2024 Australian Rover Challenge - Assessment Report

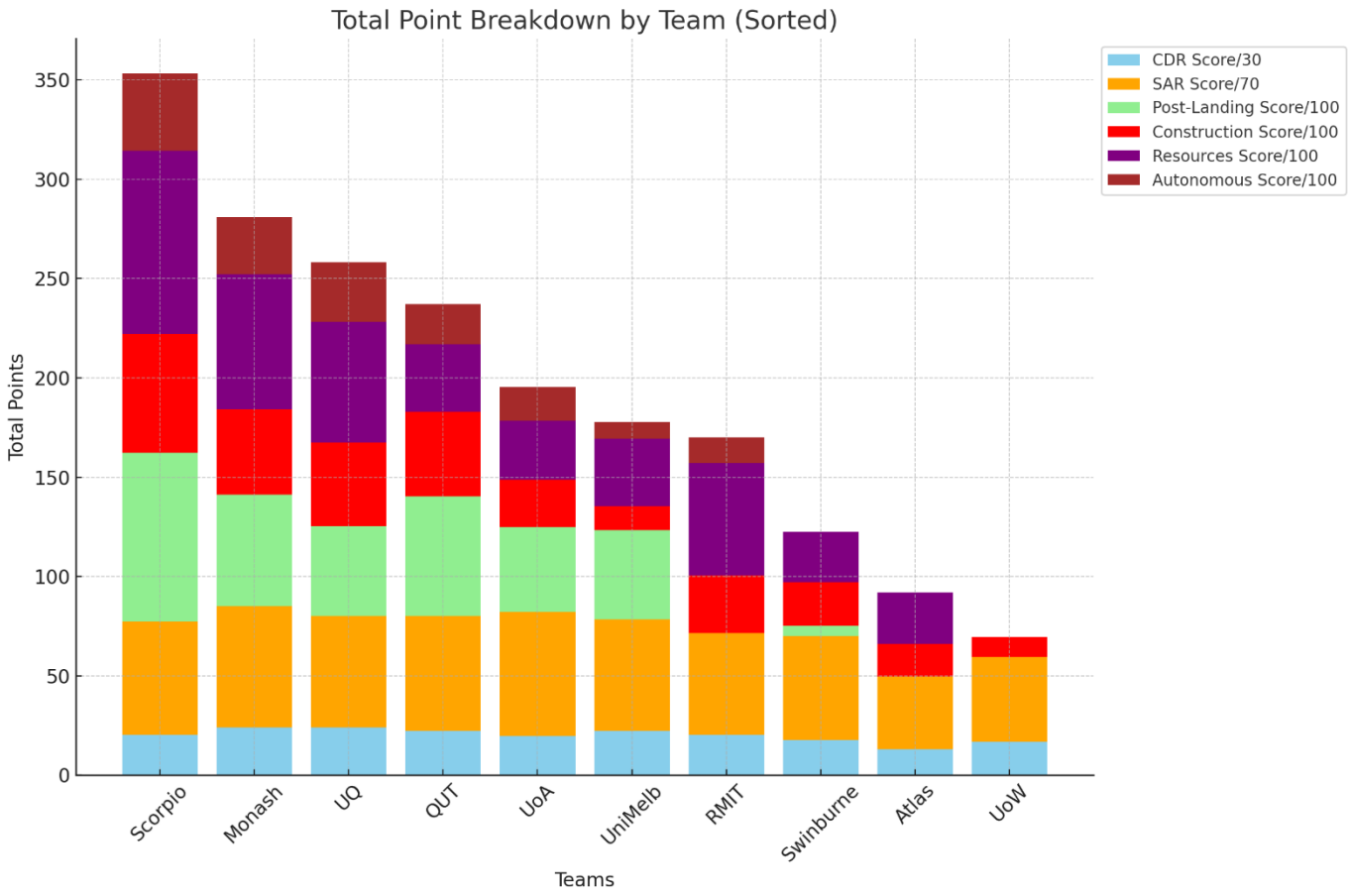
General Comments

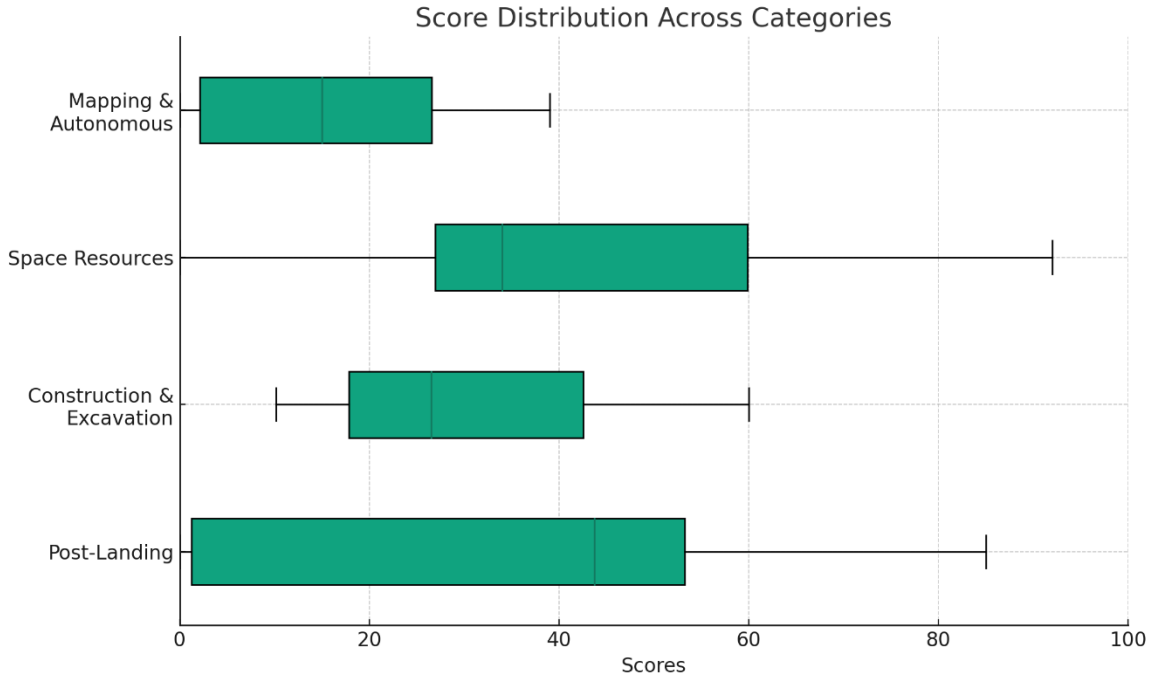
Overall teams made significant improvements from last year (2023), however fundamental issues related to basic mobility, trafficability and adherence to Rules & Requirements persist. Some teams failed to meet critical requirements including total rover mass, E-STOP and LEDs. In future these must be explicitly demonstrated in the SAR Report and Video.

To reiterate, as explained in Section 4.5 of the Rules & Requirements, the first 25 to 50 points of a task consist of basic activities, with the subsequent 25 to 50 points consisting of intermediate activities, and the final 25 points being complex activities. Basic activities involve basic navigation and sensing tasks, such as driving forward, backward, turning, and utilising cameras for visual feedback. These activities serve as a foundation for all teams and should be a minimum functionality in order to attend the competition, not something to be solved on the 2nd or 3rd day. This is a clear demonstration that more effort should be placed on preparation and testing *before the competition* and that timelines proposed in the SAR were not adhered to**.** This is the reason why the Distributed Field Test and video were introduced, to act as a benchmark to ensure core systems work.

This document starts with some analysis of the overall challenge, followed by detail for the Post Landing, Excavation & Construction, and Space Resources Tasks. Each section contains a graphical illustration of the pass rate (i.e. were **any** points scored) per activity, for each Task. Also included are score breakdowns for each activity, including detailed score distribution, pass rates, average scores and additional graphical representations of scores, depending on the Activity and Task.

Overall Summary





Individual Scores

	UoA	RMIT	Monash	UniMelb	UQ	Scorpio	QUT	Swinburne	UoW	Atlas
CDR Score/30	19.8	20.3	24.1	22.2	24.1	20.4	22.4	17.8	16.8	13.2
SAR Score/70	62.5	51.2	61.1	56.2	56.2	56.8	57.9	52.4	42.5	36.4
Post-Landing Score/100	42.5	0.0	56.0	45.0	45.0	85.0	60.0	5.0	0.0	0.0
Construction Score/100	24.0	29.0	43.0	12.0	42.0	60.0	42.7	22.0	10.2	16.5
Resources Score/100	29.7	56.6	68.0	34.0	61.0	92.0	34.0	25.2	0.0	26.0
Autonomous Score/100	17.0	13.0	28.8	8.5	30.0	39.0	20.0	0.0	0.0	0
Total Score/500	195	170	281.0	177.9	258	353.2	237	122.4	69.5	92.1

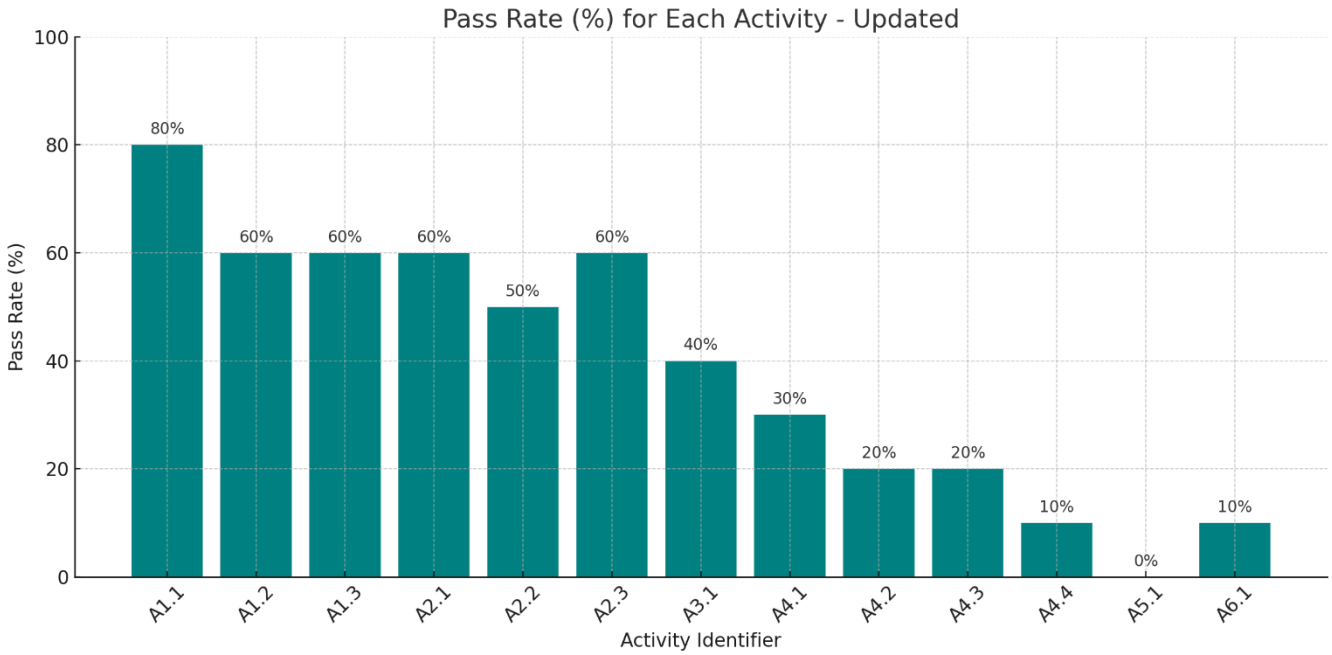
Overall Scores

Activity	Mean	Median	Standard Deviation	Score + 1 SD	Score - 1 SD
CDR Score/30	20.11	20.35	3.43	23.54	16.68
SAR Score/70	53.32	56.20	8.19	61.51	45.13
Post-Landing Score /100	33.85	43.75	30.52	64.37	3.33
Excavation & Construction Score / 100	30.14	26.50	16.24	46.38	13.90
Space Resources Score / 100	42.65	34.00	26.52	69.17	16.13
Mapping & Autonomous Score /100	15.63	15.00	13.90	29.53	1.73
Total Score /500	**195.6**	**186.45**	**88.62**	**284.23**	**106.99**

Weight (kg)										
	UoA	**RMIT**	**Monash**	**UniMelb**	**UQ**	**Scorpio**	**QUT**	**Swinburne**	**UoW**	**Atlas**
Post-Landing (kg)	48.2	48.2	47.4	35.2	44.6	47.4	37.6	49.2	58.6	71.4
Construction (kg)	48.2	51.6	46.2	42.4	50.2	56.6	55	42	57.4	41.2
Resources (kg)	59.2	57.8	47.6	44.2	43.6	52.8		49.8		42
Autonomous (kg)	41	37.6	33.6	28.6	47.6	35.4	35.6			39.6

Post Landing Task

For the **Post Landing Task**, many teams were able to achieve a large portion of points however reliability (i.e. turning on and functioning at the designated start time) and mobility remain significant issue preventing teams from collecting large amounts of points. The distribution of pass rates followed the intended point distribution curve as described in activities (Rule 4.5), however *complex* activities including Activity 4, 5 and 6 remain too difficult.



Interventions

Number	0	1	2	3	4
Count	8	2	0	0	0

Repositions

Number	0	1	2	3	4
Count	10	0	0	0	0

Activity 1 – Systems Check

A1.1 Descend Down Ramp

Mark	0	5	Pass Rate (%)
Count	2	8	80

A1.2 Circumnavigate Lander

Mark	0	10	Pass Rate (%)
Count	5	5	50

A1.3 Relay Status Readout

Mark	0	5	Average
Count	4	6	60

Activity 2 – Site Evaluation

A2.1 Supply Cache 1

Mark	0	10	Pass Rate (%)
Count	4	6	60

A2.2 Supply Cache 2

Mark	0	10	Pass Rate (%)
Count	5	5	50

A2.3 Supply Cache 3

Mark	0	10	Pass Rate (%)
Count	4	6	60

Activity 3 – Wireless Communication

Relay RFID Instructions

Mark	0	10	Pass Rate (%)
Count	6	4	40

Activity 4 – Maintenance

A4.1 Object 1

Mark	0	10	Pass Rate (%)
Count	7	3	30

A4.2 Object 2

Mark	0	10	Pass Rate (%)
Count	8	20	20

A4.3 Object 3

Mark	0	10	Pass Rate (%)

Count	8	2	20

A4.4 Object 4

Mark	0	10	Pass Rate (%)
Count	9	1	10

Activity 5 – Propellant Hose Connection

Connect Propellant hose to Lander

Mark	0	10	Pass Rate (%)
Count	10	0	0

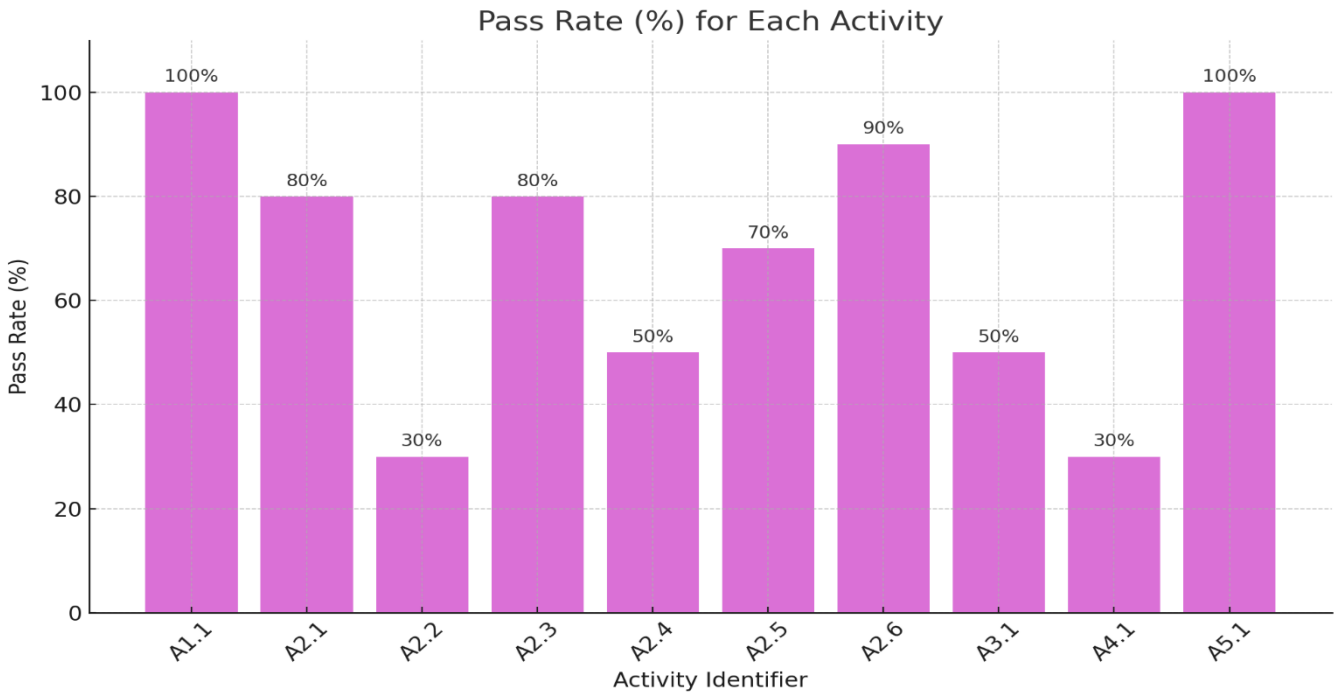
Activity 6 – Modular Propellant Hose Connection

Connect Propellant hose to Processing Plant

Mark	0	10	Pass Rate (%)
Count	9	1	10

Excavation & Construction Task

As the **Excavation & Construction Task** occurred on day 2, many issues of mobility were resolved, and all activities were passed. Although a large dispersion in scores occurred, there is clear evidence that all activities could be completed if teams continue making progress on the efficiency and implementation of their designs, and operator training.



Interventions

Number	0	1	2	3	4
Count	8	2	0	0	0

Repositions

Number	0	1	2	3	4
Count	10	0	0	0	0

Activity 1 – Leave Start

Descend Down Ramp

Mark	0	5	Pass Rate (%)
Count	0	10	100

Activity 2 – Rock Clearing

A2.1 Small Rock 1

Mark	0	2	4	Pass Rate (%)	Average
Count	2	7	1	80	1.8

A2.2 Small Rock 2

Mark	0	2	4	Pass Rate (%)	Average
Count	7	2	1	30	0.8

A2.3 Medium Rock 1

Mark	0	2	4	Pass Rate (%)	Average
Count	2	7	1	80	1.8

A2.4 Medium Rock 2

Mark	0	2	4	Pass Rate (%)	Average
Count	5	4	1	50	1.2

A2.5 Large Rock

Mark	0	3	7	Pass Rate (%)	Average
Count	3	6	1	70	2.5

A2.6 Huge Rock

Mark	0	3	7	Pass Rate (%)	Average
Count	1	7	2	90	3.5

Activity 3 – Excavation & Deposition

Mark	0	5	10	15	20	25	Pass Rate (%)	Average
Count	5	1	0	3	1	0	50	7

Activity 4 – Paver Construction

Mark	0	Lowest points	Highest points	Pass Rate (%)	Average
Count	7	7	14	50	3.27

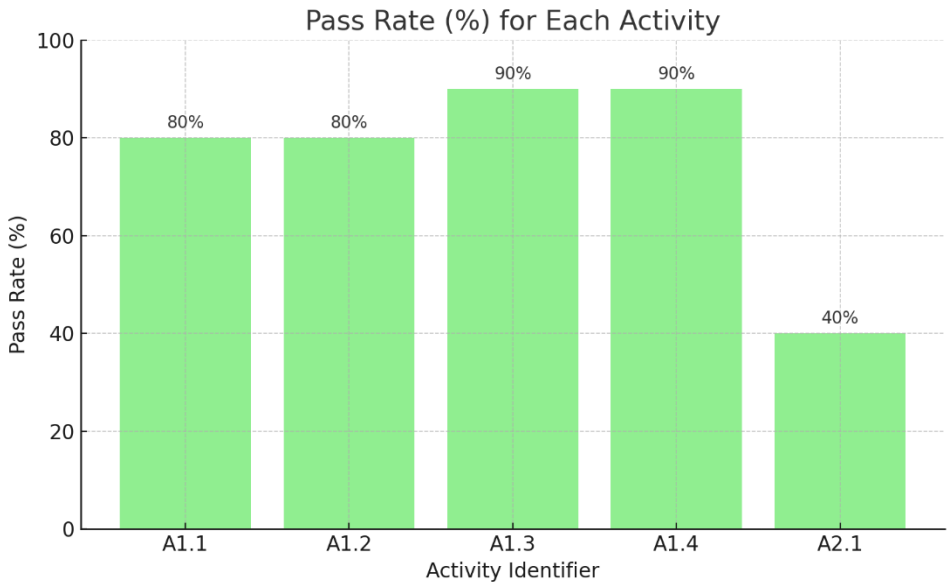
Activity 5 – Paver Justification

Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	0	0	0	5	4	1	100	3.6

Space Resources Task

For the **Space Resources Task**, several teams did achieve some quantity of water (within the 0.01g detection limit) however there is a clear need to increase yield and reduce particulate contaminants. Quantification of ice and ilmenite content varied widely – more emphasis should be placed on quantifying errors and not simply trusting data collected. It was surprising that teams estimated ice or ilmenite content at each site that were above the limits that were explicitly stated in the rules.

The presentation was overall done very well, with clear demonstration of preparation from prior testing and calibration of systems. Responses to qualitative questions (Section 10.6.1.1 and 10.6.1.3 in the Rules & Regulations) were good, however more emphasis on limitations of systems, fundamental understanding of the competition environment, evaluation of performance and identification of improvements are encouraged



Interventions

Number	0	1	2	3	4
Count	8	2	0	0	0

Repositions

Number	0	1	2	3	4
Count	10	0	0	0	0

Manual Loading

Number	0	1
Count	8	2

Activity 1 – Prospecting

A1.1 Site 1 (Icy Regolith)

Mark	0	5	Pass Rate (%)
Count	2	8	80

A1.2 Site 2 (Icy Regolith)

Mark	0	5	Pass Rate (%)
Count	2	8	80

A1.3 Site 3 (Ilmenite)

Mark	0	5	Pass Rate (%)
Count	1	9	90

A1.4 Site 4 (Ilmenite)

Mark	0	5	Pass Rate (%)
Count	1	9	90

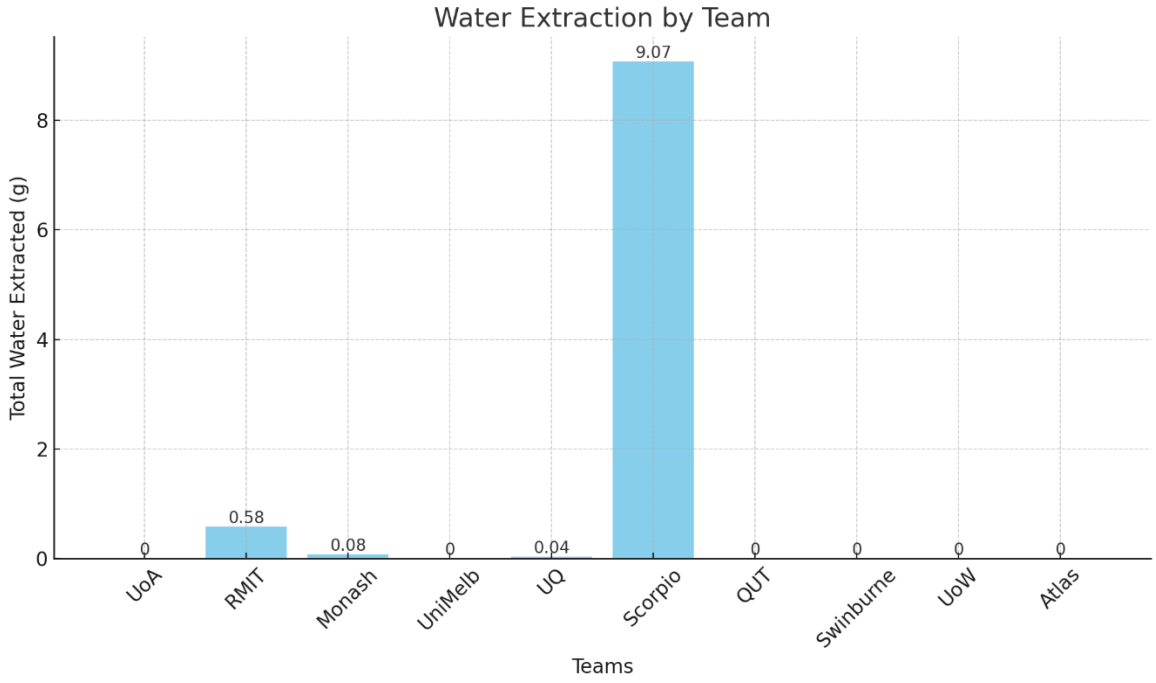
Activity 2 – Processing

Any Water collected

Mark	0	30	Pass Rate (%)
Count	6	4	40

Proportional Points

Mark	0	1	20	Pass Rate (%)
Count	6	3	1	4



Activity 3 – Space Resources Presentation

A3.1 Question 1

Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	1	0	0	1	5	3	90	4

A3.2 Site 1 (Icy Regolith)

Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	5	0	0	5	0	0	50	2

A3.3 Site 2 (Icy Regolith)

Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	5	0	3	1	0	1	50	1

A3.4 Site 3 (Ilmenite)

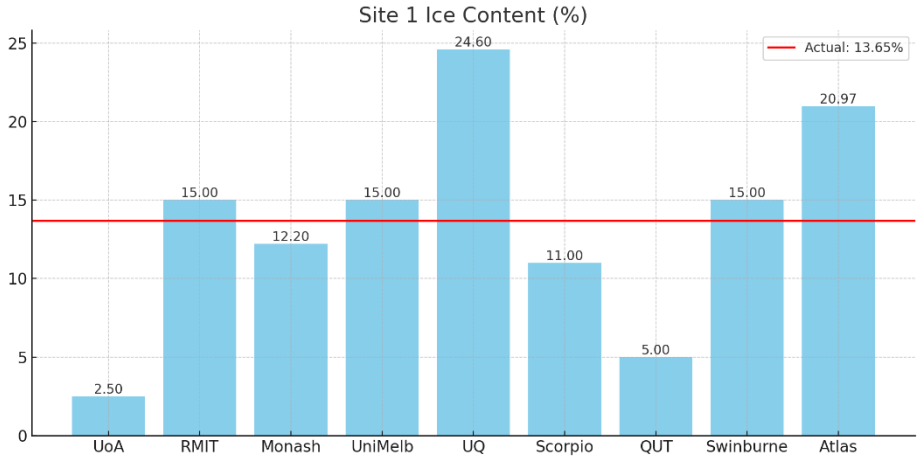
Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	3	0	6	0	0	1	70	2

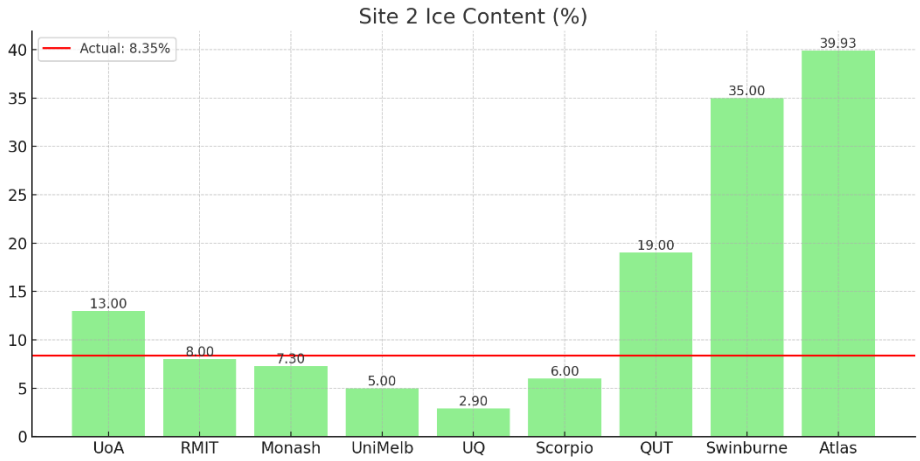
A3.5 Site 4 (Ilmenite)

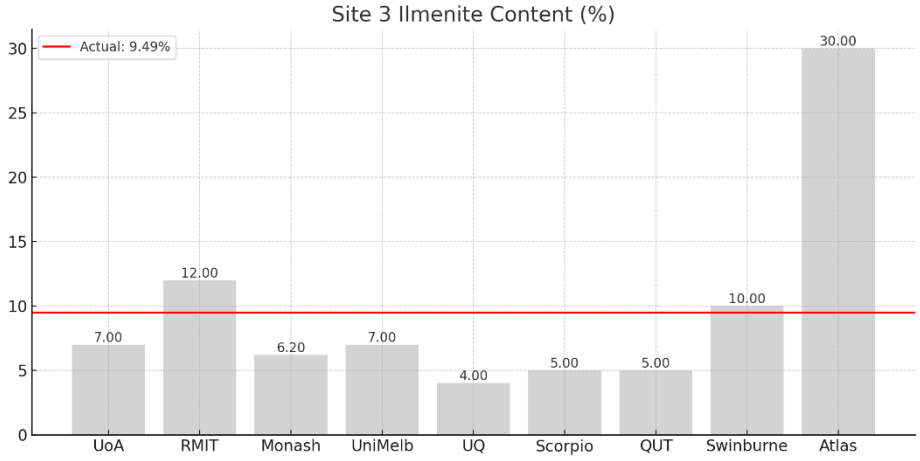
Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	7	0	2	0	0	1	30	1

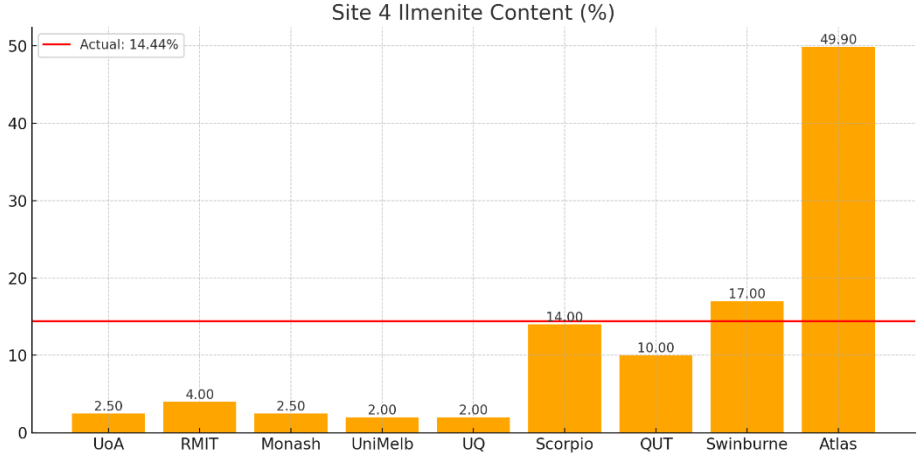
A3.6 Question 2

Mark	0	1	2	3	4	5	Pass Rate (%)	Average
Count	1	0	0	2	2	5	90	4









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