resources to either Proved Reserves and/or Probable Reserves ahead of extraction. This could be done on a campaign basis as dictated by production, rather than attempting to upgrade the total Resource in one work program.

6.5 RESOURCE SIZE GRADINGS

Table 6.3 shows the calculated mean raw sand size grading for the Resource. The mean raw size grading has been weighted for the drill hole interval represented by each test sample included into the estimates.

Table 6.3
Average Raw and Product Sand Size Gradings for Core Samples
(% Passing – Data Used for Resource Estimation)

Aperture (mm)	+6.7mm Lumps	6.7	4.75	2.36	1.18	0.600	0.425	0.300	0.150	0.075
Raw										
SFQ-DDH1 (2012)	3	97	96	93	88	78	61	41	20	14
SFQ-DDH2 (2012)	3	97	96	93	87	75	57	37	19	14
SFQ-DDH3 (2012)	3	97	96	94	89	80	66	43	19	13
SFQ-DDH4 (2016)	0	100	97	88	73	46	29	16	8	5
Average	*2.3*	*97.8*	*96.3*	*92.0*	*84.3*	*69.8*	*53.3*	*34.3*	*16.5*	*11.5*
Product (all -6.7 + 0.075mm)										
SFQ-DDH1 (2012) Calculated	0	100	99	95	89	77	57	33	7	0
SFQ-DDH2 (2012) Calculated	0	100	99	95	88	74	52	28	5	0
SFQ-DDH3 (2012) Calculated	0	100	99	96	91	80	63	36	7	0
SFQ-DDH4 (2016)	0	99	97	87	72	45	27	13	3	0
Average	*0.0*	*99.8*	*98.3*	*93.4*	*84.9*	*68.8*	*49.6*	*27.2*	*5.8*	*0.0*

Table 6.3 also presents average product sand grading for the DDH core samples either based on test results (2016 samples) or calculated with all of the +6.7mm and -0.075mm material removed (2012 samples). These gradings give a guide to the likely product particle size grading and yield for whole of the Indicated Resource.

The ‘lump’ material shown in **Table 6.3** for the core samples is comprised of +6.7mm pebbles and some of the iron rich cemented sandstone.

6.6 PRODUCT SAND RESOURCE ESTIMATES

Table 6.4 sets out the estimated product sand quantities for the resource within the extraction area based on the removal of all of the +6.7mm and –0.075mm fractions from the raw sandstone quantity presented in **Table 6.2**. **Table 6.3** includes the calculated product grading for the resource listed in **Table 6.2**, and the average grading is presented in a graphic form as **Graph 5.8** earlier in this report. In preparing **Table 6.3,** the 2012 size grading results have been used where there is data from both 2012 and 2016 testing, as this produces a slightly more conservative result with respect to lower yield and higher –0.075mm content removed and is the number used for resource estimation. To achieve the product sand grading the 2.3% of oversize (+6.7mm) 11.5% of fines (–0.075mm) material must be rejected and this amounts to 13.8% of the raw feed to the wash plant.

Table 6.4
Product Sand Resource Estimates
(Assuming all +6.7mm and –0.075mm material is removed)

	Raw Sandstone (t)	Expected % Yield	Product (Million t)	Sand Product Rounded
Sand	34,202,573	86.2	29,482,618	29 Mt
Waste		13.8	4,719,955	
Total		100.0	34,202,573	

6.7 COMMENTS ON RESOURCE ESTIMATES

The resources defined by drilling cover 59ha. **Figure 7**, prepared by AMDAD, shows the boundary to the resource area comprising both the extraction pit and the wash plant earthworks, while **Figure 8** presents typical north-south cross sections through the extraction area. These two figures are also included into **Appendix 4** together with the full set of AMDAD resource modelling and stage extraction figures.

The resource of friable sandstone (**Table 6.2**) is approximately 36 million tonnes of raw in situ sandstone. From this resource after rejecting 4.0% of ironstone + clay/shale, the feed to the wash plant is 96.0% or 34 million tonnes. During washing a further 13.8% is rejected as +6.7mm and -0.075mm fines (**Table 6.4)** and the Resource has a yield of 86.2%, for a **final yield of approximately 29 million tonnes**.

Total waste materials comprise:

Extraction non processed material = 3.0 million tonnes
Wash plant fines = 4.7 million tonnes
Total waste including soil = **7.7 million tonnes**

7. DISCUSSION

7.1 DRILLING INVESTIGATIONS

7.1.1 DDH Core Samples

The diamond drilling technique is well suited to the harder more competent sandstone occurring near Sutton Forest but is less well suited to the friable softer sandstone intervals. Sample recovery varied from excellent (100%) to moderately good, with some sample intervals over several metres drilled thickness having only in the order of 50% recovery. Details of the core recoveries are recorded in the lithological logs and are also shown on the graphic sections as black intervals. Both lithology logs and graphic sections are presented in **Appendix 2** together with the core photographs. In **Appendix 3,** the core recoveries are shown for each interval tested along with the test results.

In light of the lithological logging and sample test results on the core, it is apparent that the following drilling-related issues need to be considered when evaluating the results:

i) In the core it was easy to identify and measure the changes in lithology.

ii) For the core, the samples selected for testing were divided at lithological breaks; but for the open hole samples these were collected as 1m intervals and bulked into larger composites based on the poorer lithological log observations.

iii) The main short coming with the DDH core drilling is the core loss associated with the most friable sandstone and loose sand, which occur mainly in the upper most sections of SFQ-DDH1, 2 and 3, and generally smaller intervals deeper in the cored sections of SFQ-DDH4 and 5.

In SFQ-DDH4 and SFQ-DDH5, only the lower-most part of the sandstone occurrence within the property was drilled using coring; this is the basal Hawkesbury Sandstone interval comprising some coarser-grained sandstone with interbedded conglomerate and medium-grained sandstone units occurring immediately above the dark grey siltstone of the Berry Formation. As a result, there are no meaningful samples from the top parts of these two holes which were drilled as open holes, since both holes were targeted to commence coring at about the end of drilling in the three previously drilled nearby holes. It may have been helpful to have commenced coring about 10m higher in both SFQ-DDH4 and SFQDDH5 in order to ensure that the grey shale layer which was intersected in some other holes was recovered into the cored interval in order to confirm if it does occur at the locations of SFQ-DDH4 and SFQ-DDH5 – the cross section presented in **Figure 6** illustrates these relationships. In the event, the shale was not observed in either of these holes, and even if a thick enough interval was encountered in the open hole section it is most likely to not have been noted only the coarser sand would have been collected by the drillers. Some more information on the thickness and distribution of the shale unit would help in modelling the resource and quantifying the amount of waste shale to be extracted during the proposed operations. To resolve this issue the shale has been assumed to occur across the whole site for pit planning and resource extraction modelling, which is likely to be a worst-case approach to dealing with the quantity to be extracted separately.

7.1.2 Open Hole Samples

Open hole drilling was not as well suited to this deposit as was the core drilling. While sample recovery was generally satisfactory in the dry conditions above the water table, there is still some significant potential for sample contamination in the open holes as the cuttings return from the drill bit to the surface in the uncased hole. Below the water table, sample recovery was quite variable and significant contamination was likely in the uncased holes. This is demonstrated by the sample volume variations and the need to inject additional water in order to effectively clear the hole as drilling advanced.

Open hole drilling, at about 40% of the cost of core drilling, was used to minimise drilling expenditure. Drilling was the most expensive item in the technical evaluation of the site, comprising slightly more than half of the total expenditure.

In light of the lithological logging and sample test results on the open hole samples, it is apparent that the following drilling-related issues need to be considered when evaluating the results:

i) For the open hole samples, it was difficult to determine and log changes in lithology and grain size, as the return sample was mixed between leaving the face of the hole and depositing into the sample bag at the surface.

ii) In open hole sandstone samples, the sand grains during drilling become coated with some of the clay and silt fraction; thereby giving an appearance that the drilled particles are coarser that is actually the case, especially when the test size grading results are examined.

iii) There is a distinct trend showing in the open hole sample size grading test results. In all four open drill holes the samples are getting finer with depth. The only exception is the bottom interval from SFQ-OH4 (21-29m), which occurs beneath a clay/shale unit.

iv) The open hole drilling seems to have preferentially lifted the smaller particles, especially the -0.075mm grains; with the coarser particles not coming to the surface in the returning air stream. It is also possible that some of the coarser particles were broken by the bit during drilling.

v) The open hole drilling intersected similar lithological units to those of the core drill holes. Near the bottom of all of the core holes coarser grained, pebble sandstone/conglomerate was encountered, yet the open hole samples do not give any indication of coarser particles being present.

vi) It is likely that insufficient air volume was available during the open hole drilling to sufficiently clear the coarser cuttings from the hole and to return these particles to the hole collar. Combined with this, was a poor seal at the collar T piece resulting from erosion of the soft loose surface sand by water from below the water table.

7.2 SAMPLE TESTING

Sample test results are presented in **Appendix 3b** as size gradings for each of the intervals tested. Significant points to note are:

i) In 2012 for holes SFQ-DDH1, SFQ-DDH2, and SFQ-DDH3 composites tested from the recovered core were prepared for intervals mostly ranging from 4m to 9m thickness, to approximate a workable thickness in the pit. It is possible that some of the clay and silt intervals included into these samples could be selectively mined and rejected, if desired, by using careful mining techniques. This is the basis for the 1.4% of clay/shale rejected in the raw sandstone calculation, see Section 6.4.

ii) It has been assumed in **Tables 6.3** and **6.4** that all of the -0.075mm fraction will be rejected in calculating the recovery for the Indicated Resource based on the cored samples. In reality, a small part of this -0.075mm fraction will be acceptable into the product sand. Also, some of the finer sand fractions (coarser than 0.075mm) may be lost to waste due to wash plant inefficiencies. However, overall estimated losses of the -0.075mm fraction based on these laboratory results may be less than will actually occur in a sand wash plant, principally due to the possibility that some of the fine fraction was not sufficiently liberated during sample testing so that it could report to the -0.075mm fraction during testing.

iii) Considering further, the possibility that some of the -0.075mm fraction has not been liberated from the core samples during testing especially in the 2016 test work, and that there is a under estimation of this size fraction with a resultant over estimation of the product sand quantity. The magnitude may be of the order of 5% to 10%.

iv) Based on the 2012 laboratory reports for holes SFQ-DDH1, SFQ-DDH2, and SFQ-DDH3, the +6.7mm content averages 3.2% for the core samples and is greater than for the SFQ-DDH4 samples tested in 2016.

A comparison between the core sample size grading weighted mean % passing (taken from **Table 5.2**) and the open hole sample size grading weighted mean % passing (taken from **Table 5.3**) is presented in **Table 7.1**.

Table 7.1
Comparison between Core and Open Hole Samples Size Gradings
(Weighted % Passing)

Hole	**Lumps**	**Aperture (mm)**								
	(+6.7mm)	**6.7**	**4.75**	**2.36**	**1.18**	**0.60**	**0.425**	**0.30**	**0.15**	**0.075**
Core Samples 2012 % passing	3.2	96.8	96.1	93.5	88.1	77.3	62.1	41.2	19.6	13.3
Open Hole Samples % passing	0	100	99.8	99.5	97.8	93.8	84.9	73.2	48.9	36.7
Difference (open hole samples less core samples)*	+3.2	-3.2	-3.7	-6.0	-9.7	-16.5	-22.8	-32.0	-29.3	-23.6

* + value indicates the core samples have more of this size fraction.
- value indicates that the open hole sample has more of this size fraction.

Table 7.1 shows a significant difference in the particle size gradings for all apertures, especially from 1.18mm to 0.075mm, with the sand from the open holes being considerably finer.

In the open holes there are untested intervals for the bottom most sections of SFQ-OH2 (29-36m), SFQ-OH3 (29-39m), and SFQ-OH4 (29-40.7m). For these intervals the sample quality (particularly due to the small sample size and variations in quantity recovered) did not warrant any testing.

7.3 SIZE GRADING RESULTS - COMPARISON 2012 WITH 2016

Drill core from holes SFQ-DDH1 and SFQ-DDH3 were tested both in 2012 by the Testrite laboratory and in 2016 by Network Geotechnics. Results from both sets of testing are included in **Appendix 3b**.

In 2012, the core was tested in longer intervals ranging in length from 4.69m to 11.8m with the divisions being based on changes in the sandstone units intersected (i.e. using stratigraphic breaks). The 2016 testing used 1m down-hole intervals and included lost core into the interval thereby reducing the quantity available. The 2012 data is presented as both average (arithmetic mean) and mean weighted for the interval represented by each sample; the 2016 data is only presented as arithmetic mean since all samples were 1m intervals. A comparison was made between the two sets of results for each of the two holes with the results set out in **Table 7.2**.

Table 7.2
Test Results Comparison 2012 against 2016
(%Passing)

	Thickness (m)	No Samples	Lumps +6.7	-6.7	-4.75	-2.36	-1.18	-0.60	-0.425	-0.30	-0.15	-0.075
SFQ-**DDH1**												
2012 Intervals	42											
Av	42	5	3	97	96	93	88	78	61	41	20	14
W'td Mean	42	5	3	97	96	93	88	77	61	42	20	14
2016 **Intervals**	44											
Av	44	44	1	99	99	95	91	72	52	34	16	10
SFQ-DDH3												
2012 Intervals	35											
Av	35	5	3	97	96	93	89	80	65	41	20	13
W'td Mean	35	5	3	97	96	94	89	80	66	43	19	13
2016 Intervals												
Av	31	31	0	100	99	98	95	76	58	39	17	10

From **Table 7.2** it is apparent that:

- The 2012 results are almost identical for arithmetic and weighted means for both drill holes.
- Comparing the 2012 results against the 2016 results, it is apparent that for both holes for the apertures 1.18mm and above, the 2016 results show finer gradings (i.e. 2016 samples have a greater quantity passing these sieves).
- Comparing the 2012 results against the 2016 results, it is apparent that for both holes for the apertures 0.600mm and below, the 2016 results show coarser gradings (i.e. 2016 samples have a lesser quantity passing these sieves).

In regards to the coarse apertures (+1.18mm) there are two possible explanations for these results:

1. Compared to Testrite in 2012, Network Geotechnics in 2016 during sample preparation have ground some of the sand grains and thereby reduced the particle sizes.
2. In 2012, Testrite have not achieved full liberation of the grains before undertaking the size grading test. Alternatively, Network have broken down ironstone aggregates that Testrite left as aggregates, this is reflected in the greater quantity of lumps (+6.7mm) reported for the 2012 samples.

However, for the finer apertures (-0.600mm) the possible explanations are:

1. That Network Geotechnics have not fully liberated the finer fractions and particularly the -0.075mm material which can be difficult to disperse and liberate from the coarser grains in the sandstone feed.
2. That Testrite in 2012 have achieved better liberation of the finer fractions and especially the -0.075mm material which is the most undesirable component in the raw feed.

While the differences between these two sets of data are generally of little concern, the content of -0.075mm material does have an impact on both product sand yield, and the treatment and disposal of this fine material which includes the clay content of the raw feed. From the view point of resource estimation, the higher -0.075mm content derived from the 2012 testing has been used, i.e. the worst case is considered.

7.4 RESOURCE ESTIMATES

The following points need to be made in relation to the resources estimates:

i) All estimates are based on an in situ bulk density of 2.2 tonnes/m^3 determined from samples of core collected from the site and tested. This bulk density value is considered to be close to the overall actual value for this type of deposit.

ii) While Resource estimates in this report are based on a drill hole spacing of between approximately 200m to 300m; it is recommended that holes more closely spaced (approximately 50m to 100m apart) be drilled prior to extraction. This will allow detailed extraction plans to be prepared making full allowance for selective mining to blend varying grain sizes, and to reject those materials with an unacceptably high content of -0.075mm material.

iii) It is recommended that ahead of extraction these resource estimates should be upgraded to Proved Reserves status by drilling at approximately 50m to 100m centres on a regular campaign basis.

7.5 EXTRACTION AND UTILISATION

The Sutton Forest sandstone resource within the defined proposed extraction pit area is well suited to the production of fine-grained concrete aggregates as defined by AS2758.1. From this investigation it is concluded that a raw sandstone resource comprising 37 million tonnes (including grey shale at 650mAHD) occurs within the proposed pit and wash plant site earthworks. After rejecting ironstone and other clay/shale materials the raw sandstone available for wash plant feed will be 34 million tonnes. With a wash plant yield of 86.2% the resources will produce in the order of 29 million tonnes of sand. Extraction waste and wash plant rejects will comprise a total of approximately 7.7 million tonnes to be placed into the pit void as fill.

8. RECOMMENDATIONS FOR FURTHER INVESTIGATIONS

8.1 FUTURE DRILLING

As a result of the investigations completed to date, it is suggested that further drilling be conducted as follows.

- To upgrade the friable sandstone resources to Proved Reserves status, drill holes spaced approximately 50m to 100m apart, should be adequate; but this will need to be confirmed by testing the suitability of such spacing.
- Future drilling using either diamond coring, or preferably air core techniques, are be the suggested preferred methods. Based on the experience gained from this investigation, open hole drilling is considered **not** to be suitable for any follow up drilling program.

9. REFERENCES

JORC Code 2012 Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. December 2012 edition. Prepared by the Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia, (JORC).

APPENDICES

APPENDIX 1

DRILL HOLE COLLAR INFORMATION

APPENDIX 2a

DDH GRAPHIC LOGS, CORE PHOTOGRAPHS, AND LITHOLOGICAL LOGS

SFQ-DDH01
SFQ-DDH02
SFQ-DDH03
SFQ-DDH04
SFQ-DDH05

APPENDIX 2b

OPEN HOLE LITHOLOGICAL LOGS

SFQ-OH01
SFQ-OH02
SFQ-OH03
SFQ-OH04

APPENDIX 3a

BULK DENSITY

APPENDIX 3b

SIZE GRADINGS AND OTHER TEST RESULTS

APPENDIX 4

AMDAD EXTRACTION PIT DESIGN AND QUANTITY ESTIMATES

***** Please note that all Appendices are only available on the digital version of this document

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