Sellafield Particles in the Environment Update (End of Year 2024)

1 Progress and areas monitored

During 2024 a total area of 118ha of the beaches along the Cumbrian coast were monitored against a programme target of 105 ha. A total of 42 particles and 9 larger objects[1] were detected and recovered, details are given in Table 1. The overall target for the 2024 programme is to monitor an area of 105 ha. Further details of the programme can be found in the annual report series[2].

2 Find rates

Average find rates were compared with find rates over the last two calendar years in Table 2 and the last four years in Figure 1. For clarity of presentation, the find rates in Table 2 were rounded to the nearest significant figure.

Table 2 and Figure 1 shows that alpha-rich particle find rates are comparable with the average find rates from previous years. Beta-rich particle[3] find rates at Sellafield beach remain low. Find rates for beta-rich larger objects are elevated over 2023 data and similar to the rates measured in 2022. Larger object find remain considerably lower than find rates prior to 2017.

Find rates in 2024 did not require any form of intervention through the Environment Agency (EA) Notification and Intervention Protocol[4].

3 Find activities

Figure 2 shows the activities of alpha-rich particles and beta-rich particles were comparable to the activities measured since May 2014 (when the current version of the monitoring equipment was introduced). The activities of the recovered beta-rich larger objects were within the range of previous data. However, one find was at the upper end of the observed range and is described in more detail later in this section.

None of the finds recovered to date in 2024 were of sufficient activity to require characterisation through the EA Notification and Intervention Protocol[4].

A beta-rich larger object (a stone) was recovered from a boulder field at Sellafield beach on 11/06/24. Field readings for this find were elevated, but below alert levels. An initial screening assessment was conducted which estimated the Cs-137 activity of the find at 0.84 MBq. This screening assessment was shared with the EA on 14/06/24. Laboratory analysis, conducted on 26/06/24, confirmed a Cs-137 activity of 1.23 ± 0.25 MBq which is the 2nd highest Cs-137 activity measured in any find since the programme began.

Further investigations concluded:

- This find is within the range of larger object finds considered by the Heath Security Agency (UKHSA) in their risk assessment. There has been no significant increase in find rates, defined as an increase by an order of magnitude, and larger objects are recognised as posing a lower risk than particles.
- This find does not trigger any notification levels under the EA Notification and Intervention Protocol.
- Laboratory analysis suggested that the larger object had a relatively uniform level of radioactivity.
- An exact estimate of the age of the find cannot be made. However, based on the ratio of Cs-134 to Cs-137 it is possible to conclude that the find was produced between the 1950's – 2000.

[1] "Particles" are finds less than 2 mm in diameter and "larger objects" are finds greater than or equal to 2mm in diameter (includes: granules, gravel, pebbles, stones etc.)
[2] https://www.gov.uk/government/collections/sellafield-ltd-environmental-and-safety-reports
[3] "Alpha-rich" are finds with ^{241}Am activity greater than ^{137}Cs activity, "beta-rich" are finds with ^{137}Cs activity greater than ^{241}Am activity and "Co-60 rich" are finds with positive ^{60}Co activity greater than the ^{137}Cs activity.
[4] https://www.gov.uk/government/publications/sellafield-radioactive-objects-notification-and-intervention-plan/sellafield-radioactive-objects-notification-and-intervention-plan

- Based on the position of the find on the beach, the age of the find, the monitoring history for this area of the beach and the analytical results from similar types of finds it is very likely that Cs-137 is strongly bound to naturally occurring mica minerals on this stone.
- The initial screening criteria identified this as a potentially significant find upon recovery and prompted further investigation of the find. This demonstrating that the process of screening finds in the field is working well.

Full details of the find were shared with the EA on 26/06/24 who subsequently informed the Department of Health Committee on Medical Aspects of Radiation in the Environment (COMARE) on the 10/07/24.

4 Summary of programme

Table 3 presents a summary of the beach monitoring programme since it started in 2006. Overall, a total of 2945 ha of beaches have been monitored and 3620 particles and larger objects have been recovered and analysed.

5 Conclusion

The UK Health Security Agency risk assessment for radioactive particles and larger objects on West Cumbrian beaches reported that:

- “overall health risks for beach users are very low, and significantly lower than other risks that people accept when using the beaches.”; and that
- “measures to control these risks are not warranted on public health grounds.”

Table 1: Beach finds in 2024

Beach location	Area covered (ha)	No. of particles found				No. of larger objects found				Total finds
		Alpha-rich	Beta-rich	Other	Not analysed	Alpha-rich	Beta-rich	Other	Not analysed	
Allonby	5	0	0	0	0	0	0	0	0	0
Northern beaches	35	14	0	0	0	0	1	0	0	15
Sellafield	56	20	4	0	0	0	8	0	0	32
Southern beaches	22	4	0	0	0	0	0	0	0	4
All	**118**	**38**	**4**	**0**	**0**	**0**	**9**	**0**	**0**	**51**

Note 1: Proportion of particles as % of total finds = 78%.

Table 2: Find per hectare and area monitored for main beach areas to end of year 2024

Beach location	Year	Area covered (ha)	Find category & Type (finds per hectare)			
			Alpha-rich particle	Beta-rich particle	Beta-rich larger object	Other finds
Allonby	2022	5	0	0	0	0
	2023	5	IA $$	0	0	0
	2024	5	0	0	0	0
Northern beaches	2022	35	<1	0	0	0
	2023	34	<1	0	0	0
	2024	35	<1	0	<0.1	0
Sellafield	2022	55	<1	<0.1	<1	<0.1
	2023	59	<1	<0.1	<0.1	0
	2024	56	<1	<0.1	<1	0
Southern beaches	2022	22	<1	0	0	0
	2023	22	<0.1	0	0	0
	2024	22	<1	0	0	0

Note 2: IA – Finds have been recovered however there is insufficient area coverage to estimate finds rates (<10 ha area covered).
NA - No monitoring to date.
"<1" denotes values between 0.1 and 0.99.
"<0.1" denotes values between zero and 0.099.
$$ A find rate of <1 would be applicable if taken as a rolling average over 10 ha (3 finds recovered in 2023 and no finds over the 5 ha monitored in 2024 = 0.3 finds per hectare).

Table 3: Summary of beach monitoring data since programme began in 2006 to end of year 2024

Beach location	Area (ha)	Total		Alpha-rich		Beta-rich		Co-60 rich	
		Particle	Larger object	Particle	Larger object	Particle	Larger object	Particle	Larger object
Allonby	134	21	1	19	0	2	1	0	0
Northern beaches	972	912	1	855	0	51	1	6	0
Sellafield	1114	1778	738	1433	6	336	730	9	2
Southern beaches	648	143	6	118	0	25	4	0	2
Other beaches	78	19	1	17	0	2	1	0	0
All	**2945**	**2873**	**747**	**2442**	**6**	**416**	**737**	**15**	**4**

Note: Northern beaches are St Bees and Braystones, Southern beaches are Seascale and Drigg. Allonby and Sellafield are included specifically. All other beaches (e.g. Whitehaven, Workington, Silecroft etc.) are incorporated into the "Other beaches" definition. A single additional particle (2.8 kBq Am-241; 02/04/2012) was recovered by seabed grab sampling and is not included in the above table.

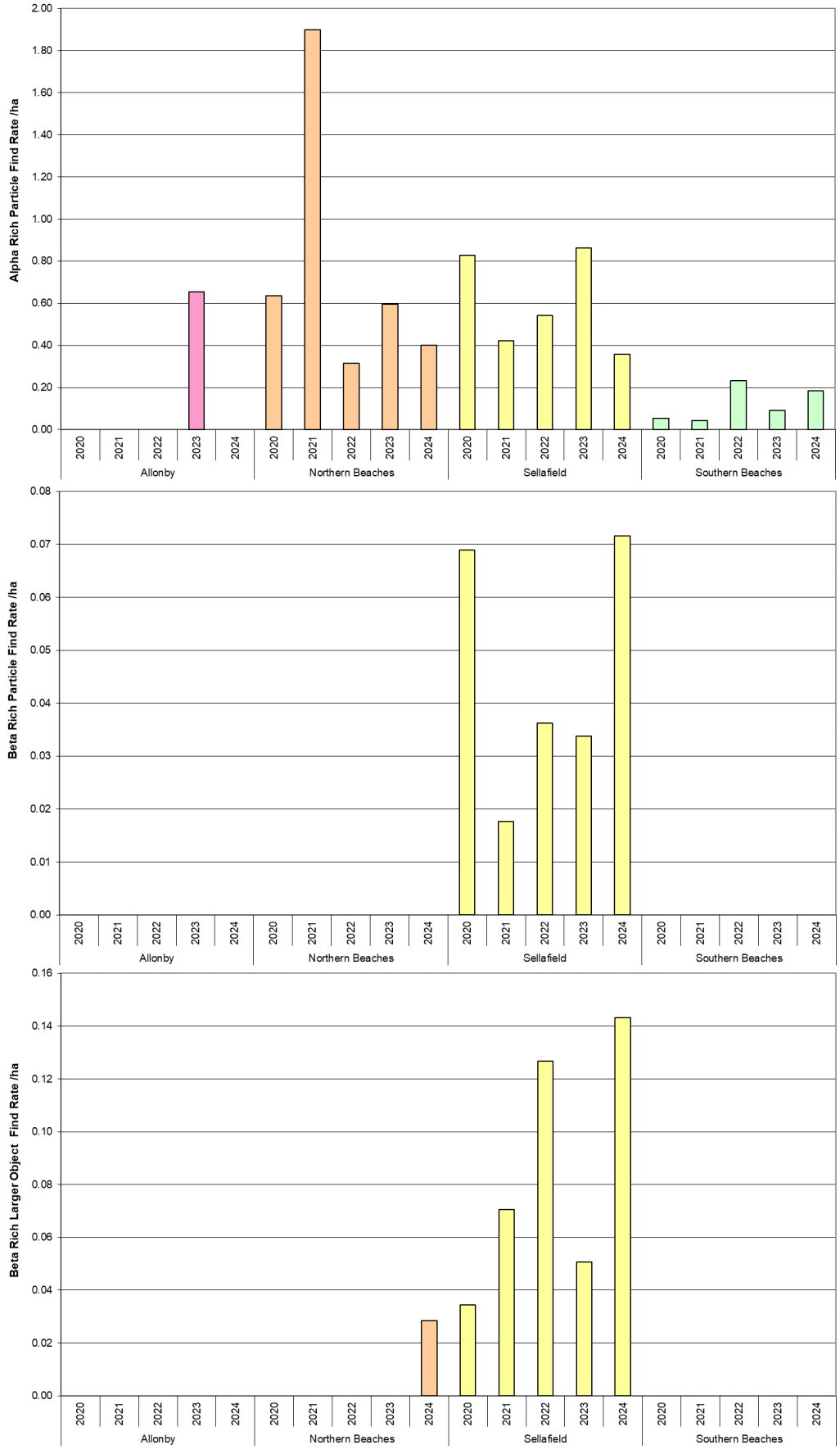
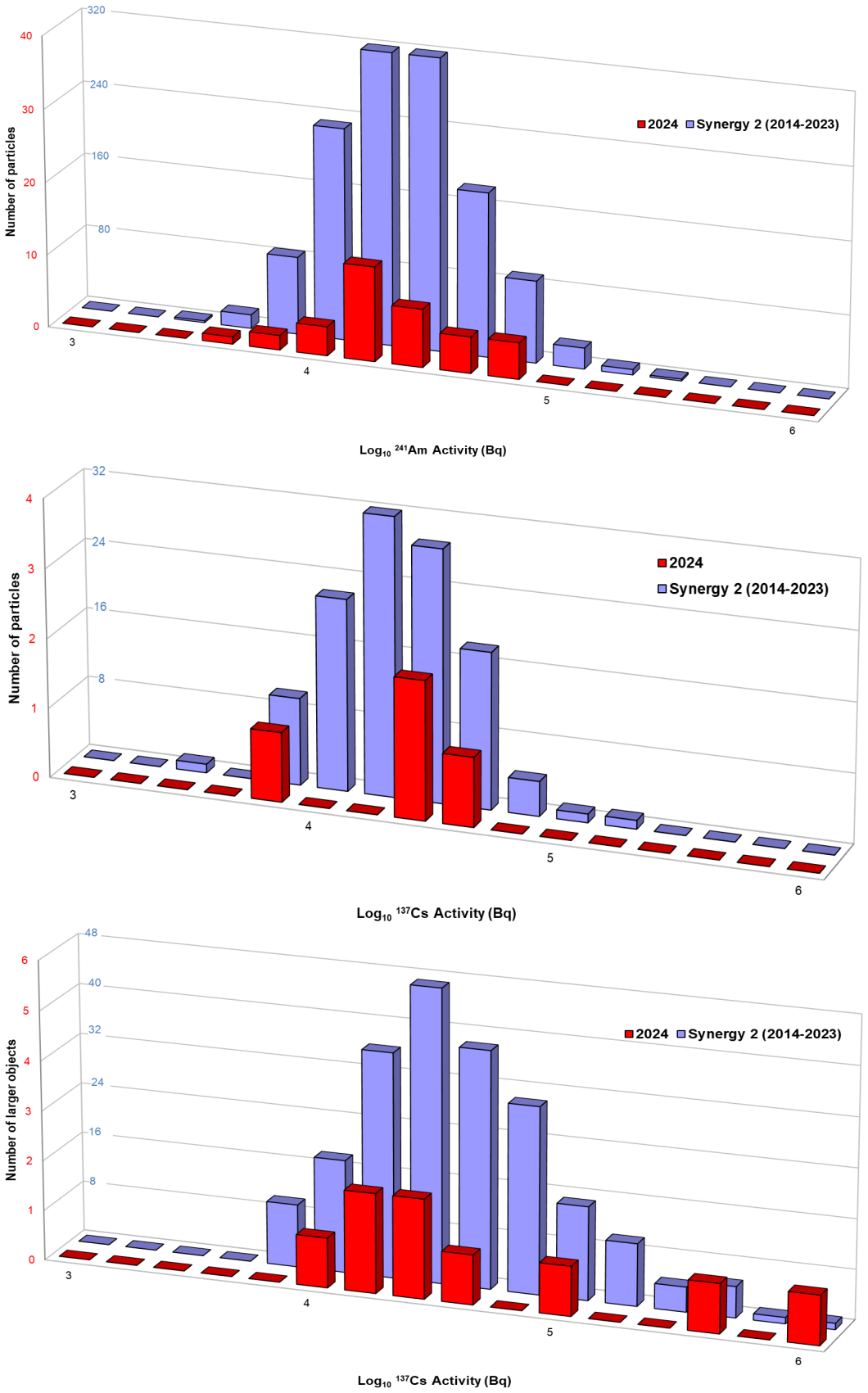


Figure 1: Find rates of alpha-rich particles (upper), beta-rich particles (middle) and beta-rich larger objects (lower) between 2020 - 2024.



Note 3: Different scales used for 2024 and Synergy2 datasets.

Figure 2: Radioactivity of finds classified as alpha-rich particles (top), beta-rich particles (middle) and beta-rich larger objects (lower) between May 2014 - December 2023 (termed "Synergy2" and shown in blue) compared to data from 2024 (termed "2024" and shown in red).