

## **APPENDIX 7. AMPHIBIAN SURVEY**

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Tuesday, 14 March 2023

Quarry Manager  
Newcastle Sand Pty Ltd  
398 Cabbage Tree Road  
Williamtown NSW 2318

Attention: Elliott Laver  
Sent by email to: [elliott@newcastlesand.com.au](mailto:elliott@newcastlesand.com.au)

**SUBJECT: Annual Amphibian Monitoring**

## 1. INTRODUCTION

### 1.1 SCOPE

Targeted fauna monitoring for the Mahony's Toadlet (*Uperoleia mahonyi*) and Wallum Froglet (*Crinia tinnula*) was undertaken by Wedgetail ecologists as part of the requirements outlined in Section 6.4C of Table 7 in the Biodiversity and Rehabilitation Management Plan Cabbage Tree Road Sand Quarry. Two discreet monitoring events were conducted between Spring 2022 and Autumn 2023. To increase the detectability of target species, surveys were undertaken after moderate rainfall was received. As such, monitoring was conducted by ecologists over nights on the 15 November 2022 and 31 January 2023. Surveys were undertaken at night, after moderate rainfall was received (**Table 1**).

**Table 1: Weather conditions during annual monitoring surveys**

Date	Max Temp (°C)	Humidity (%)	Barometric pressure (hPa)	Wind (spd/direction)	Rain past 24 hours (mm)	Rain past 5 days (mm)
15/11/2022	-	22.8	1005.7	17/SE	24.2	23.8
31/01/2023	26.4	70	1002.5	33/S	18.0	25.0

Source: Bureau of Meteorology – Williamtown RAAF (061078).

## 2. RESULTS

Survey effort was focused around ephemeral and semi-permanent water bodies using both spotlighting and quiet listening techniques (**Figure 1**). Each site was surveyed for 20 minutes on two separate occasions (see results for Mahony's Toadlet and Wallum Froglet in **Table 2**). Seven amphibian species were detected across both surveys (six species in November 2022 and four species in January 2023) (**Table 3**). The Wallum Froglet was detected at one location in November 2022 (Location 6) and Mahony's Toadlet was detected at one location (Location 3). Both Mahony's Toadlet and Wallum Froglet were detected at one location in January 2023 (Location 6).

### 3. DISCUSSION

Mahony's Toadlet was previously found at six of the seven survey locations established during initial 2018 targeted amphibian surveys. While several amphibian surveys had been conducted at the site in the past, Mahony's Toadlet has been detected at multiple survey locations on two occasions during optimal weather conditions. The species breeding behaviour is considered to be reasonably unpredictable with evidence suggesting that increased rainfall does not always trigger the initiation of calling. Despite seemingly suitable weather conditions for breeding during both surveys (November 2022 and January 2023), Mahony's Toadlet was heard calling at only two survey location. Surveys at other sites within Port Stephens showed similar results, with the absence of calling Mahony's Toadlet at highly reliable sites (reference sites). Given the lack of information about the exact breeding season and the triggers of breeding behaviour, it is possible that the species bred at other times of the year. Given that the Mahony's Toadlet was not detected at any of the survey locations within the site that the species was previously known from suggests that quarrying operations are unlikely to be the casual factor. While quarrying has commenced within site (in proximity to survey locations where Mahony's Toadlet has previously been detected), there are some survey locations that are a considerable distance from active quarrying areas. Given that Mahony's Toadlet was not redetected at these sites (which are some distance from any potential indirect impacts), this suggests that the absence of the species during surveys likely to be linked to environmental conditions.

Future monitoring should consider any available literature that is likely to be published over the coming years relating to the breeding ecology of the Mahony's Toadlet.

**Table 2: Mahony's Toadlet and Wallum Froglet presence during targeted nocturnal monitoring**

Survey Location	Original Survey 2018	November 2022	Comments November 2022	January 2023	Comments January 2023
1	+	-	30cm pooling water	-	30cm pooling water
2	-	-	10cm pooling water	-	15cm pooling water
3	+	+	10cm pooling water	-	15cm pooling water
4	+	-	10cm pooling water	-	15cm pooling water
5	+	-	Permanent water >50cm	-	Permanent water >50cm
6	+	-	10cm pooling water	+ #	15cm pooling water
7	+	-	10cm pooling water	-	15cm pooling water

(Mahony's Toadlet +) (Wallum Froglet #)

**Table 3: Full species list for 2022 surveys.**

November 2022		January 2023	
Species	Common Name	Species	Common Name
<i>Limnodynastes dumerilli</i>	Eastern Banjo Frog	<i>Crinia tinnula</i>	Wallum Froglet
<i>Limnodynastes peronii</i>	Striped Marsh Frog	<i>Limnodynastes dumerilli</i>	Eastern Banjo Frog
<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	<i>Limnodynastes peronii</i>	Striped Marsh Frog
<i>Litoria latopalmata</i>	Broad-palmed frog	<i>Uperoleia mahonyi</i>	Mahony's Toadlet
<i>Litoria tyleri</i>	Tyler's Tree Frog		
<i>Uperoleia mahonyi</i>	Mahony's Toadlet		

For any further questions, feel free to contact me.

Yours Sincerely

**Mark Dean**

Ecologist

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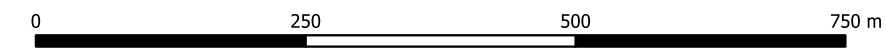


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— Subject Land    ■ Mahony's Toadlet (*Uperoleia mahonyi*) Core Habitat  
 ■ Development Site    ● Frog Survey Locations

Data Source: Metro Map 6.03.2023



## Frog Monitoring 2022

Figure  
1

Cabbage Tree Road Sand Quarry  
398 Cabbage Tree Road, Williamtown NSW



## APPENDIX 8. FAUNA MONITORING

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Tuesday, 14 March 2023

Quarry Manager  
Newcastle Sand Pty Ltd  
398 Cabbage Tree Road  
Williamstown NSW 2318

Attention: Elliott  
Sent by email to: Elliott@newcastlesand.com.au

**SUBJECT: Camera Monitoring 2022**

Dear Elliott,

Between April and December 2022, Wedgetail Project Consulting carried out camera monitoring to observe and record sightings of fauna, both native and exotic. On each of these occasions, infra-red, motion detecting cameras were set up in both random and targeted locations across the site, for a minimum period of 2 weeks at a time (see Table 1). The locations that cameras were set up can be seen in Figure 1. The sightings for each location are listed along with the date and picture reference in tables 2-12.

**Table 1** Amount of time that cameras were set up at each location.

Camera No.	Location	Start Date	Finish Date	Duration (Days)
12	Western Boundary of Area 1	5/04/2022	26/04/2022	21
13	Northern boundary of Areas 1A & 2	5/04/2022	26/04/2022	21
14	Haul Road	5/04/2022	26/04/2022	21
15	Border of Area 4B and 5A – northwest corner	29/04/2022	16/05/2022	17
16	Border of Area 4B and 5A	29/04/2022	16/05/2022	17
17	Northwest corner of Area 4	29/04/2022	16/05/2022	17
18	Border of Area 4 and 5	8/06/2022	24/06/2022	16
19	Border of Area 4 and 6B	8/06/2022	24/06/2022	16
20	Northwest corner of Area 7	4/07/2022	22/07/2022	18
21	Border of Area 7 and 6B	4/07/2022	22/07/2022	18
22	Northwest corner of Area 7	4/07/2022	22/07/2022	18
23	Northwest corner of Area 7A	1/08/2022	30/08/2022	30
24	Border of Area 7A and 6B	1/08/2022	30/08/2022	30
25	Northeast corner of Area 7A	1/08/2022	30/08/2022	30
26	Northeast corner of Area 7A	5/09/2022	30/09/2022	25
27	Northeast corner of Area 7A	5/09/2022	30/09/2022	25
28	Northern boundary of Area 7A	5/09/2022	30/09/2022	25
29	South of truck wash bay	10/10/2022	27/10/2022	17
30	South of truck wash bay	10/10/2022	27/10/2022	17
31	Eastern boundary of Area 6B	10/10/2022	27/10/2022	17

32	Eastern boundary of Area 6B	31/10/2022	22/11/2022	23
33	Northeast corner of Area 6B	31/10/2022	22/11/2022	23
34	Southeast corner of Area 6A	31/10/2022	22/11/2022	23
35	Northern boundary of Area 6A	1/12/2022	20/12/2022	20
36	Northern boundary of Area 6A	1/12/2022	20/12/2022	20
37	Northern boundary of Area 6A	1/12/2022	20/12/2022	20

Table 2 Camera monitoring in April 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 12 – Western Boundary of Area 1</b>		
9/04/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
16/04/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
17/04/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
18/04/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
18/04/2022	<i>Stizoptera bichenovii</i>	Double-barred Finch
23/04/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
26/04/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
<b>Camera 13 – Northern boundary of Areas 1A &amp; 2</b>		
5/04/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
6/04/2022	-	Unidentified mouse
6/04/2022	-	Unidentified mouse
7/04/2022	-	Unidentified mouse
7/04/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
8/04/2022	-	Unidentified Frog
9/04/2022	-	Unidentified mouse
9/04/2022	-	Unidentified mouse
11/04/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
12/04/2022	-	Unidentified mouse
12/04/2022	-	Unidentified mouse
14/04/2022	-	Unidentified mouse
15/04/2022	-	Unidentified mouse
16/04/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
17/04/2022	-	Unidentified mouse
17/04/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
18/04/2022	-	Unidentified mouse
19/04/2022	-	Unidentified mouse
19/04/2022	-	Unidentified mouse
20/04/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
22/04/2022	-	Unidentified mouse
23/04/2022	-	Unidentified mouse
23/04/2022	-	Unidentified mouse
24/04/2022	-	Unidentified mouse
26/04/2022	-	Unidentified mouse

<b>Camera 14 – Haul Road</b>		
7/04/2022	-	Unidentified mouse
9/04/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
17/04/2022	<i>Colluricincla harmonica</i>	Grey Shrike-thrush

Table 3 Camera monitoring in May 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 15 – Border of Area 4B and 5A – northwest corner</b>		
-	-	No fauna identified
<b>Camera 16 – Border of Area 4B and 5A</b>		
8/06/2022	<i>Coturnix ypsilophora</i>	Brown Quail
13/06/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
19/06/2022	<i>Coturnix ypsilophora</i>	Brown Quail
25/06/2022	<i>Coturnix ypsilophora</i>	Brown Quail
<b>Camera 17 – Northwest corner of Area 4</b>		
-	-	No fauna identified

Table 4 Camera monitoring in June 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 18 – Border of Area 4 and 5</b>		
9/06/2022	-	Unidentified mouse
<b>Camera 19 – Border of Area 4 and 6B</b>		
11/06/2022	<i>Oryctolagus cuniculus</i>	Rabbit

Table 5 Camera monitoring in July 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 20 – Northwest corner of Area 7</b>		
12/07/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
18/07/2022	<i>Vulpes vulpes</i>	Red Fox
<b>Camera 21 – Border of Area 7 and 6B</b>		
6/07/2022	-	Unidentified mouse
14/07/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
<b>Camera 22 – Northwest corner of Area 7</b>		
5/07/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
11/07/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
16/07/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
19/07/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot

Table 6 Camera monitoring in August 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 23 – Northwest corner of Area 7A</b>		
10/08/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
16/08/2022	-	Unknown Glider
21/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
23/08/2022	-	Unidentified mouse
24/08/2022	<i>Phascolarctos cinereus</i>	Koala
<b>Camera 24 – Border of Area 7A and 6B</b>		
03/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
05/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
09/08/2022	-	Unidentified mouse
10/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
11/08/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
13/08/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
19/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
20/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
21/08/2022	<i>Cracticus torquatus</i>	Grey Butcherbird
24/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
24/08/2022	-	Unidentified mouse
26/08/2022	-	Unidentified mouse
27/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
28/08/2022	<i>Felis catus</i>	Feral Cat
28/08/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
29/08/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
<b>Camera 25 – Northeast corner of Area 7A</b>		
13/08/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby

Table 7 Camera monitoring in September 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 26 – Northeast corner of Area 7A</b>		
11/09/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
14/09/2022	<i>Pseudonaja textilis</i>	Eastern Brown Snake
15/09/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
16/09/2022	<i>Pseudonaja textilis</i>	Eastern Brown Snake
27/09/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
30/09/2022	-	Unidentified mouse
<b>Camera 27 – Northeast corner of Area 7A</b>		
18/09/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
19/09/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
22/09/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
<b>Camera 28 – Northern boundary of Area 7A</b>		
5/9/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
8/09/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo

Table 8 Camera monitoring in October 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 29 – Eastern boundary of Area 6B</b>		
14/10/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
<b>Camera 30 – Northeast corner of Area 6B</b>		
10-27/10/2022	<i>Vulpes vulpes</i>	Red Fox
10/10/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
21/10/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
22/10/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
24/10/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
24/10/2022	<i>Sericornis frontalis</i>	White-browed Scrubwren
25/10/2022	-	Unidentified Skink
25/10/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
26/10/2022	<i>Amphibolurus muricatus</i>	Jacky Lizard
26/10/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
27/10/2022	<i>Ctenotus</i> sp.	Unidentified Skink
27/10/2022	<i>Malurus cyaneus</i>	Superb Fairy-wren
<b>Camera 31 – Southeast corner of Area 6A</b>		
10-15/10/2022	<i>Vulpes vulpes</i>	Red Fox

Table 9 Camera monitoring in November 2022

DATE	SCIENTIFIC NAME	COMMON NAME
<b>Camera 32 – South of truck wash bay</b>		
11/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
14/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
17/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
18/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
19/11/2022	<i>Varanus varius</i>	Lace Monitor
22/11/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
<b>Camera 33 – South of truck wash bay</b>		
5/11/2022	<i>Varanus varius</i>	Lace Monitor
6/11/2022	<i>Varanus varius</i>	Lace Monitor
6/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
7/11/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
7/11/2022	<i>Varanus varius</i>	Lace Monitor
8/11/2022	<i>Varanus varius</i>	Lace Monitor
9/11/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
11/11/2022	<i>Felis catus</i>	Feral Cat
11/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
16/11/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
16/11/2022	<i>Podargus strigoides</i>	Tawny Frogmouth
18/11/2022	<i>Felis catus</i>	Feral Cat
18/11/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo



<b>Camera 34 – Eastern boundary of Area 6B</b>		
31/10/2022	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
31/10/2022	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
1/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
2/11/2022	<i>Felis catus</i>	Feral Cat
2/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
3/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
5/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
6/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
7/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
8/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
10/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
11/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
11/11/2022	-	Unidentified mouse
12/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
21/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
15/11/2022	-	Unidentified mouse
16/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
16/11/2022	<i>Rattus sp.</i>	Unidentified Rat
16/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
16/11/2022	<i>Varanus varius</i>	Lace Monitor
17/11/2022	<i>Rattus sp.</i>	Unidentified Rat
17/11/2022	-	Unidentified mouse
18/11/2022	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
18/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
19/11/2022	<i>Rattus sp.</i>	Unidentified Rat
19/11/2022	<i>Varanus varius</i>	Lace Monitor
20/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
20/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
21/11/2022	<i>Wallabia bicolor</i>	Swamp Wallaby
21/11/2022	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
22/11/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby

**Table 9 Camera monitoring in December 2022**

<b>DATE</b>	<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<b>Camera 35 – Northern boundary of Area 6A</b>		
4/12/2022	<i>Cracticus torquatus</i>	Grey Butcherbird
5/12/2022	<i>Wallabia bicolor</i>	Swamp Wallaby
8/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
10/12/2022	<i>Cracticus torquatus</i>	Grey Butcherbird
11/12/2022	<i>Wallabia bicolor</i>	Swamp Wallaby
12/12/2022	-	Unidentified mouse
14/12/2022	<i>Wallabia bicolor</i>	Swamp Wallaby
16/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot

19/12/2022	<i>Varanus varius</i>	Lace Monitor
19/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
<b>Camera 36 – Northern boundary of Area 6A</b>		
3/12/2022	<i>Cracticus torquatus</i>	Grey Butcherbird
5/12/2022	<i>Cracticus torquatus</i>	Grey Butcherbird
10/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
10/12/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
11/12/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
14/12/2022	<i>Wallabia bicolor</i>	Swamp Wallaby
18/12/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
<b>Camera 37 – Northern boundary of Area 6A</b>		
3/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
4/12/2022	<i>Macropus rufogriseus</i>	Red-necked Wallaby
8/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
9/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
9/12/2022	<i>Varanus varius</i>	Lace Monitor
11/12/2022	<i>Perameles nasuta</i>	Long-nosed Bandicoot
14/12/2022	<i>Wallabia bicolor</i>	Swamp Wallaby

For any further questions, feel free to contact me.

Yours Sincerely

**Nathan Ottley**

Environmental Advisor

M: 0478 224 563

[nottley@wedgetail.com.au](mailto:nottley@wedgetail.com.au)





● 18°C 2018/01/09 19:43:10

Unidentified frog



● 21°C 2018/02/17 14:54:46

Brown Quail



○ 29°C 2022/04/18 17:11:44

Double-barred Finch



● 15°C 2022/08/21 09:24:29

Grey Butcherbird



○ 25°C 2021/10/19 07:38:12

Grey Shrike-thrush



● 31°C 2022/10/06 13:26:20

Laughing Kookaburra





● 22°C 2022/04/23 15:51:35

Superb Fairy-wren



● 11°C 2022/11/16 20:05:47

Tawny Frogmouth



● 21°C 2018/01/08 10:02:53

White-browed Scrubwren



○ 14°C 2022/04/17 22:09:22

Common Brushtail Possum



○ 9°C 2022/09/11 07:22:24

Eastern Grey Kangaroo



○ 18°C 2022/11/11 20:26:21

Feral Cat





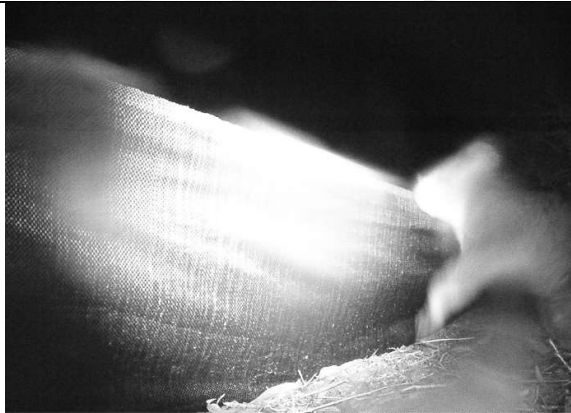
● 8°C 2022/10/25 01:37:42

Feral Rattus sp



○ 14°C 2022/10/10 19:01:27

Feral Red Fox



● 4°C 2022/08/24 02:23:55

Koala



● 2°C 2022/08/20 03:01:04

Long-nosed Bandicoot



● 18°C 2022/10/26 06:20:17

Red-necked Wallaby



● 12°C 2022/08/29 23:49:22

Short-beaked Echidna





● 12°C 2022/10/27 03:25:23

Swamp Wallaby



● 12°C 2018/01/07 00:49:06

Unidentified Mouse



● 22°C 2022/09/16 12:40:43

Eastern Brown Snake



● 33°C 2022/10/26 15:45:36

Jacky Lizard



● 35°C 2022/11/19 14:58:27

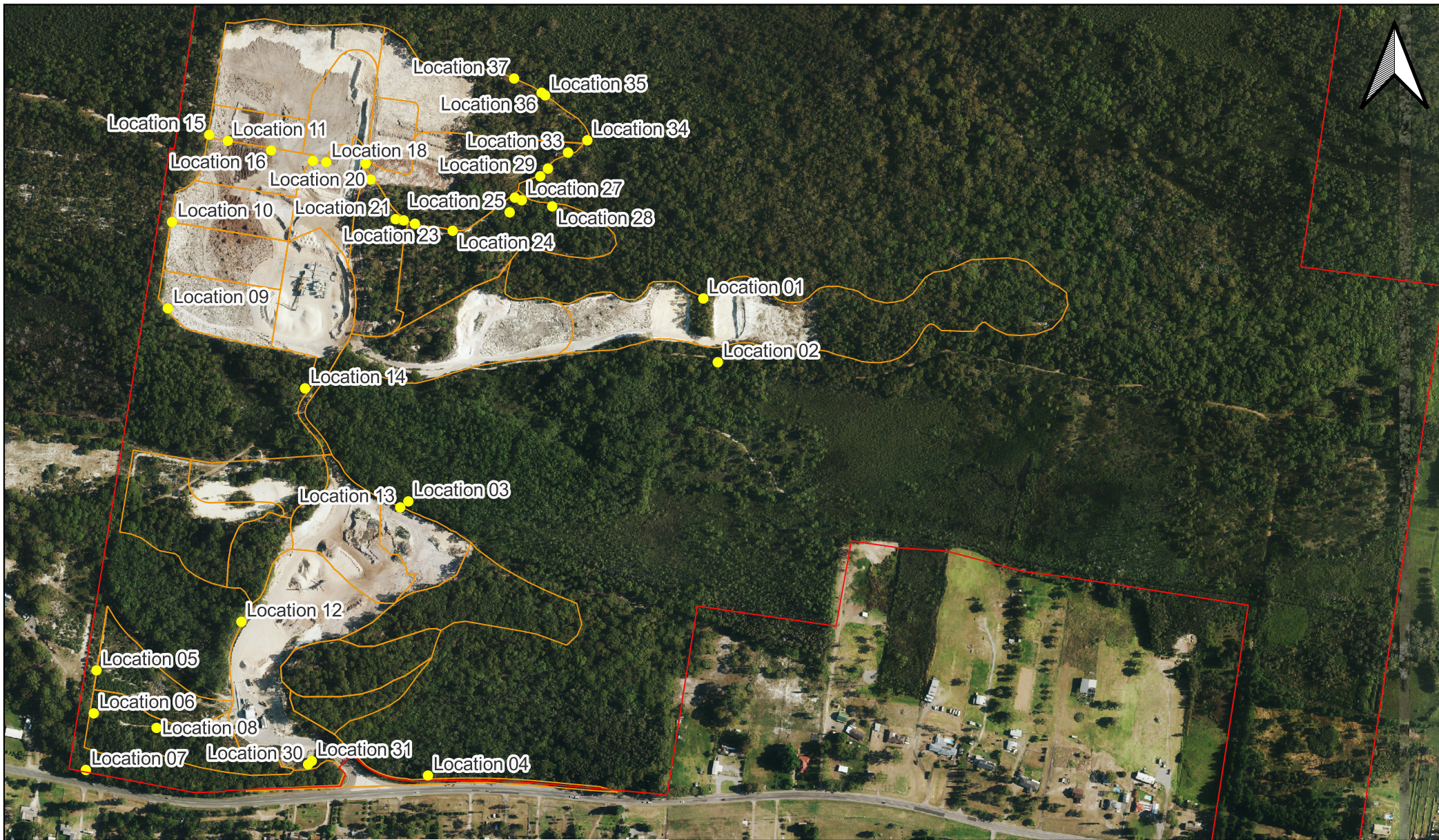
Lace Monitor



● 26°C 2022/10/27 09:51:20

Unidentified Skink





Created by: NO Version: A  
Date: 14/03/2023



— Site\_Boundary      ● Camera\_Locations  
— Development Site

Data Source: Metro Map 6.03.2023

0 250 500 750 m

## Camera Locations

Figure  
**1**

Cabbage Tree Road Sand Quarry  
398 Cabbage Tree Road, Williamtown NSW





Thursday, 23 February 2023

Quarry Manager  
Newcastle Sand Pty Ltd  
398 Cabbage Tree Road  
Williamtown NSW 2318

Attention: Sean Pennell  
Sent by email to: sean@newcastlesand.com.au

**SUBJECT: NESTBOX MONITORING – MAY 2022**

Dear Sean,

On 25 and 27 May 2022, an Ecologist from Wedgetail Project Consulting, Mark Dean, and Nathan Ottley inspected nest boxes previously installed by Kleinfelder and Wedgetail. A total of 183 nest boxes were inspected within the Onsite Biodiversity Offset Areas, checking for structural integrity and for signs of use. For each nest box, previously collected data was confirmed or amended where necessary, and photos were taken inside the boxes using a GoPro© mounted on a 4m extension pole.

Of the 183 nest boxes, 1 box hadn't been installed and was found to be sitting at the base of the tree, 2 boxes were damaged and in need of repair and 8 were wet inside and may require readjustment.

The remaining 172 nest boxes were found to be structurally sound, and associated data was collected including habitation. Of those nest boxes,

4 contained Squirrel gliders (*Petaurus norfolcensis* – see **Plate 1 & Plate 2**), 7 contained Brown antechinus (*Antechinus stuartii* – see **Plate 3 & Plate 4**), 4 contained unidentified microbats (*Nyctophilus sp.* – see **Plate 5**), 1 contained a Lace monitor (*Varanus varius* – see **Plate 6**) and 38 boxes contained nesting materials.

The location of associated boxes can be seen in **Figure 1**.





Plate 1: Pair of Squirrel gliders (*Petaurus norfolcensis*)



Plate 2: A pair of Squirrel gliders (*Petaurus norfolcensis*)



Plate 3: Brown antechinus (*Antechinus stuartii*)



Plate 4: Brown antechinus (*Antechinus stuartii*)



Plate 5: Unidentified species of microbats (*Nyctophilus* sp.)



Plate 6: A Lace monitor (*Varanus varius*)

A current summary of the total number of hollows removed and the number of nestboxes installed to date, can be seen in **Table 1**. As it stands, there have been 75 hollows removed across the site and a total of 184 nest boxes installed. Taking into consideration the 2 boxes that have been found to be damaged, there is currently an additional 108 nestboxes that have been installed ahead of requirements. As such there is no immediate requirement to replace or repair the 2 boxes in question.

**Table 1 Net balance of hollows removed to nestboxes installed**

Year	Hollows removed	Nestboxes installed		
		Small / Micro Bat	Medium / Glider	Large
August 2019 to 31 December 2019 Construction	6	-	-	-
2020 – Sectors 1A and 2	64	28	30	1
10 July 2020 Nestbox installation	-	7	16	2
March 2021 – Sectors 7B and 7C	5	39	33	27
<b>October 2021 – Sectors 3A &amp; 3B</b>	0	-	-	-
<b>February 2022 – Sector 4A</b>	0	-	-	-
<b>TOTAL</b>	<b>75</b>	<b>74</b>	<b>79</b>	<b>30</b>
		<b>183</b>		

For any further questions, feel free to contact me.

Yours Sincerely

**Nathan Ottley**

Environmental Advisor

M: 0478 224 563

[nottley@wedgetail.com.au](mailto:nottley@wedgetail.com.au)

## **APPENDIX 9. BORTOLO RADIATION SURVEY**

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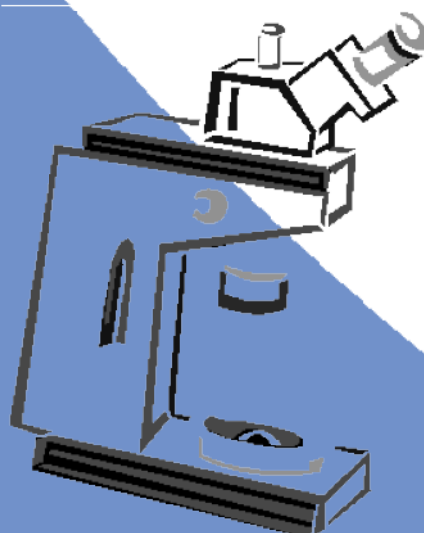
# **Surface Gamma Radiation Survey of Sections 6 & 7 of the Sand Quarry Site, Cabbage Tree Road, Williamtown, NSW**

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20 November 2022

**BARTOLO SAFETY  
MANAGEMENT SERVICE**

Laboratory, Radiation and  
Dangerous Goods Consultant



# **Surface Gamma Radiation Survey of Part of Section 6 & 7 (7 & 7A) of the Sand Quarry Site, Cabbage Tree Road, Williamtown, NSW**

**November 2022**

**by**

**Bartolo Safety Management Service**

**PO Box 264**

**Jannali NSW 2226**

**Phone: 02 9528 7676**

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**Email: [bartolo-safety@hotmail.com](mailto:bartolo-safety@hotmail.com)**

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## **Disclaimer**

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The material contained in this report is the professional opinion of the author based on the relevant Legislation, Australian Standards, Codes of Practice and experience. The author has taken all care with respect to the information contained in the report but takes no responsibility for any errors contained in it or arising from it.

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This report has been prepared in accordance within the scope of services described, in consultation between the Newcastle Sand Pty Ltd and Bartolo Safety Management Service. The report may rely on information, data, surveys and results provided by the client and the client shall assume responsibility for the accuracy of the supplied information.

This document shall not be reproduced, except in full, without the written consent of Bartolo Safety Management Service.

Author: **William C F Bartolo, B.Sc., M.Sc., M.A.R.P.S. CRSA**

Signed:



Date: ...20<sup>th</sup> November, 2022.

Reviewer:

.....

Signed:

.....

Date:

.....

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## 1.0 Introduction

### Glossary

ARPANSA – Australian Radiation Protection Nuclear Science Agency

Becquerel – the SI unit for radioactive activity is defined as the number of disintegrations per second

EPA – Environmental Protection Agency

Gray – is the SI unit of absorbed dose). It is defined as an energy deposition of one joule per kilogram.

NORM – Naturally Occurring Radioactive Material

Sievert – is the SI unit of equivalent dose. Dose equivalent remains, by definition, the absorbed dose multiplied by the quality factor, Q.

TENORM – Technically Enhanced Naturally Occurring Radioactive Material

## 1.1 Site Description

The site (see Appendix 1), Newcastle Sands (Cabbage Tree Road site Williamstown), has been partly sand mined and is generally an undulating site.

The area Under consideration is deemed as part of Section 6 and 7 (7 & 7A) and is being quarried for the sand for use in construction etc.

The site has a total area of approx. 10 - 11 ha and the survey measurements were taken on 16<sup>th</sup> November 2022.

Additionally, there has been some import in the past of other material to form the access roads, etc.

## 1.2 Purpose

The purpose of this project is to determine if there is any remaining deposits of heavy mineral sands and their associated radioactivity, either left as not being mined or due to man's activities such as stock-piling, vehicle wash-downs or track consolidation.

## 1.3 Scope

The scope of the work being undertaken by Bartolo Safety Management Service is the Geotechnic Surface Gamma Radiation Survey (where the terrain and vegetation permits). Any situations elucidated during the survey will not be part of this work.

Radiological exposure of non-human species was not included within the scope of this assessment, nor was assessment of non-radiological contaminants.

## 1.4 Information and Reference Material

### General

Natural radionuclide content in soil can vary significantly as evidenced by the following ranges of global median values: 16-110 Bq/kg for uranium-238, 11-64 Bq/kg for thorium-232 and 140-850 Bq/kg for potassium-40[3]. Mineral sands can have enhanced concentrations of the naturally occurring radionuclides uranium-238 and thorium-232, as well as their associated decay progeny, which can result in elevated terrestrial air kerma rates. In-situ processing of mineral sands typically separates sands of varying mineralogy by mass, magnetic and electrostatic properties; the main constituents include rutile, ilmenite, zircon, garnet and monazite. A dataset of uranium-238 and thorium-232 concentrations in heavy mineral sands is listed in Table 1.

**TABLE 1:** Typical specific activity concentrations of uranium and thorium in commercially available South East Queensland mineral sands (adapted from Johnston, 1988)<sup>[4]</sup>.

MINERAL PRODUCT	Uranium-238 (Bq/kg)	Thorium-232 (Bq/kg)
Rutile	560 ± 50	70 ± 15
Ilmenite	50 ± 20	64 ± 20
Zircon	3900 ± 300	620 ± 30
Monazite	21000 ± 2000	147000 ± 1900

***(Note: while the radiation dose units in the different State regulations are variously quoted in  $\mu\text{Sv}$  (microsievert) or  $\mu\text{Gy}$  (microgray) these units are identical for gamma radiation in this situation)***

The results of the radiation survey are compared to the limits as set in the following:

A surface radiation survey, as described in National and International documents (see below), was conducted to better define radiation levels over the site. There is no justification under ***Guideline 12*** and ***International Commission on Radiation Protection*** guidelines for further investigation methods such as sub-surface bore and soil measurements. The process of accurate boring and bore radiation measurements is relatively expensive, with only a very few companies/authorities in Australia doing such work.

### **The International Commission on Radiological Protection (ICRP) recommendations**

The ICRP, an independent international body, recommends upper limits on acceptable radiation dose to occupationally exposed workers (20mSv/yr averaged over 5 years) and members of the public (1mSv/yr). These limits are accepted throughout the world and used as the basis of national laws and regulations. The most recent recommendations were published in 1991 (ICRP 1991) and have been reconfirmed in 2007 (ICRP 103).

This publication introduced a new concept that is relevant to this site; the concept of “intervention”. Intervention applies to situations, such as abandoned contaminated sites, where “the sources of exposure and the exposure pathways are already present and the only type of action available is intervention”.

These ICRP recommendations have been adopted by the National Health and Medical Research Council (NHMRC 1995) [now controlled by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)] for use in Australia. ARPANSA has also updated and/or released a number of documents such as RPS 9 *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste management in Mining and Mineral Processing* (2005), and RPS 15 *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM)* (2008). The

relevant Commonwealth and State laws and Codes of Practice in turn adopt the NHMRC/ARPANSA recommendations but not all ARPANSA codes have yet been gazetted/mandated or included in the legislation at this time.

## New South Wales

NSW Radiation Control Branch has adopted the **ARPANSA Code RPS G-2 “Radiation Protection for Existing Exposure Situations”** which supersedes Radiation Safety Information Series No 12: *Clean-up and Disposal of Radioactive Residues from Commercial Operations Involving Mineral Sands*.

This document adopts a recommendation of a reference level of 10 mSv/a to be a starting point. Then using Figure 4.1 in the code this reference level may be adjusted to suit the prevailing conditions and proposed land use.

This introduces some difficulty, especially explaining to stakeholders that certain conditions or certain land uses would be restricted, as there is no definitive guideline as was in the old guideline.

For most of this work where it is old mineral sand mining sites, the proposed land use is either: a) national park; b) State forest or reserve; c) parkland; or d) a sand quarry for commercial sand supply, and as such would see the occupancy to be low (an occupant factor of about 25% or less).

As individuals who would be utilising these areas (recreation or work) would be classed as “General Public” the the annual dose limit would be 1 mSv/a. As such the following calculations are based on this dose limit and an occupancy factor of 25% (which would cover the average weekly working hours):

Dose rate at 1 metre above surface level would be (for recreational purposes, conservation or work):

$$\begin{aligned}\text{NORM Dose Rate } N_{\text{ann}} &= 1000 \mu\text{Sv/a} \div (8736 \times 0.25) \\ N_{\text{ann}} &= 1000 \mu\text{Sv/a} \div 2184 \\ N_{\text{ann}} &= 0.458 \mu\text{Sv/hr}\end{aligned}$$

If this was for residential purposes, the dose rate at 1 metre above surface level would be:

(using an occupancy factor of 85% taken from the old guideline)

$$\begin{aligned}\text{NORM Dose Rate } N_{\text{ann}} &= 1000 \mu\text{Sv/a} \div (8736 \times 0.85) \\ N_{\text{ann}} &= 1000 \mu\text{Sv/a} \div 7425 \\ N_{\text{ann}} &= 0.135 \mu\text{Sv/hr}\end{aligned}$$

Which is approximately average background.

Hence from these calculations, the dose limits are the following:

- For residential – 0.135  $\mu\text{Sv/hr}$



- For parks, reserves, work areas, etc - 0.458  $\mu\text{Sv/hr}$
- For solely conservation and reserve (parks) areas - 1.145  $\mu\text{Sv/hr}$  (using a reference level of 2.5 mSv/a)

### Other States

See Appendice 2

## 2.0 Historic Aspects

This land has been sand mined in an unusual pattern, probably following a natural depressions where the heavy mineral sands would accumulate due to transport mechanisms such as water run-off and wind erosion. A large portion of this survey area has not been sand mined, and as such contains natural vegetation at natural density for this area and type of ecological community.

The land does not appear to have been developed since the mining, other than a little sand quarrying.

## 3.0 Instruments and Measurement Technique

### 3.1 Instruments

SAIC Exploranium Model No.: GR130 Serial No.: 9940+GM Gamma ray survey (calibration conducted in September 2022 [see attached sheets Appendix 5] and confirmed on the day by use of an educational Thorium Standard and stabilized using a Cs-137 source);

As a confirmation of any “high” counts a Radiation Alert “Inspector” (Calibrated September 2022 - see Appendix 6), also used with the wipe test plate for any soil analysis ;

a Garmin GPSMAP 64SX GPS unit.

The SAIC equipment measures in Counts per Second, and hence measurements need to be converted to dose rate for comparison with the NSW Guidelines and other documents. To do this the following formula, which is based and derived from the data supplied with the calibration certificates, is used:

$$Y = X \times 1.001784518$$

$$R^2 = 1$$

Where:

y – is dose rate in nGy/hr

x – is counts per second

## 3.2 Measurement Techniques

### Surface Measurements

The proposal was to measure each of the lots as discrete areas with each area measured at approximately 15 metre grid transect using the GPS for tracking of the measurement transects and any other deviations and paths. This whole approach was dependent on the conditions (vegetation, radiation activity, topography, obstructions, and structures), Work health and Safety (WHS) Risk Assessment and as such the measurement transect pattern varied significantly mostly due to terrain and vegetation density. This modification “on-the-run” would continually consider the necessity of accurate and reliable data, and the need for sufficient measurements to capture substantial contamination zones.

The transect patterns that were finalized “on-the-run” are displayed in the Appendix (Appendix 3). NOTE: the original transect plan was “abandoned” due to the vegetation and topography (mainly the density of the vegetation).

The measurement process is to trek the “transect line” with the instrument above the ground at about the 1 metre level. Measurements were noted when the auditory level of the instrument changed. Any “high” measurements were defined by moving about the area to determine the limit of the contamination and the highest level. The measurements would then be confirmed by using the RadAlert instrument if necessary.

The SAIC Exploranium is set up to record the measurements every two seconds in unique data sets as determined by when the measurement activity is terminated. Two second measurement intervals would equate to approximately 3 metres of normal walking over an easy walking surface. Once the work or area under consideration is completed the Exploranium is then attached to a computer and the data downloaded as a CSV file for assessment and manipulation.

**NOTE:** the measurements as displayed in the relevant appendices **do not** indicate a length of transect but rather in this situation the time and thus difficulty of progress across the terrain.

The information contained in the header of the first column of the results is the following for example:

Using Transect P6-B3 the header is:

**3 16:05:25 10:20:28 cps Live time (s) 2.00**

The first number is the data set number (hence this is data set 3 for this site)

The second set 16:05:25 is the date – 25 May 2016

The third set 10:20:28 is the time – is 10.20.28 AM

The fourth set of information is cps indicating that the results are in Counts Per Second

The last piece of information is Live Time (s) 2.00 which means that the measurement and data record is set at 2 second intervals.

### **Cosmic Radiation Component**

The cosmic radiation component of natural background is latitude, longitude and altitude dependent; and has been calculated using United States Federal Aviation Administration Civil Aerospace Medical Institute software ‘CARI-6’. The mean cosmic surface air kerma rate for November was 39.5 nGy/h (0.0395 µSv/h) at 32° 48’ 28.695”S 151° 48’ 06.77”E, elevation of 13 m, using a dose conversion factor of 1Sv/Gy.

This does not however take into account such things as heavy cloud, rain and dense vegetation canopy which acts as shielding.

The results in the relevant Appendices have not been adjusted by the reduction of the measurements by the (0.0395 µSv/h factor and this has been incorporated in the data contained in column 3 of the data sets of the relevant appendices.

### **Work, Health and Safety Risk Assessment**

As this work is being conducted in a “remote” location and that there are various risks associated with this type of work (such as slips, trips and falls,

snake/spider/tick/insect bites, cuts and abrasions due to vegetation, allergy reactions to plants and other things, and falling limbs and branches) then a risk assessment is required and that this risk assessment is “living” whilst the work is being conducted.

As the risk for some of the hazards are medium and high then the approach BSMS will conduct during the transect measurements will be to change the transects as needed to avoid or minimise such risks.



## 4.0 Survey Results

### 4.1 General

All measurements were completed on the 16<sup>th</sup> November 2022, and the results for the transects that were measured, showed results that in general were not of concern in terms of radiation.

As can be seen from Appendix 4 the following is a summation of that data:

- Total distance covered whilst surveying area – approx. 11.5 kilometres
- Highest CPS measurement recorded – 78 cps
- Highest Dose rate measurement recorded – 0.08  $\mu\text{Sv/h}$  (before cosmic radiation adjustment)
- Lowest CPS measurement recorded – 22 cps
- Lowest Dose rate measurement recorded – 0.02  $\mu\text{Sv/h}$  (before cosmic radiation adjustment)

As can be seen from the results the dose range was from 0.02 to 0.08  $\mu\text{Sv/h}$ , which is well below the 0.135  $\mu\text{Sv/hr}$  for residential limit and the 0.458  $\mu\text{Sv/hr}$  for parks and works limit. Hence there would be no radiological concerns for this area.

## 5.0 Discussion

**NOTE:** The transects were not conducted as planned due to the very dense vegetation in places – this caused loss of direction and the rambling of the transects. It was extremely difficult to walk the planned transects and maintain direction. See Appendix 3 for the map of transects.

On examining the results of the surface gamma radiation survey there are no radioactive concentrations or activities that are of any concern for the proposed use of the land/sand. All locations are below the levels derived from the ARPANSA Code.

The results, even when compared to the most restrictive of the

guidelines/legislation (WA in this instance), indicate that none of the results would reach the level of 0.46 µGy/hr for dwellings.

## References

ICRP 2007. Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Elsevier 2007.

Qld Health Department. Radiation Dose Levels For Properties Where Mineral Sand Residues Are Deposited On The Ground. 1995

ARPANSA Code RPS G-2 “Radiation Protection for Existing Exposure Situations” (2017)

ARPANSA RPS 9 *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste management in Mining and Mineral Processing* (2005)

ARPANSA RPS 15 *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM)* (2008).

FAA's Civil Aerospace Medical Institute Radiobiology Research Team, *CARI-6*, 2004, United States of America Federal Aviation Administration. p. Computer Freeware.



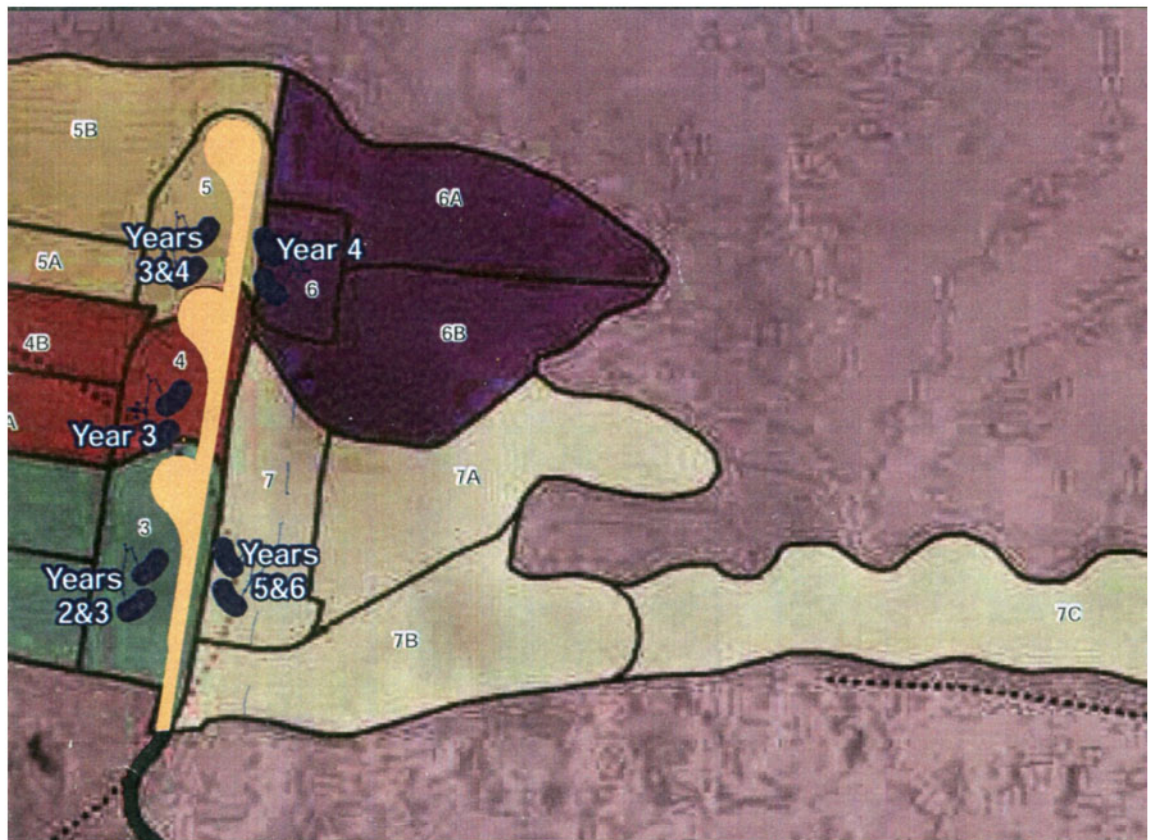


Figure 1. Areas 6 (6, 6A & 6B) and 7 (7, 7A & 7B) that are mapped by Newcastle Sand for Quarry Work

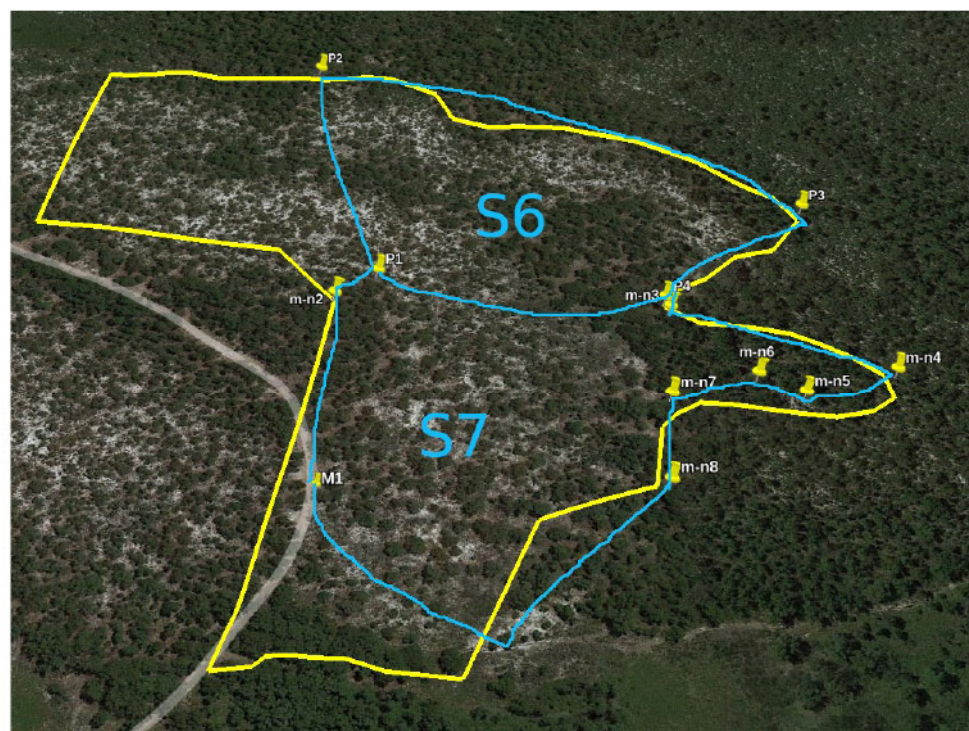


Figure 2. Areas outlined in blue that BSMS surveyed

### GPS References

Reference	Latitude	Longitude
M1	32° 48' 28.69"S	151° 48' 6.77"E
M-n2	32° 48' 24.02"S	151° 48' 06.86"E
M-n3	32°48'24.32"S	151°48'15.07"E
M-n4	32°48'25.94"S	151°48'20.19"E
M-n5	32°48'26.52"S	151°48'17.93"E
M-n6	32°48'26.05"S	151°48'16.91"E
M-n7	32°48'26.60"S	151°48'14.81"E
M-n8	32°48'28.61"S	151°48'14.53"E
P1	32°48'23.43"S	151°48'7.91"E
P2	32°48'16.80"S	151°48'6.00"E
P3	32°48'21.41"S	151°48'18.87"E
P4	32°48'24.06"S	151°48'14.99"E

## APPENDIX 2 OTHER STATES' RELEVANT LEGISLATION

### Queensland

#### **Queensland Health Policy Document: Radiation Dose Levels for Properties where Mineral Sand Residues are Deposited on the Ground**

This document is of relevance because it was written in 1995 and incorporates the more recent ICRP concept of “intervention”. For some of its recommendations, however, it still refers back to a 1984 NHMRC document.

For practices under control, where technically enhanced radiation sources (TENORM) of mineral sands are deposited on the ground the limits are:

0.1  $\mu\text{Sv/hr}$  above the natural background level for dwellings, schools, etc. and

0.2  $\mu\text{Sv/hr}$  above the natural background level for parks etc.

Assuming a background level of 0.1  $\mu\text{Sv/hr}$ , the action levels for dwellings, schools, etc. would be 0.2  $\mu\text{Sv/hr}$  and for parks etc. would be 0.3  $\mu\text{Sv/hr}$ . Practices under control refer to situations where the mining company is still operating and has responsibility for the land in question.

For an “out of control” practice (i.e. an intervention situation), where the mining company is not still operating and has no responsibility for the land in question, the action levels including background are:

for dwellings, schools etc., 0.6  $\mu\text{Sv/hr}$  (600 nGy/hr),

for parks etc., 1.0  $\mu\text{Sv/hr}$  (1000 nGy/hr) and

for roads and footpaths, 2.5  $\mu\text{Sv/hr}$  (2500 nGy/hr).

*PTO*

## **Western Australia**

### **Radiation Health Branch of WA Mines Department Guidelines**

The Radiation Health Branch of the West Australian Mines Department set (in 1988) Guidelines for remedial action in areas of enhanced background gamma radiation levels. The action level criteria are:

- for dwellings, 0.46  $\mu\text{Gy/hr}$ ,
- for schools, 0.57  $\mu\text{Gy/hr}$ ,
- for other areas, 0.7  $\mu\text{Gy/hr}$ , and
- for roads, paths etc, 2.5  $\mu\text{Gy/hr}$ .

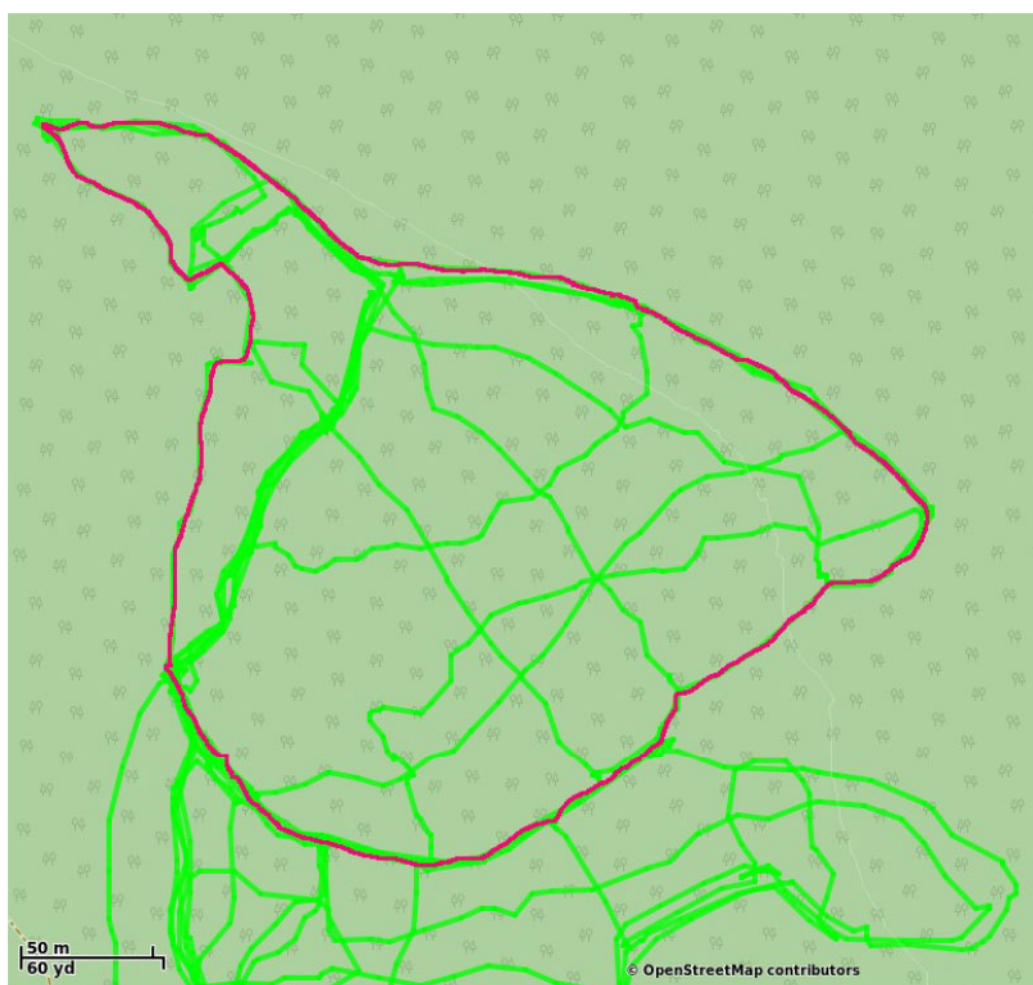


## APPENDIX 3 DETAILS, AND TRANSECTS

Map datum WSG84; North Reference – Magnetic;  
Coordinate type – Degree minutes & seconds

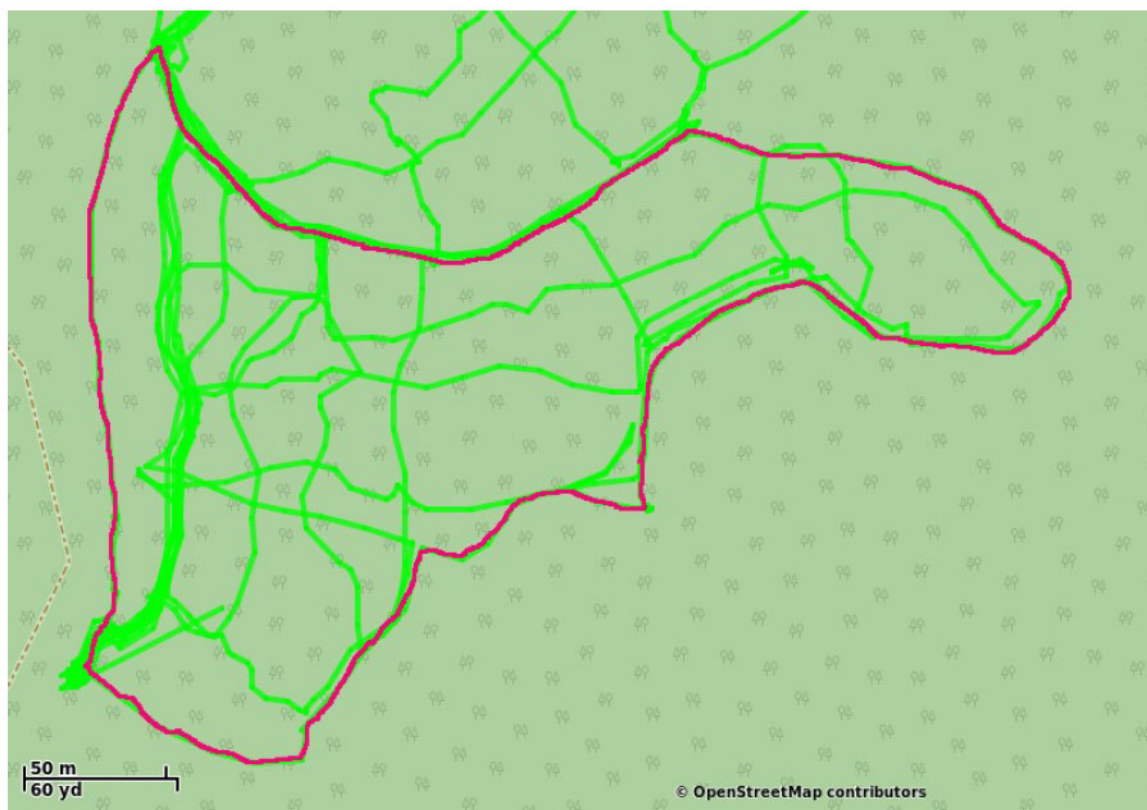
Information Detail	Value
Distance traversed	Approx. 11.5 km
No. transects	27 (2 perimeter, 25 internal)
No. data Points	Approx 3990

The transects (tracks) conducted on the site for the Gamma Radiation Surface Survey **Section 6**  
(GPS error approx  $\pm 3m$ )[red track = perimeter; – light green tracks = transects conducted]





The transects (tracks) conducted on the site for the Gamma Radiation Surface Survey **Section 7**  
(GPS error approx  $\pm 3\text{m}$ ) [red track = perimeter; – light green tracks = transects conducted]



## APPENDIX 4 SURFACE GAMMA RADIATION RESULTS

### SECTION 6

#### P1 - P2 (West Boundary)

3 22:11:16		
11:33:33 cps		
Live time (s)		
2.00	microSv/hr	Cosmic Corrected microSv/hr
56	0.06	0.02
51	0.05	0.01
48	0.05	0.01
57	0.06	0.02
48	0.05	0.01
57	0.06	0.02
56	0.06	0.02
48	0.05	0.01
53	0.05	0.01
46	0.05	0.01
44	0.04	0.00
47	0.05	0.01
47	0.05	0.01
43	0.04	0.00
49	0.05	0.01
46	0.05	0.01
35	0.04	0.00
45	0.05	0.01
39	0.04	0.00
43	0.04	0.00
44	0.04	0.00
60	0.06	0.02
66	0.07	0.03
49	0.05	0.01
55	0.06	0.02
52	0.05	0.01
44	0.04	0.00
44	0.04	0.00
52	0.05	0.01
49	0.05	0.01
42	0.04	0.00
51	0.05	0.01
42	0.04	0.00
42	0.04	0.00
43	0.04	0.00
48	0.05	0.01
60	0.06	0.02

60	0.06	0.02
64	0.06	0.02
57	0.06	0.02
53	0.05	0.01
53	0.05	0.01
56	0.06	0.02
44	0.04	0.00
62	0.06	0.02
46	0.05	0.01
49	0.05	0.01
50	0.05	0.01
55	0.06	0.02
56	0.06	0.02
60	0.06	0.02
58	0.06	0.02
65	0.07	0.03
56	0.06	0.02
51	0.05	0.01
57	0.06	0.02
58	0.06	0.02
59	0.06	0.02
57	0.06	0.02
63	0.06	0.02
61	0.06	0.02
60	0.06	0.02
63	0.06	0.02
57	0.06	0.02
54	0.05	0.01
64	0.06	0.02
58	0.06	0.02
61	0.06	0.02
51	0.05	0.01
65	0.07	0.03

#### P2 - P3 (North Boundary)

4 22:11:16		
11:43:16 cps		
Live time (s)		
2.00	microSv/hr	Cosmic Corrected microSv/hr
43	0.04	0.00
38	0.04	0.00

44	0.04	0.00	53	0.05	0.01
55	0.06	0.02	54	0.05	0.01
58	0.06	0.02	36	0.04	0.00
57	0.06	0.02	53	0.05	0.01
46	0.05	0.01	59	0.06	0.02
41	0.04	0.00	50	0.05	0.01
51	0.05	0.01	62	0.06	0.02
47	0.05	0.01	48	0.05	0.01
50	0.05	0.01	49	0.05	0.01
43	0.04	0.00	50	0.05	0.01
43	0.04	0.00	45	0.05	0.01
46	0.05	0.01	49	0.05	0.01
45	0.05	0.01	51	0.05	0.01
56	0.06	0.02	44	0.04	0.00
52	0.05	0.01	45	0.05	0.01
45	0.05	0.01	55	0.06	0.02
51	0.05	0.01	48	0.05	0.01
58	0.06	0.02	56	0.06	0.02
66	0.07	0.03	37	0.04	0.00
56	0.06	0.02	57	0.06	0.02
51	0.05	0.01	45	0.05	0.01
46	0.05	0.01	46	0.05	0.01
54	0.05	0.01	47	0.05	0.01
50	0.05	0.01	41	0.04	0.00
48	0.05	0.01	50	0.05	0.01
55	0.06	0.02	43	0.04	0.00
55	0.06	0.02	66	0.07	0.03
51	0.05	0.01	59	0.06	0.02
47	0.05	0.01	56	0.06	0.02
53	0.05	0.01	49	0.05	0.01
65	0.07	0.03	51	0.05	0.01
48	0.05	0.01	64	0.06	0.02
62	0.06	0.02	46	0.05	0.01
54	0.05	0.01	62	0.06	0.02
49	0.05	0.01	50	0.05	0.01
51	0.05	0.01	52	0.05	0.01
60	0.06	0.02	60	0.06	0.02
48	0.05	0.01	56	0.06	0.02
52	0.05	0.01	59	0.06	0.02
60	0.06	0.02	63	0.06	0.02
49	0.05	0.01	57	0.06	0.02
55	0.06	0.02	53	0.05	0.01
47	0.05	0.01	50	0.05	0.01
67	0.07	0.03	34	0.03	0.00
48	0.05	0.01	43	0.04	0.00
46	0.05	0.01	49	0.05	0.01
57	0.06	0.02	38	0.04	0.00

39	0.04	0.00
44	0.04	0.00
39	0.04	0.00
41	0.04	0.00
32	0.03	0.00
36	0.04	0.00
41	0.04	0.00
37	0.04	0.00
31	0.03	0.00
32	0.03	0.00
37	0.04	0.00
32	0.03	0.00
26	0.03	0.00
32	0.03	0.00
34	0.03	0.00
37	0.04	0.00
40	0.04	0.00
42	0.04	0.00
48	0.05	0.01
37	0.04	0.00
37	0.04	0.00
39	0.04	0.00
24	0.02	0.00
37	0.04	0.00
29	0.03	0.00
24	0.02	0.00
30	0.03	0.00
31	0.03	0.00
40	0.04	0.00
33	0.03	0.00
34	0.03	0.00
40	0.04	0.00
40	0.04	0.00
35	0.04	0.00
36	0.04	0.00
31	0.03	0.00
30	0.03	0.00
32	0.03	0.00
39	0.04	0.00
33	0.03	0.00
37	0.04	0.00
35	0.04	0.00
34	0.03	0.00
48	0.05	0.01
46	0.05	0.01
36	0.04	0.00
42	0.04	0.00

36	0.04	0.00
32	0.03	0.00
33	0.03	0.00
23	0.02	0.00
26	0.03	0.00
33	0.03	0.00
25	0.03	0.00
24	0.02	0.00
29	0.03	0.00
24	0.02	0.00
30	0.03	0.00
31	0.03	0.00
28	0.03	0.00
31	0.03	0.00
31	0.03	0.00
30	0.03	0.00
32	0.03	0.00
31	0.03	0.00
33	0.03	0.00
26	0.03	0.00
36	0.04	0.00
35	0.04	0.00
29	0.03	0.00
25	0.03	0.00
30	0.03	0.00
35	0.04	0.00
34	0.03	0.00
33	0.03	0.00
30	0.03	0.00
29	0.03	0.00
25	0.03	0.00
25	0.03	0.00

#### P3 - P4 (East Boundary)

5 22:11:16

11:50:56 cps

Live time (s)

2.00

microSv/hr

Cosmic  
Corrected  
microSv/hr

28	0.03	0.00
31	0.03	0.00
32	0.03	0.00
30	0.03	0.00
30	0.03	0.00
29	0.03	0.00
28	0.03	0.00
26	0.03	0.00



26	0.03	0.00
27	0.03	0.00
23	0.02	0.00
27	0.03	0.00
26	0.03	0.00
25	0.03	0.00
27	0.03	0.00
27	0.03	0.00
22	0.02	0.00
24	0.02	0.00
27	0.03	0.00
23	0.02	0.00
22	0.02	0.00
29	0.03	0.00
25	0.03	0.00
22	0.02	0.00
33	0.03	0.00
34	0.03	0.00
22	0.02	0.00
23	0.02	0.00
22	0.02	0.00
19	0.02	0.00
32	0.03	0.00
26	0.03	0.00
22	0.02	0.00
30	0.03	0.00
30	0.03	0.00
29	0.03	0.00
42	0.04	0.00
25	0.03	0.00
31	0.03	0.00
28	0.03	0.00
31	0.03	0.00
26	0.03	0.00
22	0.02	0.00
43	0.04	0.00
33	0.03	0.00
33	0.03	0.00
27	0.03	0.00
31	0.03	0.00
29	0.03	0.00
28	0.03	0.00
34	0.03	0.00
27	0.03	0.00
27	0.03	0.00
22	0.02	0.00
30	0.03	0.00

29	0.03	0.00
27	0.03	0.00
24	0.02	0.00
25	0.03	0.00
31	0.03	0.00
31	0.03	0.00
35	0.04	0.00
35	0.04	0.00
32	0.03	0.00
32	0.03	0.00
35	0.04	0.00
26	0.03	0.00
32	0.03	0.00
34	0.03	0.00

#### P4 - P1 (South Boundary)

6 22:11:16

11:55:27 cps

Live time (s)

2.00

microSv/hr

Cosmic  
Corrected  
microSv/hr

29	0.03	0.00
31	0.03	0.00
33	0.03	0.00
37	0.04	0.00
25	0.03	0.00
34	0.03	0.00
40	0.04	0.00
31	0.03	0.00
30	0.03	0.00
30	0.03	0.00
36	0.04	0.00
42	0.04	0.00
44	0.04	0.00
30	0.03	0.00
32	0.03	0.00
35	0.04	0.00
28	0.03	0.00
36	0.04	0.00
39	0.04	0.00
42	0.04	0.00
40	0.04	0.00
36	0.04	0.00
33	0.03	0.00
33	0.03	0.0046
34	0.03	0.00
28	0.03	0.00

34	0.03	0.00	39	0.04	0.00
45	0.05	0.01	31	0.03	0.00
48	0.05	0.01	45	0.05	0.01
59	0.06	0.02	35	0.04	0.00
41	0.04	0.00	34	0.03	0.00
46	0.05	0.01	31	0.03	0.00
49	0.05	0.01	43	0.04	0.00
55	0.06	0.02	38	0.04	0.00
41	0.04	0.00	29	0.03	0.00
45	0.05	0.01	36	0.04	0.00
42	0.04	0.00	45	0.05	0.01
42	0.04	0.00	45	0.05	0.01
40	0.04	0.00	38	0.04	0.00
44	0.04	0.00	43	0.04	0.00
52	0.05	0.01	48	0.05	0.01
52	0.05	0.01	53	0.05	0.01
43	0.04	0.00	46	0.05	0.01
37	0.04	0.00	55	0.06	0.02
42	0.04	0.00	34	0.03	0.00
42	0.04	0.00	45	0.05	0.01
46	0.05	0.01	41	0.04	0.00
54	0.05	0.01	34	0.03	0.00
57	0.06	0.02	40	0.04	0.00
53	0.05	0.01	33	0.03	0.00
48	0.05	0.01	36	0.04	0.00
51	0.05	0.01	39	0.04	0.00
50	0.05	0.01	38	0.04	0.00
57	0.06	0.02	37	0.04	0.00
47	0.05	0.01	38	0.04	0.00
48	0.05	0.01	34	0.03	0.00
52	0.05	0.01	47	0.05	0.01
47	0.05	0.01	49	0.05	0.01
41	0.04	0.00	54	0.05	0.01
46	0.05	0.01	37	0.04	0.00
43	0.04	0.00			
58	0.06	0.02			
42	0.04	0.00			
54	0.05	0.01			
52	0.05	0.01			
49	0.05	0.01			
51	0.05	0.01			
62	0.06	0.02			
55	0.06	0.02			
62	0.06	0.02			
55	0.06	0.02			
52	0.05	0.01			
38	0.04	0.00			

#### Transect S6#1

1 22:11:16		
12:20:33 cps		Cosmic
Live time (s)		Corrected
2.00	microSv/hr	microSv/hr
54	0.05	0.01
47	0.05	0.01
44	0.04	0.00
47	0.05	0.01
47	0.05	0.01

47	0.05	0.01	53	0.05	0.01
45	0.05	0.01	45	0.05	0.01
36	0.04	0.00	48	0.05	0.01
32	0.03	0.00	49	0.05	0.01
46	0.05	0.01	47	0.05	0.01
44	0.04	0.00	52	0.05	0.01
41	0.04	0.00	57	0.06	0.02
48	0.05	0.01	47	0.05	0.01
53	0.05	0.01	41	0.04	0.00
48	0.05	0.01	46	0.05	0.01
41	0.04	0.00	46	0.05	0.01
49	0.05	0.01	47	0.05	0.01
52	0.05	0.01	45	0.05	0.01
53	0.05	0.01	50	0.05	0.01
52	0.05	0.01	48	0.05	0.01
50	0.05	0.01	45	0.05	0.01
42	0.04	0.00	47	0.05	0.01
51	0.05	0.01	39	0.04	0.00
46	0.05	0.01	39	0.04	0.00
51	0.05	0.01	55	0.06	0.02
54	0.05	0.01	44	0.04	0.00
56	0.06	0.02	43	0.04	0.00
46	0.05	0.01	42	0.04	0.00
48	0.05	0.01	55	0.06	0.02
48	0.05	0.01	47	0.05	0.01
56	0.06	0.02	45	0.05	0.01
59	0.06	0.02	44	0.04	0.00
54	0.05	0.01	44	0.04	0.00
58	0.06	0.02	44	0.04	0.00
65	0.07	0.03			
58	0.06	0.02			
60	0.06	0.02			
52	0.05	0.01			
58	0.06	0.02			
69	0.07	0.03			
61	0.06	0.02			
57	0.06	0.02			
58	0.06	0.02			
47	0.05	0.01			
40	0.04	0.00			
37	0.04	0.00			
35	0.04	0.00			
31	0.03	0.00			
40	0.04	0.00			
43	0.04	0.00			
44	0.04	0.00			
54	0.05	0.01			

#### Transect S6#2

2 22:11:16

12:27:00 cps

Live time (s)

2.00

microSv/hr

Cosmic  
Corrected  
microSv/hr

43

0.04

0.00

38

0.04

0.00

33

0.03

0.00

41

0.04

0.00

45

0.05

0.01

39

0.04

0.00

44

0.04

0.00

35

0.04

0.00

42

0.04

0.00

30

0.03

0.00

39

0.04

0.00

38	0.04	0.00	48	0.05	0.01
41	0.04	0.00	41	0.04	0.00
39	0.04	0.00	50	0.05	0.01
36	0.04	0.00	40	0.04	0.00
47	0.05	0.01	44	0.04	0.00
45	0.05	0.01	50	0.05	0.01
37	0.04	0.00	37	0.04	0.00
49	0.05	0.01	40	0.04	0.00
35	0.04	0.00	46	0.05	0.01
40	0.04	0.00	40	0.04	0.00
29	0.03	0.00	50	0.05	0.01
28	0.03	0.00	34	0.03	0.00
28	0.03	0.00	46	0.05	0.01
23	0.02	0.00	36	0.04	0.00
44	0.04	0.00	34	0.03	0.00
41	0.04	0.00	38	0.04	0.00
39	0.04	0.00	39	0.04	0.00
36	0.04	0.00	50	0.05	0.01
40	0.04	0.00	34	0.03	0.00
37	0.04	0.00	35	0.04	0.00
40	0.04	0.00	40	0.04	0.00
42	0.04	0.00	48	0.05	0.01
39	0.04	0.00	45	0.05	0.01
37	0.04	0.00	48	0.05	0.01
41	0.04	0.00	59	0.06	0.02
52	0.05	0.01	57	0.06	0.02
43	0.04	0.00	57	0.06	0.02
47	0.05	0.01	53	0.05	0.01
39	0.04	0.00	66	0.07	0.03
45	0.05	0.01	53	0.05	0.01
46	0.05	0.01	61	0.06	0.02
48	0.05	0.01	55	0.06	0.02
39	0.04	0.00	57	0.06	0.02
41	0.04	0.00	69	0.07	0.03
45	0.05	0.01	63	0.06	0.02
44	0.04	0.00	49	0.05	0.01
45	0.05	0.01	48	0.05	0.01
39	0.04	0.00	56	0.06	0.02
44	0.04	0.00	52	0.05	0.01
44	0.04	0.00	55	0.06	0.02
39	0.04	0.00	51	0.05	0.01
37	0.04	0.00	61	0.06	0.02
41	0.04	0.00	52	0.05	0.01
47	0.05	0.01	49	0.05	0.01
46	0.05	0.01	41	0.04	0.00
42	0.04	0.00	44	0.04	0.00
42	0.04	0.00	47	0.05	0.01



43	0.04	0.00
41	0.04	0.00
51	0.05	0.01
49	0.05	0.01
51	0.05	0.01
42	0.04	0.00
53	0.05	0.01
49	0.05	0.01
49	0.05	0.01
59	0.06	0.02
52	0.05	0.01
58	0.06	0.02
57	0.06	0.02
51	0.05	0.01
61	0.06	0.02
52	0.05	0.01
48	0.05	0.01
54	0.05	0.01
48	0.05	0.01
55	0.06	0.02
51	0.05	0.01
53	0.05	0.01
52	0.05	0.01
46	0.05	0.01
48	0.05	0.01
55	0.06	0.02
61	0.06	0.02
57	0.06	0.02
44	0.04	0.00
54	0.05	0.01
49	0.05	0.01
38	0.04	0.00
55	0.06	0.02

#### **Transect S6#3**

3 22:11:16

12:36:24 cps

Live time (s)

2.00

microSv/hr

Cosmic  
Corrected  
microSv/hr

46	0.05	0.01
47	0.05	0.01
42	0.04	0.00
48	0.05	0.01
43	0.04	0.00
44	0.04	0.00
46	0.05	0.01

43	0.04	0.00
43	0.04	0.00
40	0.04	0.00
41	0.04	0.00
41	0.04	0.00
45	0.05	0.01
42	0.04	0.00
51	0.05	0.01
46	0.05	0.01
58	0.06	0.02
52	0.05	0.01
52	0.05	0.01
49	0.05	0.01
45	0.05	0.01
56	0.06	0.02
49	0.05	0.01
60	0.06	0.02
54	0.05	0.01
58	0.06	0.02
61	0.06	0.02
59	0.06	0.02
50	0.05	0.01
58	0.06	0.02
49	0.05	0.01
56	0.06	0.02
53	0.05	0.01
39	0.04	0.00
34	0.03	0.00
36	0.04	0.00
43	0.04	0.00
36	0.04	0.00
51	0.05	0.01
50	0.05	0.01
47	0.05	0.01
42	0.04	0.00
41	0.04	0.00
48	0.05	0.01
47	0.05	0.01
45	0.05	0.01
55	0.06	0.02
43	0.04	0.00
35	0.04	0.00
37	0.04	0.00
39	0.04	0.00
37	0.04	0.00
40	0.04	0.00
41	0.04	0.00

54	0.05	0.01	39	0.04	0.00
44	0.04	0.00	35	0.04	0.00
56	0.06	0.02	31	0.03	0.00
51	0.05	0.01	35	0.04	0.00
58	0.06	0.02	40	0.04	0.00
47	0.05	0.01	36	0.04	0.00
59	0.06	0.02	32	0.03	0.00
59	0.06	0.02	39	0.04	0.00
53	0.05	0.01	29	0.03	0.00
47	0.05	0.01	31	0.03	0.00
57	0.06	0.02	32	0.03	0.00
52	0.05	0.01	33	0.03	0.00
52	0.05	0.01	34	0.03	0.00
48	0.05	0.01	32	0.03	0.00
54	0.05	0.01	22	0.02	0.00
54	0.05	0.01	26	0.03	0.00
53	0.05	0.01	29	0.03	0.00
54	0.05	0.01	30	0.03	0.00
61	0.06	0.02	28	0.03	0.00
52	0.05	0.01	27	0.03	0.00
56	0.06	0.02	35	0.04	0.00
42	0.04	0.00	32	0.03	0.00
50	0.05	0.01	33	0.03	0.00
48	0.05	0.01	31	0.03	0.00
37	0.04	0.00	27	0.03	0.00
40	0.04	0.00	26	0.03	0.00
40	0.04	0.00	27	0.03	0.00
35	0.04	0.00	24	0.02	0.00
30	0.03	0.00	31	0.03	0.00
38	0.04	0.00	37	0.04	0.00
38	0.04	0.00	32	0.03	0.00
48	0.05	0.01	38	0.04	0.00
51	0.05	0.01	33	0.03	0.00
41	0.04	0.00	35	0.04	0.00
37	0.04	0.00	36	0.04	0.00
33	0.03	0.00	28	0.03	0.00
41	0.04	0.00	40	0.04	0.00
34	0.03	0.00	32	0.03	0.00
40	0.04	0.00	34	0.03	0.00
31	0.03	0.00	41	0.04	0.00
32	0.03	0.00	33	0.03	0.00
38	0.04	0.00	36	0.04	0.00
35	0.04	0.00	28	0.03	0.00
36	0.04	0.00	38	0.04	0.00
34	0.03	0.00	29	0.03	0.00
36	0.04	0.00	34	0.03	0.00
34	0.03	0.00	43	0.04	0.00

31

0.03

0.00

43

0.04

0.00

40	0.04	0.00	27	0.03	0.00
34	0.03	0.00	27	0.03	0.00
31	0.03	0.00	42	0.04	0.00
40	0.04	0.00	36	0.04	0.00
36	0.04	0.00	34	0.03	0.00
46	0.05	0.01	28	0.03	0.00
36	0.04	0.00	33	0.03	0.00
34	0.03	0.00	26	0.03	0.00
37	0.04	0.00	26	0.03	0.00
36	0.04	0.00	30	0.03	0.00
34	0.03	0.00	28	0.03	0.00
37	0.04	0.00	30	0.03	0.00
46	0.05	0.01	23	0.02	0.00
39	0.04	0.00	32	0.03	0.00
39	0.04	0.00	28	0.03	0.00
34	0.03	0.00	36	0.04	0.00
35	0.04	0.00	27	0.03	0.00
36	0.04	0.00	28	0.03	0.00
39	0.04	0.00	24	0.02	0.00
26	0.03	0.00	34	0.03	0.00
31	0.03	0.00	34	0.03	0.00
24	0.02	0.00	29	0.03	0.00
26	0.03	0.00	39	0.04	0.00
30	0.03	0.00	35	0.04	0.00
29	0.03	0.00	27	0.03	0.00
30	0.03	0.00	27	0.03	0.00
36	0.04	0.00	26	0.03	0.00
28	0.03	0.00	36	0.04	0.00
26	0.03	0.00	30	0.03	0.00
30	0.03	0.00	31	0.03	0.00
22	0.02	0.00	33	0.03	0.00
25	0.03	0.00	27	0.03	0.00
32	0.03	0.00	28	0.03	0.00
32	0.03	0.00	39	0.04	0.00
31	0.03	0.00	29	0.03	0.00
31	0.03	0.00	32	0.03	0.00
36	0.04	0.00	24	0.02	0.00
34	0.03	0.00	35	0.04	0.00
37	0.04	0.00	31	0.03	0.00
35	0.04	0.00	28	0.03	0.00
39	0.04	0.00	36	0.04	0.00
28	0.03	0.00	26	0.03	0.00
28	0.03	0.00	24	0.02	0.00
34	0.03	0.00	25	0.03	0.00
27	0.03	0.00	31	0.03	0.00
34	0.03	0.00	29	0.03	0.00
32	0.03	0.00	25	0.03	0.00



31	0.03	0.00
31	0.03	0.00
29	0.03	0.00
28	0.03	0.00
32	0.03	0.00
28	0.03	0.00
34	0.03	0.00
24	0.02	0.00
19	0.02	0.00
30	0.03	0.00

33	0.03	0.00
42	0.04	0.00
37	0.04	0.00
43	0.04	0.00
32	0.03	0.00
46	0.05	0.01
43	0.04	0.00
35	0.04	0.00
41	0.04	0.00
38	0.04	0.00
30	0.03	0.00
40	0.04	0.00
42	0.04	0.00
41	0.04	0.00
28	0.03	0.00
34	0.03	0.00
36	0.04	0.00
29	0.03	0.00
33	0.03	0.00
29	0.03	0.00
27	0.03	0.00
31	0.03	0.00
20	0.02	0.00
34	0.03	0.00
29	0.03	0.00
27	0.03	0.00
29	0.03	0.00
35	0.04	0.00
27	0.03	0.00
35	0.04	0.00
31	0.03	0.00
34	0.03	0.00
31	0.03	0.00
33	0.03	0.00
29	0.03	0.00
29	0.03	0.00
42	0.04	0.00
31	0.03	0.00
33	0.03	0.00
32	0.03	0.00
29	0.03	0.00
29	0.03	0.00
31	0.03	0.00
25	0.03	0.00
32	0.03	0.00
30	0.03	0.00
29	0.03	0.00

#### Transect S6#4

4 22:11:16		
12:44:59 cps		
Live time (s)		Cosmic
2.00	microSv/hr	Corrected
		microSv/hr
31	0.03	0.00
25	0.03	0.00
35	0.04	0.00
34	0.03	0.00
31	0.03	0.00
29	0.03	0.00
24	0.02	0.00
27	0.03	0.00
23	0.02	0.00
29	0.03	0.00
22	0.02	0.00
25	0.03	0.00
26	0.03	0.00
25	0.03	0.00
20	0.02	0.00
18	0.02	0.00
22	0.02	0.00
25	0.03	0.00
17	0.02	0.00
30	0.03	0.00
27	0.03	0.00
28	0.03	0.00
32	0.03	0.00
23	0.02	0.00
25	0.03	0.00
28	0.03	0.00
29	0.03	0.00
27	0.03	0.00
37	0.04	0.00
41	0.04	0.00

33	0.03	0.00
42	0.04	0.00
37	0.04	0.00
43	0.04	0.00
32	0.03	0.00
46	0.05	0.01
43	0.04	0.00
35	0.04	0.00
41	0.04	0.00
38	0.04	0.00
30	0.03	0.00
40	0.04	0.00
42	0.04	0.00
41	0.04	0.00
28	0.03	0.00
34	0.03	0.00
36	0.04	0.00
29	0.03	0.00
33	0.03	0.00
29	0.03	0.00
27	0.03	0.00
31	0.03	0.00
20	0.02	0.00
34	0.03	0.00
29	0.03	0.00
27	0.03	0.00
29	0.03	0.00
35	0.04	0.00
27	0.03	0.00
35	0.04	0.00
31	0.03	0.00
34	0.03	0.00
31	0.03	0.00
33	0.03	0.00
29	0.03	0.00
29	0.03	0.00
42	0.04	0.00
31	0.03	0.00
33	0.03	0.00
32	0.03	0.00
29	0.03	0.00
29	0.03	0.00
31	0.03	0.00
25	0.03	0.00
32	0.03	0.00
30	0.03	0.00
29	0.03	0.00

29	0.03	0.00	45	0.05	0.01
33	0.03	0.00	50	0.05	0.01
32	0.03	0.00	46	0.05	0.01
30	0.03	0.00	45	0.05	0.01
22	0.02	0.00	49	0.05	0.01
30	0.03	0.00	38	0.04	0.00
37	0.04	0.00	49	0.05	0.01
36	0.04	0.00	49	0.05	0.01
39	0.04	0.00	42	0.04	0.00
37	0.04	0.00	48	0.05	0.01
37	0.04	0.00	37	0.04	0.00
35	0.04	0.00	42	0.04	0.00
36	0.04	0.00	46	0.05	0.01
37	0.04	0.00	38	0.04	0.00
36	0.04	0.00	43	0.04	0.00
27	0.03	0.00	49	0.05	0.01
38	0.04	0.00	50	0.05	0.01
41	0.04	0.00	46	0.05	0.01
41	0.04	0.00	35	0.04	0.00
37	0.04	0.00	41	0.04	0.00
39	0.04	0.00	38	0.04	0.00
38	0.04	0.00	32	0.03	0.00
35	0.04	0.00	41	0.04	0.00
38	0.04	0.00	45	0.05	0.01
37	0.04	0.00	38	0.04	0.00
42	0.04	0.00	39	0.04	0.00
41	0.04	0.00	39	0.04	0.00
35	0.04	0.00	45	0.05	0.01
40	0.04	0.00	31	0.03	0.00
32	0.03	0.00	43	0.04	0.00
41	0.04	0.00	48	0.05	0.01
40	0.04	0.00	48	0.05	0.01
39	0.04	0.00	59	0.06	0.02
29	0.03	0.00	55	0.06	0.02
40	0.04	0.00	46	0.05	0.01
37	0.04	0.00	43	0.04	0.00
38	0.04	0.00	57	0.06	0.02
34	0.03	0.00	53	0.05	0.01
44	0.04	0.00	42	0.04	0.00
41	0.04	0.00	61	0.06	0.02
41	0.04	0.00	45	0.05	0.01
41	0.04	0.00	43	0.04	0.00
46	0.05	0.01	53	0.05	0.01
41	0.04	0.00	49	0.05	0.01
32	0.03	0.00	53	0.05	0.01
43	0.04	0.00	55	0.06	0.02
46	0.05	0.01	53	0.05	0.01

60	0.06	0.02	48	0.05	0.01
48	0.05	0.01	49	0.05	0.01
48	0.05	0.01	46	0.05	0.01
47	0.05	0.01	43	0.04	0.00
48	0.05	0.01	57	0.06	0.02
46	0.05	0.01	49	0.05	0.01
41	0.04	0.00	48	0.05	0.01
44	0.04	0.00	64	0.06	0.02
41	0.04	0.00	38	0.04	0.00
48	0.05	0.01	50	0.05	0.01
44	0.04	0.00	50	0.05	0.01
49	0.05	0.01	45	0.05	0.01
36	0.04	0.00	44	0.04	0.00
43	0.04	0.00	43	0.04	0.00
44	0.04	0.00	59	0.06	0.02
41	0.04	0.00	53	0.05	0.01
41	0.04	0.00	45	0.05	0.01
36	0.04	0.00	52	0.05	0.01
35	0.04	0.00	50	0.05	0.01
39	0.04	0.00	54	0.05	0.01
42	0.04	0.00	47	0.05	0.01
42	0.04	0.00	52	0.05	0.01
46	0.05	0.01	44	0.04	0.00
46	0.05	0.01	57	0.06	0.02
38	0.04	0.00	53	0.05	0.01
43	0.04	0.00	61	0.06	0.02
52	0.05	0.01	65	0.07	0.03
48	0.05	0.01	61	0.06	0.02
53	0.05	0.01	49	0.05	0.01
35	0.04	0.00	38	0.04	0.00
57	0.06	0.02	42	0.04	0.00
44	0.04	0.00	40	0.04	0.00
37	0.04	0.00	37	0.04	0.00
43	0.04	0.00	45	0.05	0.01
49	0.05	0.01	44	0.04	0.00
51	0.05	0.01	37	0.04	0.00
40	0.04	0.00	42	0.04	0.00
61	0.06	0.02	34	0.03	0.00
50	0.05	0.01	37	0.04	0.00
48	0.05	0.01	28	0.03	0.00
45	0.05	0.01	46	0.05	0.01
45	0.05	0.01	39	0.04	0.00
46	0.05	0.01	40	0.04	0.00
55	0.06	0.02	45	0.05	0.01
49	0.05	0.01	46	0.05	0.01
50	0.05	0.01	44	0.04	0.00
50	0.05	0.01	50	0.05	0.01

39	0.04	0.00	54	0.05	0.01
44	0.04	0.00	53	0.05	0.01
43	0.04	0.00	50	0.05	0.01
45	0.05	0.01	39	0.04	0.00
48	0.05	0.01	50	0.05	0.01
36	0.04	0.00	48	0.05	0.01
41	0.04	0.00	53	0.05	0.01
42	0.04	0.00	43	0.04	0.00
45	0.05	0.01	47	0.05	0.01
46	0.05	0.01	46	0.05	0.01
48	0.05	0.01	47	0.05	0.01
43	0.04	0.00	52	0.05	0.01
41	0.04	0.00	59	0.06	0.02
47	0.05	0.01	45	0.05	0.01
38	0.04	0.00	42	0.04	0.00
41	0.04	0.00	57	0.06	0.02
32	0.03	0.00	47	0.05	0.01
37	0.04	0.00	44	0.04	0.00
39	0.04	0.00	44	0.04	0.00
45	0.05	0.01	51	0.05	0.01
32	0.03	0.00	52	0.05	0.01
41	0.04	0.00	45	0.05	0.01
35	0.04	0.00	53	0.05	0.01
32	0.03	0.00	42	0.04	0.00
32	0.03	0.00	58	0.06	0.02
37	0.04	0.00	50	0.05	0.01
49	0.05	0.01	62	0.06	0.02
53	0.05	0.01	66	0.07	0.03
51	0.05	0.01	67	0.07	0.03
48	0.05	0.01	55	0.06	0.02
51	0.05	0.01	52	0.05	0.01
45	0.05	0.01	55	0.06	0.02
44	0.04	0.00	60	0.06	0.02
42	0.04	0.00	50	0.05	0.01
45	0.05	0.01	57	0.06	0.02
50	0.05	0.01	64	0.06	0.02
49	0.05	0.01	65	0.07	0.03
50	0.05	0.01	64	0.06	0.02
51	0.05	0.01	51	0.05	0.01
53	0.05	0.01	41	0.04	0.00
44	0.04	0.00	39	0.04	0.00
49	0.05	0.01	37	0.04	0.00
60	0.06	0.02	36	0.04	0.00
54	0.05	0.01	38	0.04	0.00
45	0.05	0.01	41	0.04	0.00
38	0.04	0.00	41	0.04	0.00
42	0.04	0.00	39	0.04	0.00



49	0.05	0.01	49	0.05	0.01
43	0.04	0.00	44	0.04	0.00
46	0.05	0.01	60	0.06	0.02
54	0.05	0.01	39	0.04	0.00
39	0.04	0.00	47	0.05	0.01
48	0.05	0.01	49	0.05	0.01
45	0.05	0.01	46	0.05	0.01
52	0.05	0.01	48	0.05	0.01
44	0.04	0.00	46	0.05	0.01
49	0.05	0.01	56	0.06	0.02
55	0.06	0.02	52	0.05	0.01
47	0.05	0.01	47	0.05	0.01
51	0.05	0.01	45	0.05	0.01
50	0.05	0.01	53	0.05	0.01
54	0.05	0.01	52	0.05	0.01
39	0.04	0.00	46	0.05	0.01
48	0.05	0.01	44	0.04	0.00
46	0.05	0.01	56	0.06	0.02
47	0.05	0.01	48	0.05	0.01
41	0.04	0.00	49	0.05	0.01
52	0.05	0.01	51	0.05	0.01
43	0.04	0.00	57	0.06	0.02
47	0.05	0.01	52	0.05	0.01
49	0.05	0.01	59	0.06	0.02
46	0.05	0.01	50	0.05	0.01
44	0.04	0.00	49	0.05	0.01
60	0.06	0.02	56	0.06	0.02
44	0.04	0.00	56	0.06	0.02
39	0.04	0.00	47	0.05	0.01
47	0.05	0.01	54	0.05	0.01
58	0.06	0.02	56	0.06	0.02
51	0.05	0.01	51	0.05	0.01
47	0.05	0.01	55	0.06	0.02
43	0.04	0.00	60	0.06	0.02
50	0.05	0.01	56	0.06	0.02
47	0.05	0.01	50	0.05	0.01
41	0.04	0.00	56	0.06	0.02
49	0.05	0.01	49	0.05	0.01
53	0.05	0.01	42	0.04	0.00
48	0.05	0.01	54	0.05	0.01
44	0.04	0.00	42	0.04	0.00
48	0.05	0.01	43	0.04	0.00
42	0.04	0.00	47	0.05	0.01
47	0.05	0.01	43	0.04	0.00
46	0.05	0.01	47	0.05	0.01
44	0.04	0.00	37	0.04	0.00
46	0.05	0.01	47	0.05	0.01

44	0.04	0.00
38	0.04	0.00
50	0.05	0.01
44	0.04	0.00
50	0.05	0.01
52	0.05	0.01
51	0.05	0.01
38	0.04	0.00
49	0.05	0.01
43	0.04	0.00
44	0.04	0.00
45	0.05	0.01
54	0.05	0.01
40	0.04	0.00
52	0.05	0.01
46	0.05	0.01
44	0.04	0.00
53	0.05	0.01
47	0.05	0.01
57	0.06	0.02
47	0.05	0.01
51	0.05	0.01
53	0.05	0.01
52	0.05	0.01
48	0.05	0.01
44	0.04	0.00
42	0.04	0.00
39	0.04	0.00
47	0.05	0.01
46	0.05	0.01
42	0.04	0.00
46	0.05	0.01

#### Transect 6#5

5 22:11:16		
13:01:15 cps		
Live time (s)		
2.00	microSv/hr	Cosmic Corrected microSv/hr
45	0.05	0.01
48	0.05	0.01
46	0.05	0.01
46	0.05	0.01
57	0.06	0.02
56	0.06	0.02
53	0.05	0.01
51	0.05	0.01

48	0.05	0.01
54	0.05	0.01
54	0.05	0.01
55	0.06	0.02
47	0.05	0.01
49	0.05	0.01
57	0.06	0.02
41	0.04	0.00
44	0.04	0.00
40	0.04	0.00
47	0.05	0.01
51	0.05	0.01
53	0.05	0.01
57	0.06	0.02
51	0.05	0.01
57	0.06	0.02
50	0.05	0.01
50	0.05	0.01
51	0.05	0.01
47	0.05	0.01
46	0.05	0.01
46	0.05	0.01

#### Transect S6#6

6 22:11:16		
13:12:24 cps		
Live time (s)		
2.00	microSv/hr	Cosmic Corrected microSv/hr
27	0.03	0.00
23	0.02	0.00
24	0.02	0.00
19	0.02	0.00
23	0.02	0.00
33	0.03	0.00
29	0.03	0.00
24	0.02	0.00
36	0.04	0.00
37	0.04	0.00
33	0.03	0.00
34	0.03	0.00
33	0.03	0.00
54	0.05	0.01
41	0.04	0.00
45	0.05	0.01
42	0.04	0.00
47	0.05	0.01

55	0.06	0.02	41	0.04	0.00
38	0.04	0.00	40	0.04	0.00
41	0.04	0.00	42	0.04	0.00
34	0.03	0.00	41	0.04	0.00
35	0.04	0.00	49	0.05	0.01
35	0.04	0.00	42	0.04	0.00
35	0.04	0.00	43	0.04	0.00
34	0.03	0.00	43	0.04	0.00
28	0.03	0.00	43	0.04	0.00
44	0.04	0.00	38	0.04	0.00
45	0.05	0.01	41	0.04	0.00
41	0.04	0.00	38	0.04	0.00
38	0.04	0.00	39	0.04	0.00
32	0.03	0.00	41	0.04	0.00
38	0.04	0.00	35	0.04	0.00
43	0.04	0.00	37	0.04	0.00
41	0.04	0.00	41	0.04	0.00
39	0.04	0.00	43	0.04	0.00
45	0.05	0.01	47	0.05	0.01
39	0.04	0.00	48	0.05	0.01
38	0.04	0.00	47	0.05	0.01
39	0.04	0.00	50	0.05	0.01
36	0.04	0.00	46	0.05	0.01
36	0.04	0.00	45	0.05	0.01
39	0.04	0.00	52	0.05	0.01
31	0.03	0.00	42	0.04	0.00
28	0.03	0.00	44	0.04	0.00
34	0.03	0.00	40	0.04	0.00
37	0.04	0.00	39	0.04	0.00
35	0.04	0.00	43	0.04	0.00
34	0.03	0.00	39	0.04	0.00
39	0.04	0.00	49	0.05	0.01
39	0.04	0.00	41	0.04	0.00
39	0.04	0.00	43	0.04	0.00
32	0.03	0.00	50	0.05	0.01
40	0.04	0.00	44	0.04	0.00
38	0.04	0.00	57	0.06	0.02
29	0.03	0.00	44	0.04	0.00
34	0.03	0.00	50	0.05	0.01
35	0.04	0.00	43	0.04	0.00
33	0.03	0.00	53	0.05	0.01
30	0.03	0.00	58	0.06	0.02
35	0.04	0.00	44	0.04	0.00
39	0.04	0.00	50	0.05	0.01
35	0.04	0.00	42	0.04	0.00
39	0.04	0.00	46	0.05	0.01
50	0.05	0.01	46	0.05	0.01

54	0.05	0.01	43	0.04	0.00
52	0.05	0.01	31	0.03	0.00
46	0.05	0.01	49	0.05	0.01
51	0.05	0.01	48	0.05	0.01
64	0.06	0.02	48	0.05	0.01
47	0.05	0.01	49	0.05	0.01
38	0.04	0.00	61	0.06	0.02
45	0.05	0.01	50	0.05	0.01
48	0.05	0.01	50	0.05	0.01
50	0.05	0.01	47	0.05	0.01
51	0.05	0.01	44	0.04	0.00
47	0.05	0.01	49	0.05	0.01
50	0.05	0.01	42	0.04	0.00
48	0.05	0.01	40	0.04	0.00
39	0.04	0.00	45	0.05	0.01
47	0.05	0.01	46	0.05	0.01
57	0.06	0.02	48	0.05	0.01
50	0.05	0.01	60	0.06	0.02
46	0.05	0.01	57	0.06	0.02
45	0.05	0.01	45	0.05	0.01
49	0.05	0.01	54	0.05	0.01
41	0.04	0.00	53	0.05	0.01
56	0.06	0.02	44	0.04	0.00
44	0.04	0.00	51	0.05	0.01
48	0.05	0.01	52	0.05	0.01
51	0.05	0.01	50	0.05	0.01
51	0.05	0.01	58	0.06	0.02
43	0.04	0.00	47	0.05	0.01
48	0.05	0.01	52	0.05	0.01
45	0.05	0.01	52	0.05	0.01
44	0.04	0.00	53	0.05	0.01
53	0.05	0.01	68	0.07	0.03
47	0.05	0.01	59	0.06	0.02
52	0.05	0.01	64	0.06	0.02
54	0.05	0.01	52	0.05	0.01
54	0.05	0.01	57	0.06	0.02
46	0.05	0.01	49	0.05	0.01
67	0.07	0.03	61	0.06	0.02
42	0.04	0.00	60	0.06	0.02
49	0.05	0.01	57	0.06	0.02
45	0.05	0.01			
55	0.06	0.02			
56	0.06	0.02			
46	0.05	0.01			
48	0.05	0.01			
50	0.05	0.01			
46	0.05	0.01			



**Transect S6#7**

7 22:11:16

13:22:52 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
44	0.04	0.00
49	0.05	0.01
46	0.05	0.01
50	0.05	0.01
47	0.05	0.01
56	0.06	0.02
49	0.05	0.01
50	0.05	0.01
55	0.06	0.02
68	0.07	0.03
68	0.07	0.03
59	0.06	0.02
64	0.06	0.02
55	0.06	0.02
66	0.07	0.03
56	0.06	0.02
59	0.06	0.02
57	0.06	0.02
60	0.06	0.02
60	0.06	0.02
48	0.05	0.01
41	0.04	0.00
58	0.06	0.02
60	0.06	0.02
57	0.06	0.02
48	0.05	0.01
51	0.05	0.01
64	0.06	0.02
53	0.05	0.01
53	0.05	0.01
64	0.06	0.02
50	0.05	0.01
62	0.06	0.02
58	0.06	0.02
64	0.06	0.02
55	0.06	0.02
55	0.06	0.02
51	0.05	0.01
49	0.05	0.01
56	0.06	0.02
49	0.05	0.01

55	0.06	0.02
59	0.06	0.02
50	0.05	0.01
42	0.04	0.00
53	0.05	0.01
51	0.05	0.01
33	0.03	0.00
24	0.02	0.00
31	0.03	0.00
43	0.04	0.00
36	0.04	0.00
41	0.04	0.00
40	0.04	0.00
25	0.03	0.00
32	0.03	0.00
32	0.03	0.00
33	0.03	0.00
36	0.04	0.00
41	0.04	0.00
36	0.04	0.00
31	0.03	0.00
45	0.05	0.01
44	0.04	0.00
42	0.04	0.00
39	0.04	0.00
42	0.04	0.00
34	0.03	0.00
41	0.04	0.00
38	0.04	0.00
41	0.04	0.00
42	0.04	0.00
44	0.04	0.00
48	0.05	0.01
45	0.05	0.01
47	0.05	0.01
47	0.05	0.01
43	0.04	0.00
48	0.05	0.01
28	0.03	0.00
37	0.04	0.00
34	0.03	0.00
33	0.03	0.00
29	0.03	0.00
27	0.03	0.00
33	0.03	0.00
28	0.03	0.00
34	0.03	0.00

33	0.03	0.00
43	0.04	0.00
32	0.03	0.00
37	0.04	0.00
29	0.03	0.00
35	0.04	0.00
35	0.04	0.00
29	0.03	0.00
30	0.03	0.00
33	0.03	0.00
24	0.02	0.00

42	0.04	0.00
32	0.03	0.00
26	0.03	0.00
26	0.03	0.00
35	0.04	0.00
33	0.03	0.00
26	0.03	0.00
32	0.03	0.00
32	0.03	0.00
30	0.03	0.00
31	0.03	0.00
29	0.03	0.00
32	0.03	0.00
42	0.04	0.00
35	0.04	0.00
37	0.04	0.00
37	0.04	0.00
40	0.04	0.00
36	0.04	0.00
37	0.04	0.00
44	0.04	0.00
39	0.04	0.00
42	0.04	0.00
50	0.05	0.01
40	0.04	0.00
38	0.04	0.00
56	0.06	0.02
51	0.05	0.01
41	0.04	0.00
57	0.06	0.02
55	0.06	0.02
40	0.04	0.00
46	0.05	0.01
42	0.04	0.00
47	0.05	0.01
61	0.06	0.02
55	0.06	0.02
54	0.05	0.01
69	0.07	0.03
50	0.05	0.01
56	0.06	0.02
49	0.05	0.01
51	0.05	0.01
61	0.06	0.02
60	0.06	0.02
58	0.06	0.02
51	0.05	0.01

#### Transect S6#8

8 22:11:16		
13:31:49 cps		Cosmic
Live time (s)		Corrected
2.00	microSv/hr	microSv/hr
32	0.03	0.00
30	0.03	0.00
32	0.03	0.00
24	0.02	0.00
22	0.02	0.00
23	0.02	0.00
29	0.03	0.00
27	0.03	0.00
33	0.03	0.00
28	0.03	0.00
30	0.03	0.00
27	0.03	0.00
20	0.02	0.00
32	0.03	0.00
20	0.02	0.00
32	0.03	0.00
37	0.04	0.00
28	0.03	0.00
26	0.03	0.00
27	0.03	0.00
27	0.03	0.00
34	0.03	0.00
32	0.03	0.00
36	0.04	0.00
29	0.03	0.00
31	0.03	0.00
28	0.03	0.00
35	0.04	0.00
31	0.03	0.00

60	0.06	0.02
50	0.05	0.01
60	0.06	0.02
56	0.06	0.02
52	0.05	0.01
50	0.05	0.01
53	0.05	0.01
45	0.05	0.01
36	0.04	0.00
56	0.06	0.02
47	0.05	0.01
48	0.05	0.01
50	0.05	0.01
48	0.05	0.01
45	0.05	0.01
46	0.05	0.01
49	0.05	0.01
52	0.05	0.01
41	0.04	0.00
37	0.04	0.00
39	0.04	0.00
48	0.05	0.01
40	0.04	0.00
45	0.05	0.01
46	0.05	0.01
40	0.04	0.00
36	0.04	0.00
49	0.05	0.01
52	0.05	0.01
42	0.04	0.00
44	0.04	0.00
45	0.05	0.01
55	0.06	0.02
46	0.05	0.01
37	0.04	0.00
44	0.04	0.00
51	0.05	0.01
47	0.05	0.01
44	0.04	0.00
46	0.05	0.01

#### Transect S6#9

9 22:11:16

13:40:28 cps

Live time (s)

2.00

microSv/hr

Cosmic  
Corrected  
microSv/hr

56	0.06	0.02
46	0.05	0.01
41	0.04	0.00
48	0.05	0.01
44	0.04	0.00
45	0.05	0.01
45	0.05	0.01
45	0.05	0.01
52	0.05	0.01
51	0.05	0.01
47	0.05	0.01
62	0.06	0.02
55	0.06	0.02
45	0.05	0.01
56	0.06	0.02
46	0.05	0.01
53	0.05	0.01
52	0.05	0.01
52	0.05	0.01
53	0.05	0.01
51	0.05	0.01
52	0.05	0.01
53	0.05	0.01
42	0.04	0.00
43	0.04	0.00
48	0.05	0.01
51	0.05	0.01
43	0.04	0.00
43	0.04	0.00
38	0.04	0.00
52	0.05	0.01
49	0.05	0.01
40	0.04	0.00
52	0.05	0.01
56	0.06	0.02
39	0.04	0.00
47	0.05	0.01
49	0.05	0.01
48	0.05	0.01
55	0.06	0.02

45	0.05	0.01
54	0.05	0.01
40	0.04	0.00
46	0.05	0.01
47	0.05	0.01
40	0.04	0.00
51	0.05	0.01

30	0.03	0.00
42	0.04	0.00
36	0.04	0.00
39	0.04	0.00
39	0.04	0.00
41	0.04	0.00
36	0.04	0.00
34	0.03	0.00
34	0.03	0.00

#### Transect S6#10

10 22:11:16

13:43:21 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
53	0.05	0.01
49	0.05	0.01
45	0.05	0.01
54	0.05	0.01
52	0.05	0.01
53	0.05	0.01
52	0.05	0.01
50	0.05	0.01
51	0.05	0.01
42	0.04	0.00
49	0.05	0.01
47	0.05	0.01
54	0.05	0.01
50	0.05	0.01
49	0.05	0.01
45	0.05	0.01
48	0.05	0.01
52	0.05	0.01
48	0.05	0.01
49	0.05	0.01
54	0.05	0.01
48	0.05	0.01
49	0.05	0.01

39	0.04	0.00
38	0.04	0.00
34	0.03	0.00
39	0.04	0.00
45	0.05	0.01
44	0.04	0.00
39	0.04	0.00
39	0.04	0.00
41	0.04	0.00
40	0.04	0.00
41	0.04	0.00
38	0.04	0.00
43	0.04	0.00
41	0.04	0.00
43	0.04	0.00
43	0.04	0.00
51	0.05	0.01
39	0.04	0.00
45	0.05	0.01
48	0.05	0.01
52	0.05	0.01
56	0.06	0.02
64	0.06	0.02
55	0.06	0.02
61	0.06	0.02
72	0.07	0.03
71	0.07	0.03
70	0.07	0.03
63	0.06	0.02
69	0.07	0.03
72	0.07	0.03

#### SECTION 7

#### M1 – M-n2 (west boundary)

32 22:11:16

08:29:43 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
38	0.04	0.00
38	0.04	0.00

56	0.06	0.02
54	0.05	0.01
60	0.06	0.02
65	0.07	0.03
57	0.06	0.02
58	0.06	0.02
54	0.05	0.01



57	0.06	0.02
51	0.05	0.01
52	0.05	0.01
57	0.06	0.02
55	0.06	0.02
54	0.05	0.01
62	0.06	0.02
65	0.07	0.03
67	0.07	0.03
67	0.07	0.03
53	0.05	0.01
54	0.05	0.01
63	0.06	0.02
53	0.05	0.01
52	0.05	0.01
48	0.05	0.01
61	0.06	0.02
71	0.07	0.03
68	0.07	0.03
55	0.06	0.02
60	0.06	0.02
66	0.07	0.03
59	0.06	0.02
57	0.06	0.02
66	0.07	0.03
48	0.05	0.01
48	0.05	0.01
32	0.03	0.00
40	0.04	0.00
41	0.04	0.00
46	0.05	0.01
53	0.05	0.01
55	0.06	0.02
41	0.04	0.00
38	0.04	0.00
49	0.05	0.01
44	0.04	0.00
49	0.05	0.01
51	0.05	0.01
42	0.04	0.00
46	0.05	0.01
52	0.05	0.01
48	0.05	0.01
49	0.05	0.01

#### M-n2 – M-n3 (north boundary)

33 22:11:16  
08:34:07 cps  
Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
46	0.05	0.01
54	0.05	0.01
45	0.05	0.01
54	0.05	0.01
41	0.04	0.00
33	0.03	0.00
42	0.04	0.00
38	0.04	0.00
42	0.04	0.00
42	0.04	0.00
40	0.04	0.00
39	0.04	0.00
44	0.04	0.00
43	0.04	0.00
39	0.04	0.00
36	0.04	0.00
40	0.04	0.00
45	0.05	0.01
31	0.03	0.00
42	0.04	0.00
39	0.04	0.00
57	0.06	0.02
47	0.05	0.01
48	0.05	0.01
46	0.05	0.01
45	0.05	0.01
39	0.04	0.00
39	0.04	0.00
37	0.04	0.00
36	0.04	0.00
38	0.04	0.00
34	0.03	0.00
34	0.03	0.00
37	0.04	0.00
37	0.04	0.00
41	0.04	0.00
39	0.04	0.00
36	0.04	0.00
50	0.05	0.01
37	0.04	0.00
40	0.04	0.00
41	0.04	0.00

32	0.03	0.00	52	0.05	0.01
38	0.04	0.00	51	0.05	0.01
38	0.04	0.00	53	0.05	0.01
49	0.05	0.01	49	0.05	0.01
38	0.04	0.00	49	0.05	0.01
35	0.04	0.00	40	0.04	0.00
41	0.04	0.00	41	0.04	0.00
51	0.05	0.01	63	0.06	0.02
44	0.04	0.00	57	0.06	0.02
47	0.05	0.01	51	0.05	0.01
43	0.04	0.00	42	0.04	0.00
30	0.03	0.00	48	0.05	0.01
55	0.06	0.02	47	0.05	0.01
54	0.05	0.01	37	0.04	0.00
57	0.06	0.02	36	0.04	0.00
58	0.06	0.02	37	0.04	0.00
53	0.05	0.01	37	0.04	0.00
53	0.05	0.01	35	0.04	0.00
47	0.05	0.01	36	0.04	0.00
48	0.05	0.01	33	0.03	0.00
47	0.05	0.01	41	0.04	0.00
49	0.05	0.01	41	0.04	0.00
52	0.05	0.01	40	0.04	0.00
45	0.05	0.01	35	0.04	0.00
46	0.05	0.01	32	0.03	0.00
49	0.05	0.01	36	0.04	0.00
45	0.05	0.01	27	0.03	0.00
47	0.05	0.01	36	0.04	0.00
50	0.05	0.01	35	0.04	0.00
50	0.05	0.01	45	0.05	0.01
41	0.04	0.00	29	0.03	0.00
45	0.05	0.01	34	0.03	0.00
50	0.05	0.01	36	0.04	0.00
51	0.05	0.01	35	0.04	0.00
57	0.06	0.02	34	0.03	0.00
63	0.06	0.02	32	0.03	0.00
45	0.05	0.01	30	0.03	0.00
48	0.05	0.01	28	0.03	0.00
52	0.05	0.01	29	0.03	0.00
51	0.05	0.01	35	0.04	0.00
52	0.05	0.01	31	0.03	0.00
50	0.05	0.01	31	0.03	0.00
43	0.04	0.00	33	0.03	0.00
42	0.04	0.00	37	0.04	0.00
39	0.04	0.00	32	0.03	0.00
36	0.04	0.00			
35	0.04	0.00			

**M-n3 – M-n4 (North Boundary)**

34 22:11:16

08:42:30 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
23	0.02	0.00
32	0.03	0.00
38	0.04	0.00
32	0.03	0.00
25	0.03	0.00
31	0.03	0.00
30	0.03	0.00
37	0.04	0.00
31	0.03	0.00
29	0.03	0.00
34	0.03	0.00
36	0.04	0.00
40	0.04	0.00
43	0.04	0.00
44	0.04	0.00
40	0.04	0.00
43	0.04	0.00
43	0.04	0.00
45	0.05	0.01
46	0.05	0.01
40	0.04	0.00
43	0.04	0.00
34	0.03	0.00
50	0.05	0.01
43	0.04	0.00
41	0.04	0.00
44	0.04	0.00
49	0.05	0.01
37	0.04	0.00
42	0.04	0.00
38	0.04	0.00
48	0.05	0.01
50	0.05	0.01
43	0.04	0.00
39	0.04	0.00
43	0.04	0.00
46	0.05	0.01
44	0.04	0.00
37	0.04	0.00
38	0.04	0.00
28	0.03	0.00

38	0.04	0.00
46	0.05	0.01
43	0.04	0.00
49	0.05	0.01
47	0.05	0.01
44	0.04	0.00
44	0.04	0.00
42	0.04	0.00
40	0.04	0.00
47	0.05	0.01
43	0.04	0.00
35	0.04	0.00
44	0.04	0.00
40	0.04	0.00
41	0.04	0.00
47	0.05	0.01
37	0.04	0.00
45	0.05	0.01
37	0.04	0.00
45	0.05	0.01
43	0.04	0.00
33	0.03	0.00
46	0.05	0.01
33	0.03	0.00
37	0.04	0.00
40	0.04	0.00
42	0.04	0.00
43	0.04	0.00
31	0.03	0.00
35	0.04	0.00
29	0.03	0.00
39	0.04	0.00
38	0.04	0.00
35	0.04	0.00

**M-n4 – M-n5 (eastern south boundary)**

35 22:11:16

08:45:47 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
40	0.04	0.00
32	0.03	0.00
36	0.04	0.00
35	0.04	0.00
41	0.04	0.00
41	0.04	0.00

38	0.04	0.00
32	0.03	0.00
42	0.04	0.00
40	0.04	0.00
40	0.04	0.00
33	0.03	0.00
34	0.03	0.00

#### M-n5 – M-n6 (eastern south boundary)

36 22:11:16

08:46:17 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
38	0.04	0.00
41	0.04	0.00
33	0.03	0.00
38	0.04	0.00
40	0.04	0.00
36	0.04	0.00
30	0.03	0.00
32	0.03	0.00
33	0.03	0.00
38	0.04	0.00
35	0.04	0.00
35	0.04	0.00
30	0.03	0.00
35	0.04	0.00
31	0.03	0.00
36	0.04	0.00
29	0.03	0.00
35	0.04	0.00
34	0.03	0.00
38	0.04	0.00
32	0.03	0.00
33	0.03	0.00
36	0.04	0.00
31	0.03	0.00

#### M-n6 – M-n7 (eastern south boundary)

37 22:11:16

08:48:24 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
33	0.03	0.00
37	0.04	0.00
37	0.04	0.00

38	0.04	0.00
38	0.04	0.00
28	0.03	0.00
35	0.04	0.00
34	0.03	0.00
34	0.03	0.00
33	0.03	0.00
46	0.05	0.01
37	0.04	0.00
43	0.04	0.00
49	0.05	0.01
46	0.05	0.01
44	0.04	0.00
42	0.04	0.00
39	0.04	0.00
50	0.05	0.01
38	0.04	0.00
42	0.04	0.00

#### M-n7 – M-n8 (south eastern boundary)

38 22:11:16

08:49:47 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
41	0.04	0.00
41	0.04	0.00
45	0.05	0.01
44	0.04	0.00
46	0.05	0.01
48	0.05	0.01
48	0.05	0.01
41	0.04	0.00
28	0.03	0.00
41	0.04	0.00
36	0.04	0.00
34	0.03	0.00
34	0.03	0.00
32	0.03	0.00
37	0.04	0.00
37	0.04	0.00
37	0.04	0.00
39	0.04	0.00
34	0.03	0.00
32	0.03	0.00
28	0.03	0.00
30	0.03	0.00

22	0.02	0.00	40	0.04	0.00
25	0.03	0.00	41	0.04	0.00
22	0.02	0.00	46	0.05	0.01
Recording temporarily interrupted			45	0.05	0.01
39 22:11:16			45	0.05	0.01
08:51:25 cps		Cosmic	40	0.04	0.00
Live time (s)		Corrected	33	0.03	0.00
2.00	microSv/hr	microSv/hr	40	0.04	0.00
32	0.03	0.00	44	0.04	0.00
27	0.03	0.00	45	0.05	0.01
27	0.03	0.00	51	0.05	0.01
41	0.04	0.00	53	0.05	0.01
29	0.03	0.00	49	0.05	0.01
36	0.04	0.00	43	0.04	0.00
33	0.03	0.00	36	0.04	0.00
26	0.03	0.00	39	0.04	0.00
31	0.03	0.00	43	0.04	0.00
32	0.03	0.00	45	0.05	0.01
38	0.04	0.00	35	0.04	0.00
36	0.04	0.00	36	0.04	0.00
35	0.04	0.00	32	0.03	0.00
37	0.04	0.00	32	0.03	0.00
40	0.04	0.00	30	0.03	0.00
28	0.03	0.00	35	0.04	0.00
33	0.03	0.00	31	0.03	0.00
34	0.03	0.00	37	0.04	0.00
31	0.03	0.00	31	0.03	0.00
36	0.04	0.00	38	0.04	0.00
26	0.03	0.00	38	0.04	0.00
35	0.04	0.00	33	0.03	0.00
42	0.04	0.00	35	0.04	0.00
38	0.04	0.00	35	0.04	0.00
37	0.04	0.00	35	0.04	0.00
46	0.05	0.01	38	0.04	0.00
<b>M-n8 – M1 (south boundary)</b>			45	0.05	0.01
40 22:11:16			41	0.04	0.00
08:55:12 cps		Cosmic	46	0.05	0.01
Live time (s)		Corrected	42	0.04	0.00
2.00	microSv/hr	microSv/hr	42	0.04	0.00
37	0.04	0.00	37	0.04	0.00
44	0.04	0.00	44	0.04	0.00
33	0.03	0.00	48	0.05	0.01
34	0.03	0.00	44	0.04	0.00
38	0.04	0.00	45	0.05	0.01
30	0.03	0.00	33	0.03	0.00
35	0.04	0.00	37	0.04	0.00
			35	0.04	0.00



45	0.05	0.01	42	0.04	0.00
50	0.05	0.01	39	0.04	0.00
42	0.04	0.00	44	0.04	0.00
40	0.04	0.00	41	0.04	0.00
48	0.05	0.01	42	0.04	0.00
48	0.05	0.01	39	0.04	0.00
41	0.04	0.00	37	0.04	0.00
44	0.04	0.00	38	0.04	0.00
44	0.04	0.00	35	0.04	0.00
60	0.06	0.02	38	0.04	0.00
55	0.06	0.02	43	0.04	0.00
64	0.06	0.02	34	0.03	0.00
58	0.06	0.02	40	0.04	0.00
44	0.04	0.00	43	0.04	0.00
55	0.06	0.02	33	0.03	0.00
40	0.04	0.00	39	0.04	0.00
54	0.05	0.01	35	0.04	0.00
48	0.05	0.01	32	0.03	0.00
53	0.05	0.01	33	0.03	0.00
43	0.04	0.00	38	0.04	0.00
44	0.04	0.00	41	0.04	0.00
38	0.04	0.00	43	0.04	0.00
33	0.03	0.00	37	0.04	0.00
41	0.04	0.00	42	0.04	0.00
45	0.05	0.01	37	0.04	0.00
36	0.04	0.00	38	0.04	0.00
43	0.04	0.00	38	0.04	0.00
42	0.04	0.00	41	0.04	0.00
47	0.05	0.01	36	0.04	0.00
53	0.05	0.01	35	0.04	0.00
46	0.05	0.01	37	0.04	0.00
52	0.05	0.01	42	0.04	0.00
50	0.05	0.01	43	0.04	0.00
50	0.05	0.01	32	0.03	0.00
39	0.04	0.00	39	0.04	0.00
43	0.04	0.00	51	0.05	0.01
37	0.04	0.00	32	0.03	0.00
43	0.04	0.00	38	0.04	0.00
25	0.03	0.00	35	0.04	0.00
33	0.03	0.00	45	0.05	0.01
38	0.04	0.00			
28	0.03	0.00			
36	0.04	0.00			
43	0.04	0.00			
36	0.04	0.00			
45	0.05	0.01			
43	0.04	0.00			

**S7 Transect 1 (North-south)**

1 22:11:16  
09:19:12 cps  
Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
29	0.03	0.00
28	0.03	0.00
34	0.03	0.00
29	0.03	0.00
30	0.03	0.00
34	0.03	0.00
37	0.04	0.00
34	0.03	0.00
26	0.03	0.00
33	0.03	0.00
35	0.04	0.00
38	0.04	0.00
34	0.03	0.00
39	0.04	0.00
36	0.04	0.00
35	0.04	0.00
47	0.05	0.01
41	0.04	0.00
36	0.04	0.00
37	0.04	0.00
44	0.04	0.00
35	0.04	0.00
38	0.04	0.00
34	0.03	0.00
35	0.04	0.00
37	0.04	0.00
39	0.04	0.00
46	0.05	0.01
41	0.04	0.00
40	0.04	0.00
43	0.04	0.00
36	0.04	0.00
38	0.04	0.00
37	0.04	0.00
31	0.03	0.00
34	0.03	0.00
34	0.03	0.00
37	0.04	0.00
40	0.04	0.00
37	0.04	0.00
36	0.04	0.00
38	0.04	0.00

39	0.04	0.00
33	0.03	0.00
39	0.04	0.00
43	0.04	0.00
41	0.04	0.00
52	0.05	0.01
44	0.04	0.00
45	0.05	0.01
43	0.04	0.00
52	0.05	0.01
51	0.05	0.01
54	0.05	0.01
63	0.06	0.02
55	0.06	0.02
55	0.06	0.02
56	0.06	0.02
68	0.07	0.03
69	0.07	0.03
69	0.07	0.03
69	0.07	0.03
54	0.05	0.01
64	0.06	0.02
58	0.06	0.02
61	0.06	0.02
59	0.06	0.02
66	0.07	0.03
60	0.06	0.02
52	0.05	0.01
47	0.05	0.01
40	0.04	0.00
61	0.06	0.02
54	0.05	0.01
43	0.04	0.00
52	0.05	0.01
48	0.05	0.01
46	0.05	0.01
43	0.04	0.00
52	0.05	0.01
43	0.04	0.00
43	0.04	0.00

**S7 Transect 2 (North-South)**

2 22:11:16		Cosmic
09:23:58 cps Live		Corrected
time (s) 2.00	microSv/hr	microSv/hr
40	0.04	0.00

34	0.03	0.00	40	0.04	0.00
40	0.04	0.00	43	0.04	0.00
34	0.03	0.00	40	0.04	0.00
41	0.04	0.00	37	0.04	0.00
45	0.05	0.01	44	0.04	0.00
43	0.04	0.00	46	0.05	0.01
38	0.04	0.00	28	0.03	0.00
40	0.04	0.00	37	0.04	0.00
33	0.03	0.00	41	0.04	0.00
42	0.04	0.00	29	0.03	0.00
34	0.03	0.00	46	0.05	0.01
51	0.05	0.01	45	0.05	0.01
42	0.04	0.00	43	0.04	0.00
51	0.05	0.01	50	0.05	0.01
49	0.05	0.01	39	0.04	0.00
48	0.05	0.01	30	0.03	0.00
57	0.06	0.02	47	0.05	0.01
46	0.05	0.01	44	0.04	0.00
46	0.05	0.01	43	0.04	0.00
48	0.05	0.01	33	0.03	0.00
48	0.05	0.01	41	0.04	0.00
50	0.05	0.01	39	0.04	0.00
49	0.05	0.01			
53	0.05	0.01			
49	0.05	0.01	<b>S7 Transect 3 (North-South)</b>		
52	0.05	0.01	3 22:11:16		
46	0.05	0.01	09:27:05 cps		
55	0.06	0.02	Live time (s)		Cosmic
46	0.05	0.01	2.00	microSv/hr	Corrected
52	0.05	0.01	26	0.03	microSv/hr
49	0.05	0.01	35	0.04	0.00
62	0.06	0.02	34	0.03	0.00
52	0.05	0.01	32	0.03	0.00
52	0.05	0.01	38	0.04	0.00
36	0.04	0.00	34	0.03	0.00
41	0.04	0.00	38	0.04	0.00
39	0.04	0.00	41	0.04	0.00
40	0.04	0.00	24	0.02	0.00
49	0.05	0.01	44	0.04	0.00
40	0.04	0.00	29	0.03	0.00
40	0.04	0.00	32	0.03	0.00
42	0.04	0.00	24	0.02	0.00
37	0.04	0.00	35	0.04	0.00
42	0.04	0.00	31	0.03	0.00
42	0.04	0.00	37	0.04	0.00
33	0.03	0.00	38	0.04	0.00
40	0.04	0.00			

38	0.04	0.00	66	0.07	0.03
37	0.04	0.00	68	0.07	0.03
35	0.04	0.00	63	0.06	0.02
34	0.03	0.00	66	0.07	0.03
23	0.02	0.00	52	0.05	0.01
35	0.04	0.00	60	0.06	0.02
23	0.02	0.00	66	0.07	0.03
29	0.03	0.00	72	0.07	0.03
35	0.04	0.00	67	0.07	0.03
39	0.04	0.00	73	0.07	0.03
40	0.04	0.00	64	0.06	0.02
40	0.04	0.00	66	0.07	0.03
35	0.04	0.00	60	0.06	0.02
34	0.03	0.00	65	0.07	0.03
40	0.04	0.00	67	0.07	0.03
42	0.04	0.00	65	0.07	0.03
42	0.04	0.00	67	0.07	0.03
31	0.03	0.00	63	0.06	0.02
36	0.04	0.00	65	0.07	0.03
37	0.04	0.00	70	0.07	0.03
33	0.03	0.00	70	0.07	0.03
36	0.04	0.00	69	0.07	0.03
42	0.04	0.00	75	0.08	0.04
43	0.04	0.00	68	0.07	0.03
50	0.05	0.01	63	0.06	0.02
48	0.05	0.01	64	0.06	0.02
41	0.04	0.00	81	0.08	0.04
48	0.05	0.01	80	0.08	0.04
48	0.05	0.01	67	0.07	0.03
47	0.05	0.01	69	0.07	0.03
42	0.04	0.00	65	0.07	0.03
55	0.06	0.02	67	0.07	0.03
61	0.06	0.02	59	0.06	0.02
46	0.05	0.01	61	0.06	0.02
45	0.05	0.01	49	0.05	0.01
56	0.06	0.02	43	0.04	0.00
57	0.06	0.02	50	0.05	0.01
68	0.07	0.03	54	0.05	0.01
63	0.06	0.02	59	0.06	0.02
50	0.05	0.01	57	0.06	0.02
56	0.06	0.02	61	0.06	0.02
62	0.06	0.02	65	0.07	0.03
53	0.05	0.01			
56	0.06	0.02			
60	0.06	0.02			
61	0.06	0.02			
65	0.07	0.03			

**S7 Transect 4 (North-South)**

4 22:11:16

09:31:29 cps

Live time (s)

2.00

microSv/hr

Cosmic  
Corrected  
microSv/hr

61

0.06

0.02

62

0.06

0.02

65

0.07

0.03

59

0.06

0.02

59

0.06

0.02

67

0.07

0.03

53

0.05

0.01

58

0.06

0.02

53

0.05

0.01

64

0.06

0.02

62

0.06

0.02

68

0.07

0.03

65

0.07

0.03

72

0.07

0.03

67

0.07

0.03

76

0.08

0.04

64

0.06

0.02

58

0.06

0.02

64

0.06

0.02

74

0.07

0.03

64

0.06

0.02

69

0.07

0.03

51

0.05

0.01

65

0.07

0.03

60

0.06

0.02

58

0.06

0.02

64

0.06

0.02

57

0.06

0.02

51

0.05

0.01

57

0.06

0.02

56

0.06

0.02

53

0.05

0.01

61

0.06

0.02

57

0.06

0.02

57

0.06

0.02

54

0.05

0.01

48

0.05

0.01

51

0.05

0.01

50

0.05

0.01

58

0.06

0.02

47

0.05

0.01

40

0.04

0



31	0.03	0.00
38	0.04	0.00
45	0.05	0.01
38	0.04	0.00
36	0.04	0.00
30	0.03	0.00

#### S7 Transect 5 (North-South)

5 22:11:16  
09:35:05 cps  
Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
36	0.04	0.00
26	0.03	0.00
28	0.03	0.00
29	0.03	0.00
35	0.04	0.00
42	0.04	0.00
32	0.03	0.00
32	0.03	0.00
39	0.04	0.00
37	0.04	0.00
40	0.04	0.00
29	0.03	0.00
36	0.04	0.00
33	0.03	0.00
36	0.04	0.00
30	0.03	0.00
39	0.04	0.00
36	0.04	0.00
26	0.03	0.00
21	0.02	0.00
37	0.04	0

31	0.03	0.00
39	0.04	0.00
38	0.04	0.00
38	0.04	0.00
42	0.04	0.00
33	0.03	0.00
40	0.04	0.00
35	0.04	0.00
43	0.04	0.00
42	0.04	0.00
46	0.05	0.01
45	0.05	0.01
40	0.04	0.00
36	0.04	0.00
40	0.04	0.00
37	0.04	0.00
27	0.03	0.00
47	0.05	0.01
29	0.03	0.00
32	0.03	0.00
34	0.03	0.00
32	0.03	0.00
35	0.04	0.00
35	0.04	0.00

44	0.04	0.00
49	0.05	0.01
48	0.05	0.01
56	0.06	0.02
46	0.05	0.01
48	0.05	0.01
52	0.05	0.01
48	0.05	0.01
57	0.06	0.02</

57	0.06	0.02	39	0.04	0.00
53	0.05	0.01	36	0.04	0.00
50	0.05	0.01	35	0.04	0.00
52	0.05	0.01	47	0.05	0.01
48	0.05	0.01	41	0.04	0.00
51	0.05	0.01	36	0.04	0.00
41	0.04	0.00	37	0.04	0.00
41	0.04	0.00	44	0.04	0.00
47	0.05	0.01	35	0.04	0.00
46	0.05	0.01	38	0.04	0.00
47	0.05	0.01	34	0.03	0.00
51	0.05	0.01	35	0.04	0.00
40	0.04	0.00	37	0.04	0.00
43	0.04	0.00	39	0.04	0.00
55	0.06	0.02	46	0.05	0.01
46	0.05	0.01	41	0.04	0.00
49	0.05	0.01	40	0.04	0.00
55	0.06	0.02	43	0.04	0.00
43	0.04	0.00	36		

69	0.07	0.03
69	0.07	0.03
54	0.05	0.01
64	0.06	0.02
58	0.06	0.02
61	0.06	0.02
59	0.06	0.02
66	0.07	0.03
60	0.06	0.02
52	0.05	0.01
47	0.05	0.01
40	0.04	0.00
61	0.06	0.02
54	0.05	0.01
43	0.04	0.00
52	0.05	0.01
48	0.05	0.01
46	0.05	0.01
43	0.04	0.00
52	0.05	0.01
43	0.04	0.00
43	0.04	0.00

46	0.05	0.01
46	0.05	0.01
48	0.05	0.01
48	0.05	0.01
50	0.05	0.01
49	0.05	0.01
53	0.05	0.01
49	0.05	0.01
52	0.05	0.01
46	0.05	0.01
55	0.06	

44	0.04	0.00
43	0.04	0.00
33	0.03	0.00
41	0.04	0.00
39	0.04	0.00

36	0.04	0.00
37	0.04	0.00
33	0.03	0.00
36	0.04	0.00
42	0.04	0.00
43	0.04	0.00

50	0.05	0.01
48	0.05	0.01

41	0.04	0.00
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48	0.05	0.01
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48	0.05	0.01
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65	0.07	0.03
70	0.07	0.03
70	0.07	0.03
69	0.07	0.03
75	0.08	0.04
68	0.07	0.03
63	0.06	0.02
64	0.06	0.02
81	0.08	0.04
80	0.08	0.04
67	0.07	0.03
69	0.07	0.03
65	0.07	0.03
67	0.07	0.03
59	0.06	0.02
61	0.06	0.02
49	0.05	0.01
43	0.04	0.00
50	0.05	0.01
54	0.05	0.01
59	0.06	0.02
57	0.06	0.02
61	0.06	0.02
65	0.07	0.03

64	0.06	0.02
58	0.06	0.02
64	0.06	0.02
74	0.07	0.03
64	0.06	0.02
69	0.07	0.03
51	0.05	0.01
65	0.07	0.03
60	0.06	0.02
58	0.06	0.02
64	0.06	0.02
57	0.06	0.02
51	0.05	0.01
57	0.06	0.02
56	0.06	0.02
53	0.05	0.01
61	0.06	0.02
57	0.06	0.02
57	0.06	0.02
54	0.05	0.01
48	0.05	0.01
51	0.05	0.01
50	0.05	0.01
58	0.06	0.02
47	0.05	0.01
40	0.04	0.00
40	0.04	0.00
41	0.04	0.00
40	0.04	0.00
34	0.03	0.00
36	0.04	0.00
34	0.03	0.00
28	0.03	0.00
37	0.04	0.00
34	0.03	0.00
27	0.03	0.00
38	0.04	0.00
39	0.04	0.00
34	0.03	0.00
37	0.04	0.00
37	0.04	0.00
33	0.03	0.00
31	0.03	0.00
34	0.03	0.00
36	0.04	0.00
38	0.04	0.00
34	0.03	0.00

#### S7 Transect 12 (East-West)

26	0.03	0.00
30	0.03	0.00
35	0.04	0.00
31	0.03	0.00
34	0.03	0.00
35	0.04	0.00
39	0.04	0.00
32	0.03	0.00
32	0.03	0.00
35	0.04	0.00
25	0.03	0.00
27	0.03	0.00
31	0.03	0.00
35	0.04	0.00
33	0.03	0.00
32	0.03	0.00
27	0.03	0.00
28	0.03	0.00
21	0.02	0.00
30	0.03	0.00
31	0.03	0.00
34	0.03	0.00
26	0.03	0.00
36	0.04	0.00
28	0.03	0.00
31	0.03	0.00
38	0.04	0.00
45	0.05	0.01
38	0.04	0.00
36	0.04	0.00
30	0.03	0.00

37	0.04	0.00
40	0.04	0.00
29	0.03	0.00
36	0.04	0.00
33	0.03	0.00
36	0.04	0.00
30	0.03	0.00
39	0.04	0.00
36	0.04	0.00
26	0.03	0.00
21	0.02	0.00
37	0.04	0.00
31	0.03	0.00
43	0.04	0.00
28	0.03	0.00
35	0.04	0.00
41	0.04	0.00
30	0.03	0.00
41	0.04	0.00
41	0.04	0.00
44	0.04	0.00
51	0.05	0.01
56	0.06	0.02
57	0.06	0.02
47	0.05	0.01
46	0.05	0.01
46	0.05	0.01
48	0.05	0.01
61	0.06	0.02
58	0.06	0.02
55	0.06	0.02
57	0.06	0.02
62	0.06	0.02
70	0.07	0.03
63	0.06	0.02
62	0.06	0.02

59	0.06	0.02
58	0.06	0.02
57	0.06	0.02
59	0.06	0.02
55	0.06	0.02
53	0.05	0.01
47	0.05	0.01
55	0.06	0.02
49	0.05	0.01
48	0.05	0.01
48	0.05	0.01
45	0.05	0.01
40	0.04	0.00
50	0.05	0.01

#### S7 Transect 14 (East-West)

6 22:11:16		
09:39:50 cps		
Live time (s)		
2.00	microSv/hr	Cosmic Corrected
39	0.04	0.00
38	0.04	0.00
44	0.04	0.00
36	0.04	0.00
31	0.03	0.00
39	0.04	0.00
38	0.04	0.00
38	0.04	0.00
42	0.04	0.00
33	0.03	0.00
40	0.04	0.00
35	0.04	0.00
43	0.04	0.00
42	0.04	0.00
46	0.05	0.01
45	0.05	0.01
40	0.04	0.00
36	0.04	0.00
40	0.04	0.00
37	0.04	0.00
27	0.03	0.00
47	0.05	0.01
29	0.03	0.00
32	0.03	0.00
34	0.03	0.00

32	0.03	0.00
35	0.04	0.00
35	0.04	0.00

#### S7 Transect 15 (East-West)

7 22:11:16		
09:42:44 cps		
Live time (s)		
2.00	microSv/hr	Cosmic Corrected
52	0.05	0.01
42	0.04	0.00
44	0.04	0.00
50	0.05	0.01
47	0.05	0.01
37	0.04	0.00
38	0.04	0.00
41	0.04	0.00
44	0.04	0.00
45	0.05	0.01
46	0.05	0.01
39	0.04	0.00
38		

42	0.04	0.00
48	0.05	0.01

46	0.05	0.01
52	0.05	0.01
38	0.04	0.00
35	0.04	0.00
42	0.04	0.00

#### S7 Transect 16 (East-West)

8 22:11:16		
09:44:32 cps		Cosmic
Live time (s)		Corrected
2.00	microSv/hr	microSv/hr
36	0.04	0.00
45	0.05	0.01
40	0.04	0.00
47	0.05	0.01
54	0.05	0.01
57	0.06	0.02
54	0.05	0.01
50	0.05	0.01
63	0.06	0.02
68	0.07	0.03
58	0.06	0.02
58	0.06	0.02
47	0.05	0.01
61	0.06	0.02
58	0.06	0.02
60	0.06	0.02
57	0.06	0.02
53	0.05	0.01
50	0.05	0.01
52	0.05	0.01
48	0.05	0.01
51	0.05	0.01
41	0.04	0.00
41	0.04	0.00
47	0.05	0.01
46	0.05	0.01
47	0.05	0.01
51	0.05	0.01
40	0.04	0.00
43	0.04	0.00
55	0.06	0.02
46	0.05	0.01
49	0.05	0.01
55	0.06	0.02
43	0.04	0.00
48	0.05	0.01
40	0.04	0.00
35	0.04	0.00

#### S7 Transect 17 (East-West)

9 22:11:16		
10:20:05 cps		Cosmic
Live time (s)		Corrected
2.00	microSv/hr	microSv/hr
37	0.04	0.00
33	0.03	0.00
41	0.04	0.00
31	0.03	0.00
35	0.04	0.00
39		

**S7 Transect 18 (East-West)**

10 22:11:16

10:23:19 cps

Live time (s)

2.00	microSv/hr	Cosmic Corrected microSv/hr
27	0.03	0.00
31	0.03	0.00
32	0.03	0.00
31	0.03	0.00
29	0.03	0.00
30	0.03	0.00
40	0.04	0.00
34	0.03	0.00
33	0.03	0.00
33	0.03	0.00
30	0.03	0.00
36	0.04	0.00
29	0.03	0.00
27	0.03	0.00
32	0.03	0.00
29	0.03	0.00
31	0.03	0.00
35	0.04	0.00
29	0.03	0.00
27	0.03	0.00
28	0.03	0.00
36	0.04	0.00
34	0.03	0.00
29	0.03	0.00
27	0.03	0.00
38	0.04	0.00
32	0.03	0.00
33	0.03	0.00
34	0.03	0.00
38	0.04	0.00
38	0.04	0.00
36	0.04	0.00
31	0.03	0.00
35	0.04	0.00
34	0.03	0.00
34	0.03	0.00
29	0.03	0.00
34	0.03	0.00
24	0.02	0.00
27	0.03	0.00
27	0.03	0.00
34	0.03	0.00

23	0.02	0.00
29	0.03	0.00
29	0.03	0.00
30	0.03	0.00
27	0.03	0.00
33	0.03	0.00
29	0.03	0.00
32	0.03	0.00
35	0.04	0.00
33	0.03	0.00
34	0.03	0.00
32	0.03	0.00
46	0.05	0.01
37	0.04	0.00
35	0.04	0.00
50	0.05	0.01
48	0.05	0.01
39	0.04	0.00



62	0.06	0.02	51	0.05	0.01
66	0.07	0.03	46	0.05	0.01
60	0.06	0.02	44	0.04	0.00
59	0.06	0.02	56	0.06	0.02
71	0.07	0.03	53	0.05	0.01
63	0.06	0.02	52	0.05	0.01
61	0.06	0.02	41	0.04	0.00
62	0.06	0.02	59	0.06	0.02
53	0.05	0.01	49	0.05	0.01
59	0.06	0.02	48	0.05	0.01
57	0.06	0.02	47	0.05	0.01
50	0.05	0.01	50	0.05	0.01
59	0.06	0.02	50	0.05	0.01
57	0.06	0.02	47	0.05	0.01
59	0.06	0.02	37	0.04	0.00
65	0.07	0.03	41	0.04	0.00
59	0.06	0.02	39	0.04	0.00
55	0.06	0.02	38	0.04	0.00
62	0.06	0.02	49	0.05	0.01
67	0.07	0.03	46	0.05	0.01
68	0.07	0.03	43	0.04	0.00
55	0.06	0.02	40	0.04	0.00
67	0.07	0.03	40	0.04	0.00
56	0.06	0.02	32	0.03	0.00
57	0.06	0.02	36	0.04	0.00
64	0.06	0.02	32	0.03	0.00
57	0.06	0.02	36	0.04	0.00
65	0.07	0.03	35	0.04	0.00
60	0.06	0.02	34	0.03	0.00
58	0.06	0.02	41	0.04	0.00
50	0.05	0.01			
72	0.07	0.03			
50	0.05	0.01	<b>S7 Transect 20 (East-West)</b>		
62	0.06	0.02	12 22:11:16		
50	0.05	0.01	10:35:03 cps		Cosmic
45	0.05	0.01	Live time (s)		Corrected
56	0.06	0.02	2.00	microSv/hr	microSv/hr
51	0.05	0.01	38	0.04	0.00
55	0.06	0.02	37	0.04	0.00
68	0.07	0.03	42	0.04	0.00
66	0.07	0.03	39	0.04	0.00
58	0.06	0.02	35	0.04	0.00
62	0.06	0.02	38	0.04	0.00
54	0.05	0.01	41	0.04	0.00
62	0.06	0.02	40	0.04	0.00
60	0.06	0.02	35	0.04	0.00
57	0.06	0.02	37	0.04	0.00

42	0.04	0.00	47	0.05	0.01
37	0.04	0.00	54	0.05	0.01
41	0.04	0.00	67	0.07	0.03
40	0.04	0.00	47	0.05	0.01
38	0.04	0.00	52	0.05	0.01
39	0.04	0.00	44	0.04	0.00
41	0.04	0.00	42	0.04	0.00
48	0.05	0.01	56	0.06	0.02
42	0.04	0.00	53	0.05	0.01
40	0.04	0.00	48	0.05	0.01
48	0.05	0.01	47	0.05	0.01
46	0.05	0.01	58	0.06	0.02
46	0.05	0.01	54	0.05	0.01
41	0.04	0.00	50	0.05	0.01
43	0.04	0.00	57	0.06	0.02
49	0.05	0.01	59	0.06	0.02
44	0.04	0.00	55	0.06	0.02
47	0.05	0.01	50	0.05	0.01
45	0.05	0.01	48	0.05	0.01
37	0.04	0.00	51	0.05	0.01
43	0.04	0.00	59	0.06	0.02
47	0.05	0.01	53	0.05	0.01
40	0.04	0.00	56	0.06	0.02
38	0.04	0.00	50	0.05	0.01
36	0.04	0.00	50	0.05	0.01
43	0.04	0.00	51	0.05	0.01
39	0.04	0.00	43	0.04	0.00
27	0.03	0.00	49	0.05	0.01
42	0.04	0.00	43	0.04	0.00
40	0.04	0.00	40	0.04	0.00
45	0.05	0.01	33	0.03	0.00
48	0.05	0.01	43	0.04	0.00
46	0.05	0.01	40	0.04	0.00
46	0.05	0.01	50	0.05	0.01
48	0.05	0.01	45	0.05	0.01
43	0.04	0.00	44	0.04	0.00
42	0.04	0.00	42	0.04	0.00
39	0.04	0.00	40	0.04	0.00
51	0.05	0.01	34	0.03	0.00
52	0.05	0.01	41	0.04	0.00
53	0.05	0.01	43	0.04	0.00
57	0.06	0.02	44	0.04	0.00
52	0.05	0.01	42	0.04	0.00

36	0.04	0.00	64	0.06	0.02
30	0.03	0.00	56	0.06	0.02
23	0.02	0.00	57	0.06	0.02
32	0.03	0.00	57	0.06	0.02
26	0.03	0.00	53	0.05	0.01
27	0.03	0.00	52	0.05	0.01
39	0.04	0.00	58	0.06	0.02
26	0.03	0.00	61	0.06	0.02
29	0.03	0.00	53	0.05	0.01
38	0.04	0.00	55	0.06	0.02
30	0.03	0.00	56	0.06	0.02
40	0.04	0.00	55	0.06	0.02
33	0.03	0.00	53	0.05	0.01
48	0.05	0.01	54	0.05	0.01
38	0.04	0.00	57	0.06	0.02
38	0.04	0.00	53	0.05	0.01
34	0.03	0.00	60	0.06	0.02
38	0.04	0.00	59	0.06	0.02
38	0.04	0.00	58	0.06	0.02
42	0.04	0.00	46	0.05	0.01
48	0.05	0.01	54	0.05	0.01
45	0.05	0.01	48	0.05	0.01
44	0.04	0.00	56	0.06	0.02
37	0.04	0.00	49	0.05	0.01
39	0.04	0.00	68	0.07	0.03
28	0.03	0.00	56	0.06	0.02
40	0.04	0.00	62	0.06	0.02
47	0.05	0.01	57	0.06	0.02
46	0.05	0.01	50	0.05	0.01
42	0.04	0.00	53	0.05	0.01
57	0.06	0.02	53	0.05	0.01
50	0.05	0.01	73	0.07	0.03
55	0.06	0.02	82	0.08	0.04
48	0.05	0.01	75	0.08	0.04
56	0.06	0.02	65	0.07	0.03
50	0.05	0.01	64	0.06	0.02
62	0.06	0.02	71	0.07	0.03
57	0.06	0.02	72	0.07	0.03
58	0.06	0.02	65	0.07	0.03
71	0.07	0.03	50	0.05	0.01
61	0.06	0.02	78	0.08	0.04
65	0.07	0.03	62	0.06	0.02
64	0.06	0.02	60	0.06	0.02</

64	0.06	0.02	54	0.05	0.01
65	0.07	0.03	49	0.05	0.01
64	0.06	0.02	57	0.06	0.02
61	0.06	0.02	43	0.04	0.00
69	0.07	0.03	48	0.05	0.01
78	0.08	0.04	48	0.05	0.01
66	0.07	0.03	52	0.05	0.01
72	0.07	0.03	47	0.05	0.01
67	0.07	0.03	47	0.05	0.01
71	0.07	0.03	57	0.06	0.02
63	0.06	0.02	49	0.05	0.01
79	0.08	0.04	51	0.05	0.01
75	0.08	0.04	53	0.05	0.01
68	0.07	0.03	47	0.05	0.01
60	0.06	0.02	56	0.06	0.02
56	0.06	0.02	53	0.05	0.01
61	0.06	0.02	50	0.05	0.01
61	0.06	0.02	65	0.07	0.03
70	0.07	0.03	59	0.06	0.02
74	0.07	0.03	61	0.06	0.02
71	0.07	0.03	70	0.07	0.03
62	0.06	0.02	53	0.05	0.01
64	0.06	0.02	56	0.06	0.02
73	0.07	0.03			

## APPENDIX 5 SAIC Exploranium Calibration Certificate



Queensland  
Government

### Forensic and Scientific Services

## CERTIFICATE OF CALIBRATION

<b>CLIENT:</b>	Inmed Healthcare	Laboratory Reference:	22090139
	45 Prime Drive	Client Number:	
	Seven Hills, NSW 2147	Quote Number:	
		Date Received:	15/09/2022
		Date Commenced:	15/09/2022
<b>ATTN:</b>	Lee-Ann Sands	Laboratory Number/s:	22PX166

### INSTRUMENT DESCRIPTION

	Instrument	Detector
Manufacturer:	EXPLORANIUM	-
Model:	GR-130	-
Serial Number:	9940	-
Type :	Nal+GM	-

## GAMMA EXPOSURE

Method of Analysis: QIS 21119 QHFSS in-house method - Instrument Testing/Calibration Procedure

### PRE CALIBRATION CHECKS

**Visual Inspection:** The instrument appears to be in good condition with no obvious physical damage.

**Battery Check:** Check performed adequately on receipt, during and after the calibration process.

**High/Low Voltage:** N/A

**Self-diagnosis system:** N/A

**Desiccant condition:** N/A

**Mechanical zero:** No adjustment was necessary.

**Check Source Reading:** No check source was supplied.

**Background/Leakage:** The instrument's response to background was 0.16  $\mu$ Sv/h. All calibration measurements were adjusted by this value.

### CALIBRATION CONDITIONS

**Detector Reference Point:** The effective measurement point was taken to be the centre of the detector volume.

**Instrument Orientation:** The instrument was orientated so that the radiation beam was normally incident to the detector axis.

**Dry Bulb Temperature:** 24.9 °C

**Relative Humidity:** 51.7 %

**Atmospheric Pressure:** 1013.7 hPa (760.3 mm Hg)

**Height Above Sea Level:** 32.4 m

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).

Enquiries: Principal Health Physicist  
Phone (+61) 7 3096 2901

39 Kessels Road  
Coopers Plains QLD 4108  
AUSTRALIA

PO Box 504  
Archerfield QLD 4108  
AUSTRALIA



#### CALIBRATION TRACEABILITY AND QUALITY

Gamma Radiation Irradiator (SN: 007) utilises radioactive sources traceable to the Australian primary standard of exposure (Table 1). Air kerma rates have been verified<sup>1</sup> using a PTW UNIDOS Webline T10023 electrometer (SN: 002159)<sup>2</sup> with Standard Imaging Exradin A5 chamber (SN: 166)<sup>3</sup>.

The calibration methodology and process underlined in this certificate of calibration meets the standards and qualifications for ISO 9001.

Table 1 - CALIBRATION TRACEABILITY

Nuclide	Emission	Serial Number	Nominal Activity (GBq)	Reference Date
Caesium-137	0.662 MeV gamma	1192GN	0.037	01-July-1984
Caesium-137	0.662 MeV gamma	0892GN	0.37	01-July-1984
Caesium-137	0.662 MeV gamma	1194GN	3.7	01-July-1984
Caesium-137	0.662 MeV gamma	1085GN	37	01-July-1984

Table 2 - CALIBRATION RESULTS - RATE MODE<sup>4</sup>

Range	Expected exposure rate (µSv/h)	Average Instrument Reading* (µSv/h)	Uncertainty (%)	Variation (%)	Calibration Factor
auto	0.50	0.51	90.6%	2.6%	0.98
auto	1.00	1.07	43.7%	6.2%	0.94
auto	2.01	2.09	22.4%	4.0%	0.96
auto	5.02	5.16	9.5%	2.7%	0.97
auto	10.05	9.8	5.1%	-2.8%	1.03
auto	20.08	18.9	3.5%	-6.1%	1.06
auto	502.34	443	11.7%	-11.8%	1.13
auto	1004.92	865	6.5%	-13.9%	1.16
auto	2009.38	1726	4.8%	-14.1%	1.16
auto	3013.70	2438	4.4%	-19.1%	1.24

\*Note: all readings have been background corrected.

Table 3 - CALIBRATION RESULTS - INTEGRATE MODE<sup>4</sup>

Range	Expected exposure (µSv)	Instrument Reading* (µSv)	Integration Time (min)	Variation (%)	Calibration Factor
auto	0.50	0.51	6	2.4%	0.98
auto	1.00	0.96	6	-4.1%	1.04
auto	50.23	42.98	6	-14.4%	1.17
auto	100.49	86.98	6	-13.4%	1.16
auto	301.37	246.98	6	-18.0%	1.22

\*Note: all readings have been background corrected.

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## COMMENTS

General: The instrument responded within 25% of the expected value<sup>5</sup>.  
The instruments response to different dose rates was checked between the values showed in Table 2 and 3.

Over-Range Response: This instrument continued to indicate full scale under high exposure levels.

Energy Dependence Factors: The response of the instrument was tested for caesium-137 (0.662 MeV) only. For radiation emissions other than 0.662 MeV energy response correction, factors should be determined from the manufacturer-supplied energy response data.

Accuracy: For the calibration of an instrument of this type, the accuracy is dependent of the laboratory measurements, the accuracy of the intercomparison transfer standard and the stability of the instrument being calibrated. The result for this calibration can be considered reliable to within 20%.

Uncertainties: The uncertainties stated on this document have a 95% coverage factor.

Reference:

- 1: RNS Cs-137 source Air kerma Rate Report 20PX681, 20PX682, 20PX683
- 2: Calibrated traceable to the Australian standards of voltage, resistance and time, report CAL00924/03, 28th of November 2020.
- 3: Calibrated traceable to the Australian primary standard of air kerma, report CAL00924/01, 26th of November 2020.
- 4: Air kerma rate was converted to the ambient dose equivalent H<sup>\*</sup>K(10) for mono-energetic and parallel photon radiation using a factor of Sv/Gy = 1.21 for caesium-137 at 0.662MeV (ISO, 4037:2019. Radiological protection — X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy).
- 5: RPS C4: Code of Radiation Protection Requirements for Industrial Radiography (2018)


NEXT CALIBRATION DUE 14 September 2023

## PERFORMED BY



Matthew Wiggins  
Health Physicist  
Radiation & Nuclear Science  
15/September/2022

## REVIEWED BY



Drew Watson  
Principal Health Physicist  
Radiation & Nuclear Science  
16/09/2022

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## CERTIFICATE OF CALIBRATION

**CLIENT:** Inmed Healthcare  
45 Prime Drive  
Seven Hills, NSW 2147  
**ATTN:** Lee-Ann Sands

Laboratory Reference: 22090139  
Client Order Number: n/a  
Quote Number: n/a  
Date Received: 15/09/2022  
Date Commenced: 15/09/2022  
Laboratory Number/s: 22PX166 LANCAL Gy

### INSTRUMENT DESCRIPTION

	Instrument	Detector
Manufacturer:	EXPLORANIUM	-
Model:	GR-130	-
Serial Number:	9940	-
Type:	Nal+GM	-

## ENVIRONMENTAL GAMMA EXPOSURE

**Method of Analysis:** QIS 21119 QHFSS in-house method - Instrument Testing/Calibration Procedure

### PRE CALIBRATION CHECKS

**Visual Inspection:** Check performed adequately on receipt, during and after the calibration process.

**Battery Check:** Check performed adequately on receipt, during and after the calibration process.

**High/Low Voltage:** N/A

**Self-diagnosis system:** N/A

**Desiccant condition:** N/A

**Mechanical zero:** No adjustment was necessary.

**Check Source Reading:** No check source was supplied.

**Background/Leakage:** In the terrestrial shadow shield this survey meter reads approximately 5.7 nGy/hr, which is a combination of the instrument's response to cosmic radiation and intrinsic noise of the instrument. This value can be compared to the known cosmic radiation level stated below.

### CALIBRATION CONDITIONS

**Detector Reference Point:** The effective measurement point was taken to be the centre of the detector volume.

**Instrument Orientation:** The instrument was orientated so that its detector axis was parallel to the surface plane of the calibration pads.

### ATMOSPHERIC CONDITIONS

Dry Bulb Temperature:	24	°C
Relative Humidity:	68	%
Atmospheric Pressure:	1012.5	hPa (759.4 mm Hg)
Height Above Sea Level:	32.4	m
Cosmic radiation <sup>2</sup> :	38.8	nGy/h

The geometric mean correction factor below can be multiplied by the instrument readout to normalise the value to the RNS calibration pads.

**0.75**

This factor is determined from the results in Table 1. The correction applied assumes a linear proportional response (i.e. correction is a % increase above or below expected response). The geometric mean is used as a weighted correction which favours higher dose rates owing to reduced measurement uncertainty.

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#### CALIBRATION TRACEABILITY

The expected Air Kerma Rates (AKR) 0.15m above the Calibration pads are traceable to measurements using a transfer calibration High Pressure Ion Chamber (RSS-131ER -SN- 12B0038D) calibrated with a Cs-137 (0.662 MeV) sn:1192GN, Nominal Activity- 0.037 GBq (Ref Date: 01/07/1984) sources traceable to NIST standards.

#### CALIBRATION RESULTS - DOSE RATE MODE - Table 1

Calibration pad 1 is made from un-spiked aerated concrete and is used to normalise results from the instrument. Such that the readings only show the instruments response from the spiked material only.

PAD (#)	Expected AKR @ 150 mm (From PAD material Only) (nGy/h)	Cosmic and PAD 1 Corrected Instrument AKR (nGy/h)	Number of measurements	Variation from expected (%)	Calibration Factor
1	-	-	44	-	-
2	20 ± 9	28 ± 14	37	41.9%	0.70 ± 0.47
3	59 ± 8	79 ± 18	37	33.1%	0.75 ± 0.19
4	181 ± 9	235 ± 30	36	29.6%	0.77 ± 0.11
5	303 ± 11	391 ± 38	35	28.9%	0.78 ± 0.08

General: Detector was stabilise before use.

Over-Range Response: N/A

Energy Dependence Factors: The response of the instrument was tested for a range of NORM energies (46keV to 2.612 MeV) using U-238; Th-232 and progeny spiked aerated concrete (density=1600kg/m<sup>3</sup>) planar sources shown to be homogenous and produce uniform radiation fields.


Accuracy: For the calibration of an instrument of this type, the accuracy is dependent of the laboratory measurements, the accuracy of the intercomparison transfer standard and the stability of the instrument being calibrated. The relative uncertainty of the corrected measurement tends to be larger at the very low air kerma levels associated with pad #2.

Uncertainties: The uncertainties stated on this document have a 95% coverage factor.


Reference: 1: Radiation & Nuclear Science unit Technical Document RSS14-004 - NORM based Environmental Radiation  
2: FAA's Civil Aerospace Medical Institute Radiobiology Research Team, CARI-6. 2004, United States of America Federal Aviation Administration. p. Computer Freeware.

NEXT CALIBRATION DUE 15 September 2023

PERFORMED BY

  
Matthew Wiggins  
Health Physicist  
Radiation & Nuclear Science  
16-September-2022

REVIEWED BY

  
Drew Watson  
Principal Health Physicist  
Radiation & Nuclear Science  
16/09/2022

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## APPENDIX 6 RadAlert Inspector USB Calibration Certificate



Date: 19/09/2022  
 Customer: Bartolo Safety Management Service  
 Site Address: PO Box 264  
 Jannali  
 NSW, 2226  
 Dosimeter: Inspector USB  
 S/N: 42104  
 Cal Number: IR055038

Results	
Authority standards	+/- 25
InMed standards	+/- 15

Temp 25.6°C Humidity 30%

Activity MBq	Date	1/2 Life Days	Half Lives	Current Activity	Energy (MeV)	Fractional Yield	(u/p) air	
Cs137	9.117	1/07/2017	10964.6	0.173832151	8.082082201	3.18170E-02	1.99500E-02	1.38188E-01
1907-41-3						3.21940E-02	3.64100E-02	1.34970E-01
						6.61650E-01	8.51020E-01	2.93111E-02

Distance (cm)	100	60	40	20
Calculated Dose Rate (uSv/hr)	0.617032888	1.713980245	3.8564556	15.4258

NOTE: Source must be flipped before taking measurement

BEFORE					
Background	0.14	Cal Factor	3340	Date	19/09/2022
Measurement	Dose Rate (uSv/hr)	Dosimeter (uSv/hr)	Ref	% Dif	Fail/Pass
100cm	0.8				
	0.76	0.803333333	0.6170329	7.50%	PASS
	0.85				
60cm	2.06				
	2	2.053333333	1.7139802	12%	PASS
	2.1				
40cm	4.71				
	4.75	4.72	3.8564556	19%	FAIL
	4.7				
20cm	22.48				
	24.76	23.72	15.425822	53%	FAIL
	23.92				

ADJUSTED					
Background	0.14	Cal Factor	3940	Date	19/09/2022
Measurement	Dose Rate (uSv/hr)	Dosimeter (uSv/hr)	Ref	% Dif	Fail/Pass
1	0.72				
	0.65	0.71	0.617032888	-7.62%	PASS
	0.76				
2	1.92				
	1.75	1.84	1.713980245	-0.82%	PASS
	1.85				
3	3.9				
	4.12	4	3.85645555	0.09%	PASS
	3.98				
4	17.34				
	17	17.28	15.4258222	11.11%	PASS
	17.5				

Completed by: J Enderstein