MILLBROOK

Test Tracks

www.millbrook.co.uk

Welcome to Millbrook

At Millbrook Group, we are fortunate to have outstanding test tracks in two wonderful locations in the UK and Finland. From these, we serve the best Companies in the World and we help them to develop the vehicles, tyres, engines and fuels of the future. We are independent and impartial in everything that we do.

In this brochure, you will find details of our test tracks, from the famous Hill Route at Millbrook to the extraordinary indoor natural snow tracks at Test World. We have also included an overview of the broad range of services and test facilities that we offer to our customers that complement the test tracks. We put safety and confidentiality at the heart of our operations and we are passionate about providing outstanding customer service at all times. We invest in our people and our facilities and strive to be the best service provider in the markets we serve.

All of our employees take pride in delivering exactly what their customers want, whether that is a vehicle test, engineered conversion or smooth-running conference. The quality of our work is reflected in our ISO 9001 and ISO 14001 certifications and ISO 17025 accreditation for many test procedures.

Please do not hesitate to contact us if we can be of service.

Alex Burns
President

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Millbrook Group Overview

spectris

Millbrook Group is part of the Test and Measurement business segment of Spectris and consists of Millbrook Proving Ground in the UK and Test World in Finnish Lapland.

Spectris plc is a leading supplier of productivity-enhancing instrumentation and controls.

Millbrook is best known for its test tracks where it performs repeatable tests in a safe and secure environment. Millbrook also has a range of test facilities for full vehicles, tyres and components, including engine dynamometers, crash laboratories, advanced emissions chassis dynamometers and innovative indoor winter test tracks.

Millbrook supports its customers with specialist vehicle conversions, workshops in its Technology Park and vehicle-related events.

Safety and Confidentiality

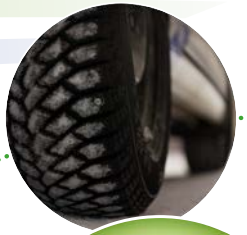
Customer Service

Technical Excellence

Priorities

Investment

Tyre Testing



Compliance

FINAS
TraFi
VCA
RDW

Special Vehicles

Vehicle Testing

Services

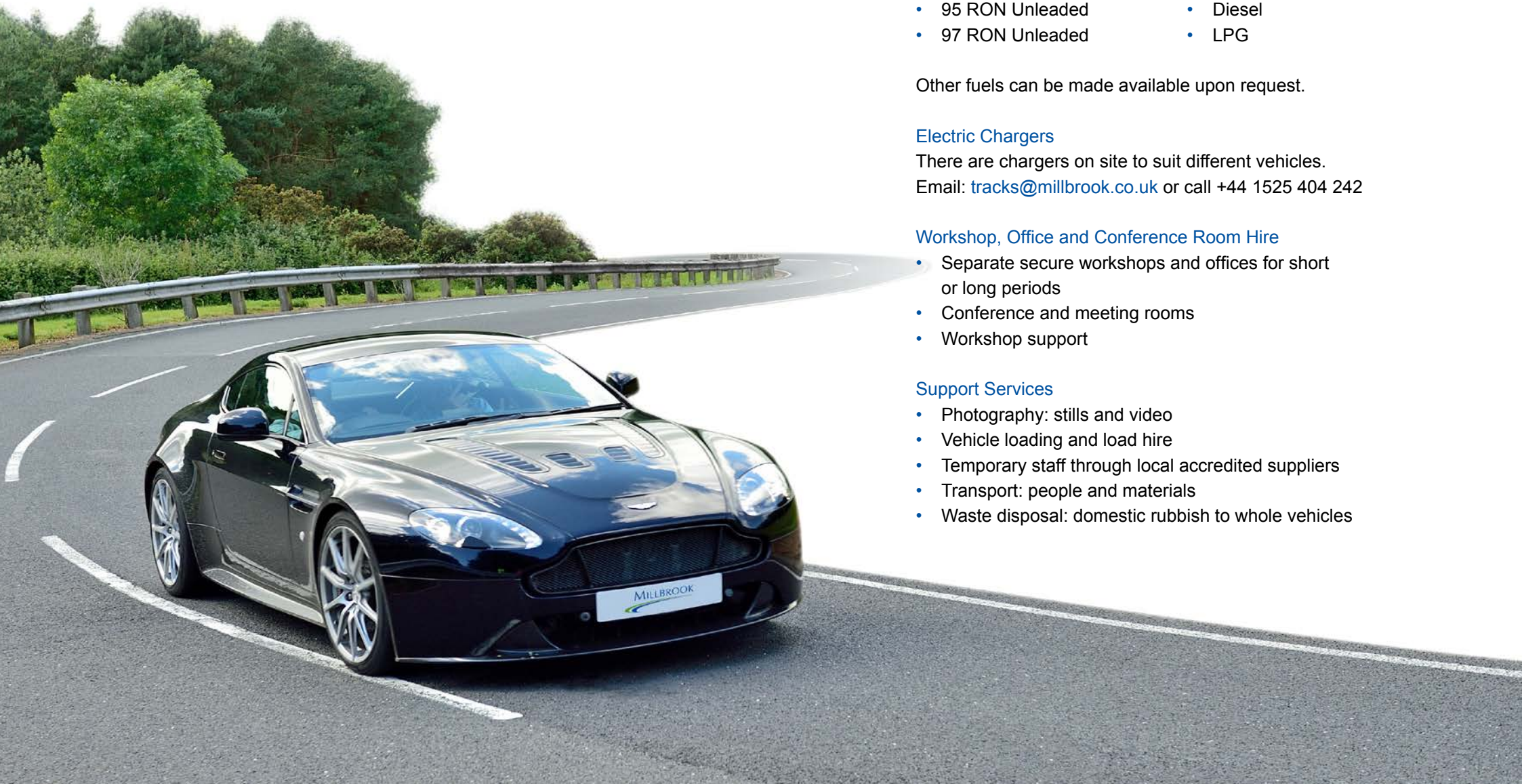
Safety Testing

Powertrain Testing

Technology Cluster

Support Services

Millbrook offers its customers a wide range of support services to make tests run as efficiently as possible.



Fuels and Lubricants

Fuels stocked on-site include:

- 95 RON Unleaded
- 97 RON Unleaded
- Diesel
- LPG

Other fuels can be made available upon request.

Electric Chargers

There are chargers on site to suit different vehicles.
Email: tracks@millbrook.co.uk or call +44 1525 404 242

Workshop, Office and Conference Room Hire

- Separate secure workshops and offices for short or long periods
- Conference and meeting rooms
- Workshop support

Support Services

- Photography: stills and video
- Vehicle loading and load hire
- Temporary staff through local accredited suppliers
- Transport: people and materials
- Waste disposal: domestic rubbish to whole vehicles

Catering

- The Millbrook Staff Restaurant is open to visitors
- Full catering available in offices and meeting rooms

Driver Training

Millbrook offers driver training packages in a range of disciplines, including:

- Advanced driver training
  - Limit and beyond-limit handling
  - Accident avoidance
  - Anti-hijack
  - Other specialist training techniques
- Skid control and hazard awareness
  - Theory and practical with the use of skid cars
- Off-Road driving techniques using world class track facilities
- Trailer training – theory and practical

All courses are structured to meet individual needs.

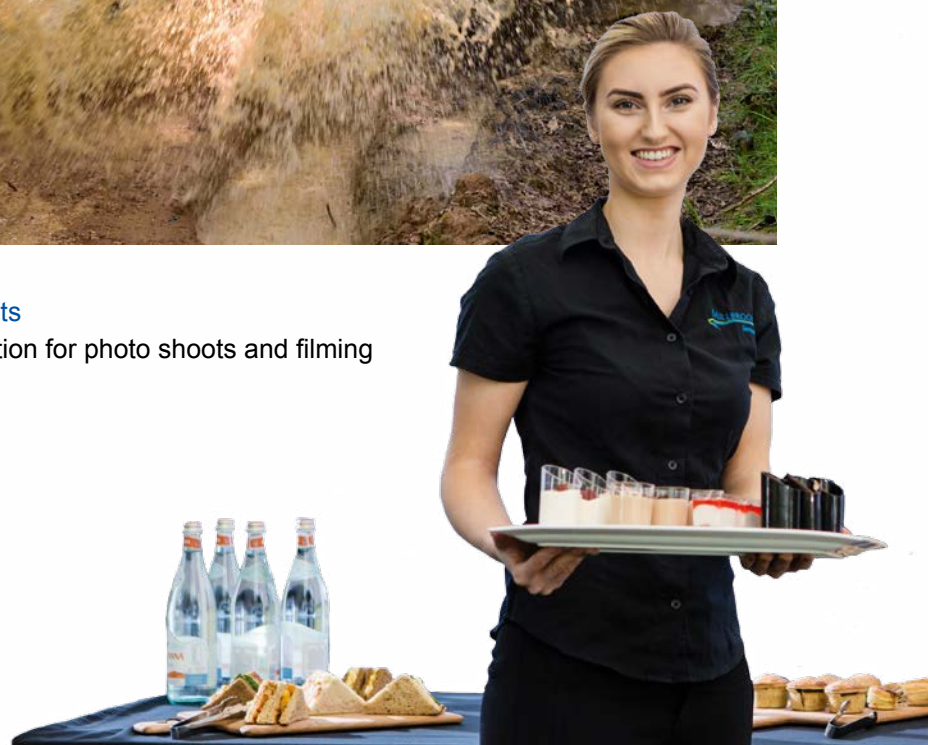
Corporate Events

Millbrook's event venues are perfectly suited to product launches, hospitality events, conferences, exhibitions, ride and drive events and themed events on any scale.

For further information please visit www.millbrookvenues.co.uk

Filming, Video and Photo Shoots

Millbrook provides a great location for photo shoots and filming vehicles in action.

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Test Tracks UK

The test tracks at Millbrook Proving Ground are some of the finest available commercially anywhere in the world.

Custom-built to simulate the world's toughest terrains, they provide an invaluable test and development resource at a single, secure and well supported site.

On-Road Tracks and Features

1. Hill Route
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3. Hill Route Loop 2
4. Hill Route Loop 3
5. High/Constant Speed Circuit
6. City/Handling Circuit
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Off-Road Tracks

22. Off-Road and Severe Off-Road

Off-Road Technical Features

23. Wading Pond
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25. Axle Bumps
26. Severe Vehicle Twist
27. Rock Run
28. Wading Trough
29. Concrete Ditches
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33. Log Roll
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36. One in One
37. 25° Traverse
38. Gravel Hills
39. 35% Gravel Hill and 155° Breakover
40. Snake Climb
41. Sand Hills
42. Deep Ditches
43. Twist Climb
44. Offset Sinusoidals
45. Structural Test Features
46. Berm Road
47. Gravel Road
48. 60% Hill Slope
49. Severe Articulation/ Hummer Hollows
50. Recovery Vehicle Winch Anchor Points
51. Gravel Pits

On-Road Tracks and Features

The on-road tracks and features make up a major proving ground, with more than 50km of varied surfaces and a range of technical features.

Millbrook supports its test track customers with:

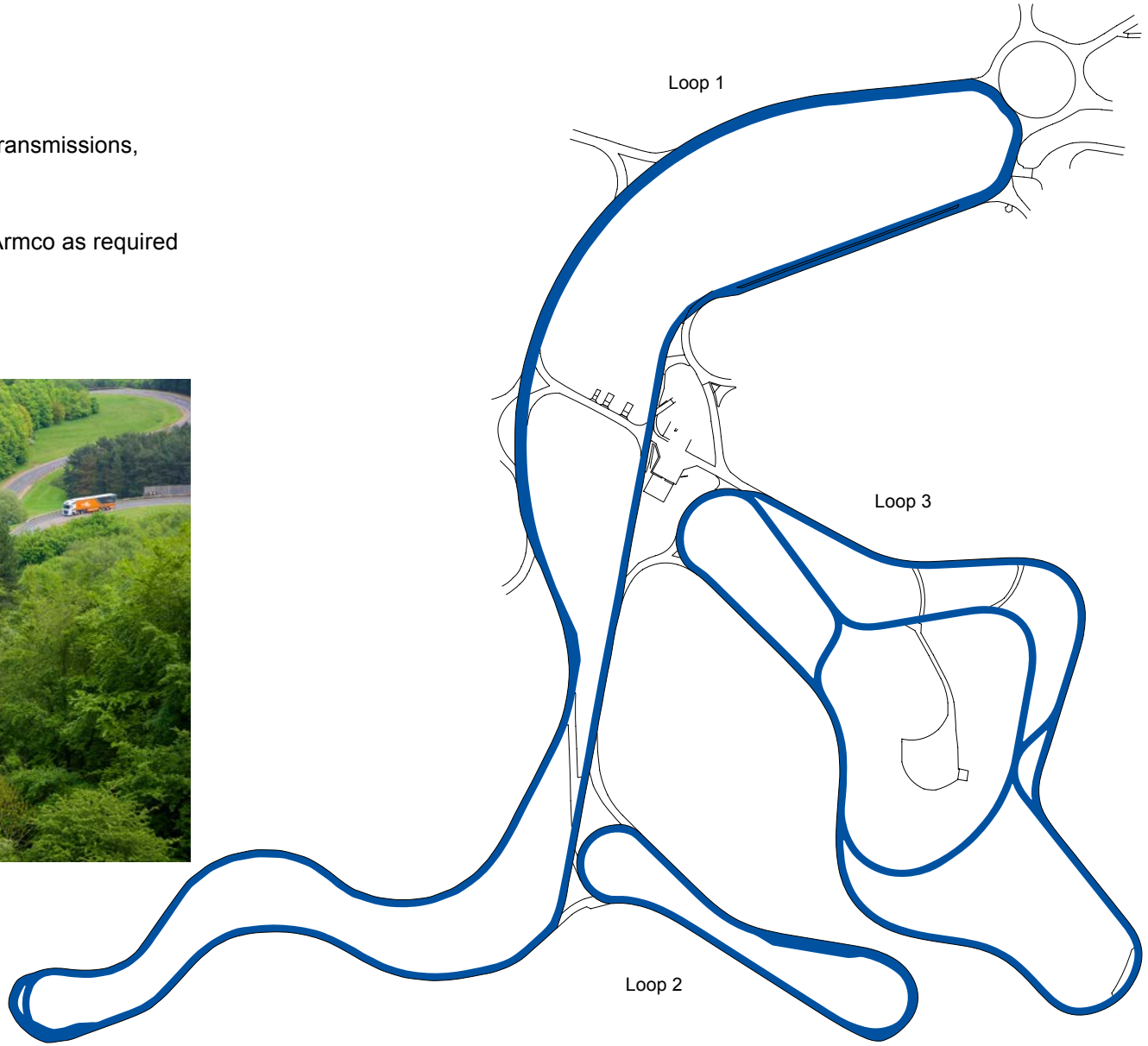
- Specialist durability correlation team
- Whole vehicle general quality, corrosion and structural durability
- Objective and subjective measurement
- Corrosion chambers
- Climatic chambers
- Type approval advice, guidance, application and certification


Valley Park
26% Up
Hill Route
-Loop 3

1. Hill Route

A unique facility for the evaluation of powertrains, transmissions, dynamics, braking and active systems.

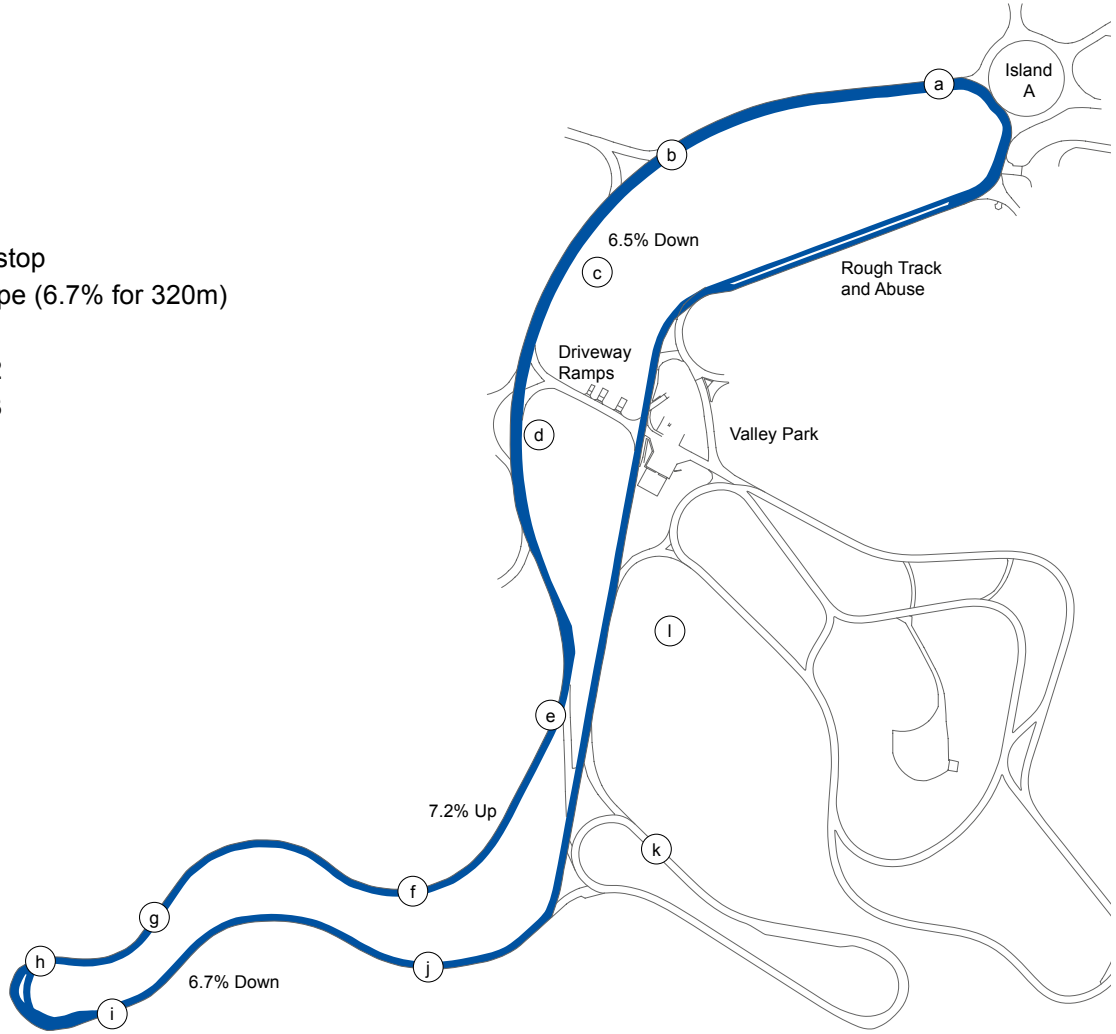
- Tarmac road surface 6m wide with flush kerbs/Armco as required
- Nominally one way
- Total length of circuit 6.5km
- Gradients from 6.5% to 26%



2. Hill Route – Loop 1

- One way facility
- Tarmac road surface 6m wide with flush kerbs
- Total length of circuit 2.69km

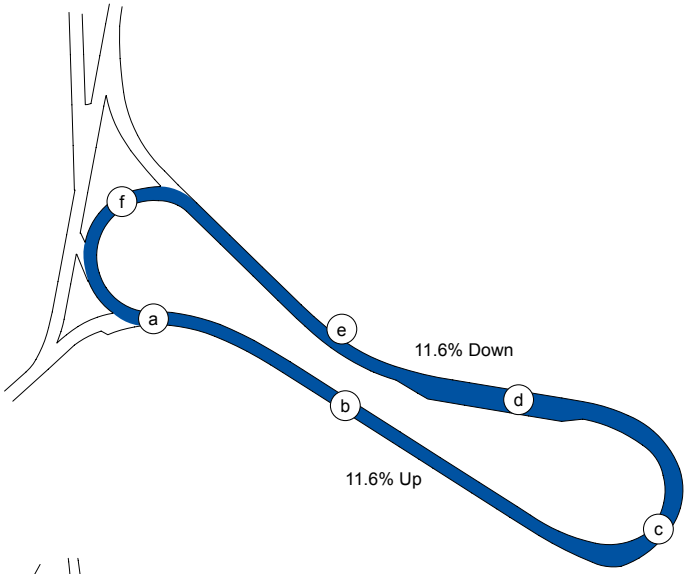
2a. Laybys and Bus stops
2b. Start of down slope (6.5% for 100m)
2c. Start of up slope (7.2% for 870m)
2d. Transmission ridges (8 @ 15m CRS)
2e. 7.2% Layby
2f. Transmission ridges (9 @ 15m CRS)
2g. End 7.2% up
2h. Laybys and Bus stop
2i. Start of down slope (6.7% for 320m)
2j. End of 6.7%
2k. Access to Loop 2
2l. Access to Loop 3



3. Hill Route – Loop 2

- One way facility
- Tarmac road surface 6m wide with flush kerbs
- Total length of circuit 655m

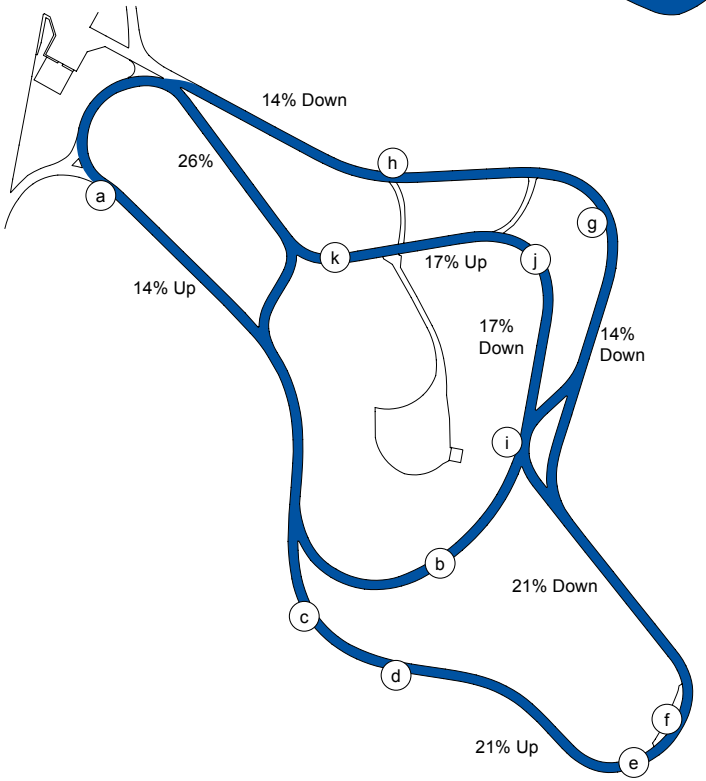
3a. Start of down slope (120m, 9m fall)
3b. Start of up slope (200m, 22m rise 11.6% for 130m)
3c. Start of down slope (225m, 22m fall 11.6% for 150m)
3d. Reversing bay (11.6% for 60m)
3e. Start of up slope (120m 9m rise)
3f. 11.6% Return



4. Hill Route – Loop 3

- One way facility except 26%
- Tarmac road surface 6m wide with flush kerbs
- Longest circuit length 1.29km
- Total length of circuit 2.99km

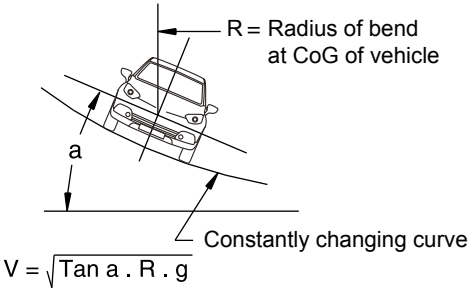
4a. Start of up slope (250m, 28m rise 14% for 130m)
4b. 21% Bypass road
4c. Start of down slope (105m, 11m fall)
4d. Start of up slope (240m, 42m rise 21% for 170m)
4e. Layby
4f. Start of down slope (350m, 52m fall 21% for 100m) and (14% Steady 85m)
4g. Start of up slope (145m, 8.5m rise 14%)
4h. Start of down slope (135m, 16.5m fall 14% for 110m)
4i. Start of down slope (200m, 18m fall 17% for 50m)
4j. Start of up slope (110m, 15m rise 17% for 45m)
4k. Start of down slope (140m, 26m fall 26% for 95m)



5. High/Constant Speed Circuit

Mileage accumulation with constant dynamic forces for the integrated evaluation of durability, brake performance, brake cooling and powertrain cooling.

- Concrete pavement
- One way facility – always counter clockwise
- Braking pads at 4 locations (235m long x 5.5m)
- Braking pads 2 and 3 have speed humps
- Braking pad 4 has wind break facility
- Hard shoulder between braking pads
- Half width safety lane at outside of facility
- Test speeds in excess of 150mph (240km/h)



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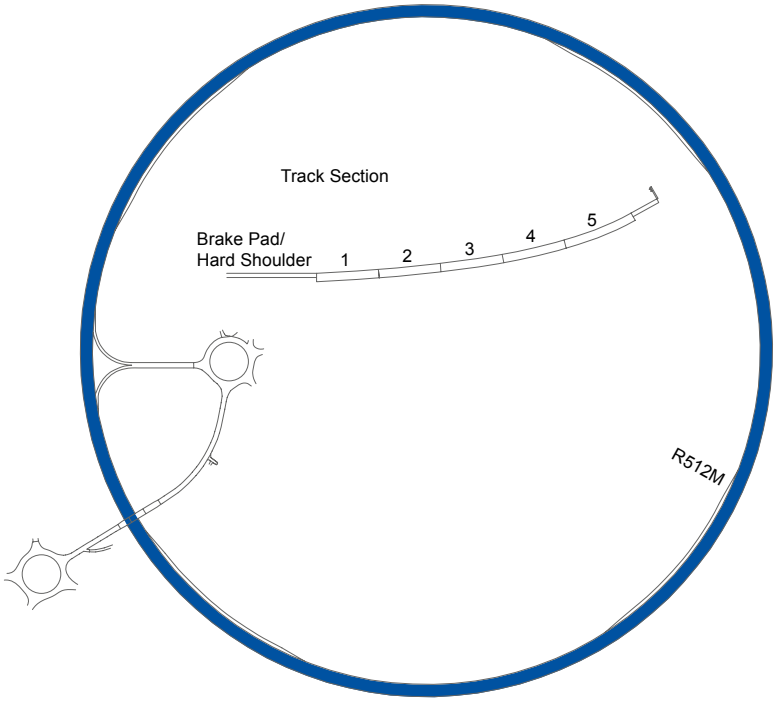


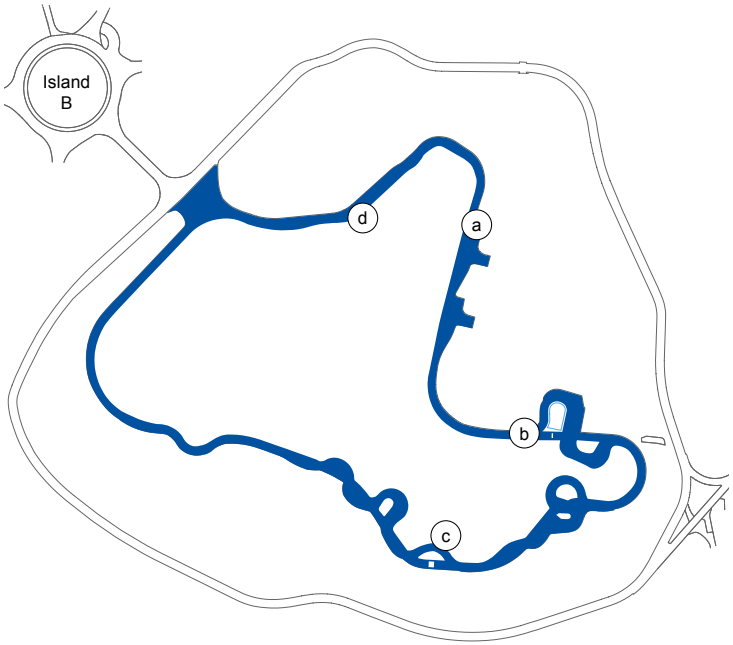
Lane	Surface Width	Neutral Steer Speed		Clearance Under Bridge	Circumference		Guide Speeds	
		km/h	mph		km	miles	km/h	mph
1	3.58m	65	40	7m	3.17	1.97	16–64	10–40
2	3.65m	80	50	6.7m	3.20	1.99	48–96	30–60
3	3.65m	95	60	6.2m	3.22	2.00	80–113	50–70
4	4.00m	120	75	5.7m	3.24	2.01	96–161	60–100
5	4.40m	160	100	4.5m	3.27	2.03	145min	90min
Nominal Figures								

6. City/Handling Circuit

Customisable city simulation facility.

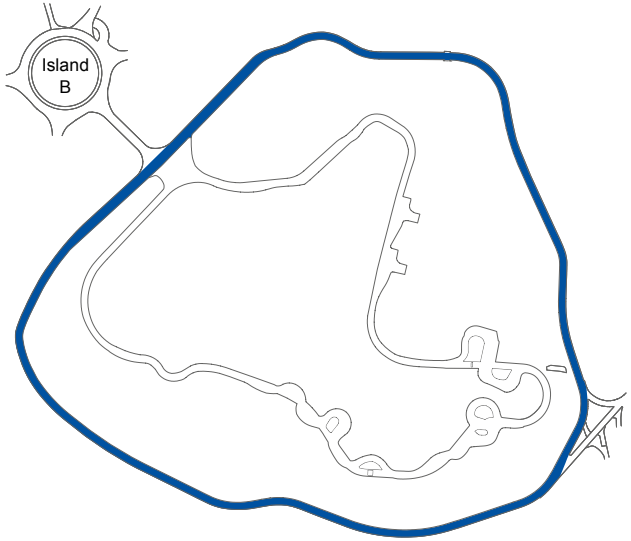
- One way facility
- Total length of circuit 1.2km
- Tarmac pavement min 6m wide
- Various markings for city driving emulation

6a. Reversing bays
6b. Variable troughs/hump profiles
6c. Hump
6d. Parking bays



7. Outer Handling Circuit

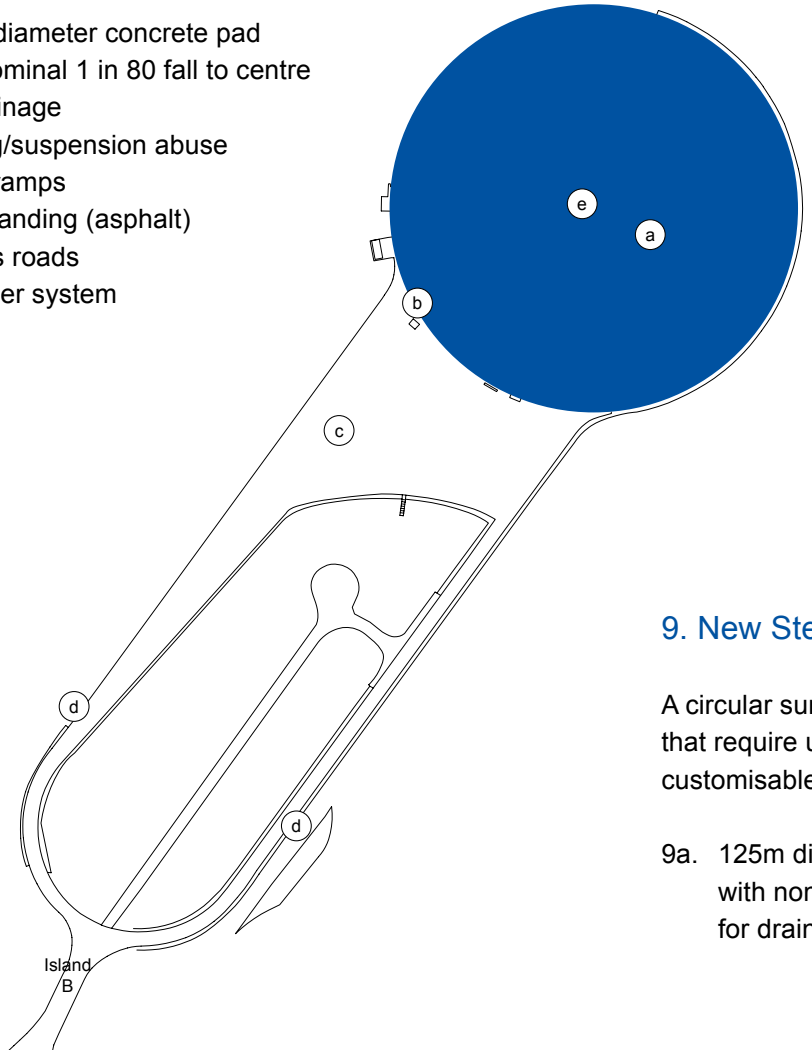
- One way facility
- Concrete pavement 6m wide with varying camber (including negative)
- Total length of circuit 1.39km



8. Steering Pad

Exceptionally large circular surface, suitable for applications that require uninterrupted space and customisable features. 50m radius can be wetted using a central sprinkler system.

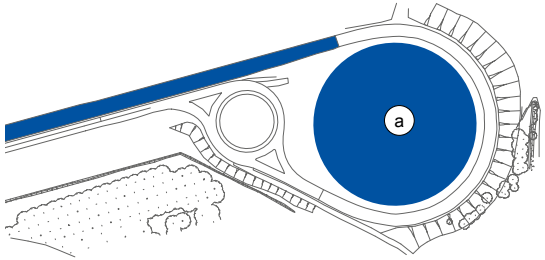
8a. 137m diameter concrete pad with nominal 1 in 80 fall to centre for drainage
8b. Air bag/suspension abuse kerbs/ramps
8c. Hardstanding (asphalt)
8d. Access roads
8e. Sprinkler system



9. New Steering Pad

A circular surface, suitable for applications that require uninterrupted space and customisable features.

9a. 125m diameter tarmac pad with nominal 1% gradient for drainage



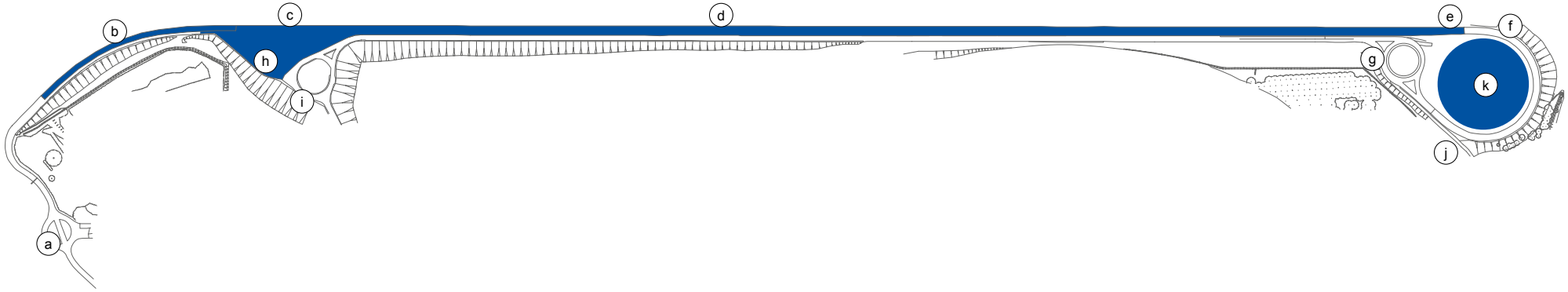
*Available late 2017

10. Mile Straight/Mile Straight Apron

Long, precisely levelled surface with fast approach and departure,
ideal for the evaluation of vehicle acceleration and braking performance.

- Asphalt surface laid level end to end (1 mile) with 1 in 80 crossfall
- Normally one way – two way running by prior agreement

10a. Roundabout for return
10b. Spiral approach – banked
10c. Start of mile straight
10d. Mile straight (marked for start, 1/2, 3/4, 1km and start, 1/2, 3/4, 1 mile)
10e. End of mile straight (North end)
10f. Banked return loop
10g. Return roundabout
10h. Mile Straight Apron (5750 m^2 asphalt)
10i. Lower approach (normal entrance to facility)
10j. Layby
10k. Tarmac Steering pad 125m diameter

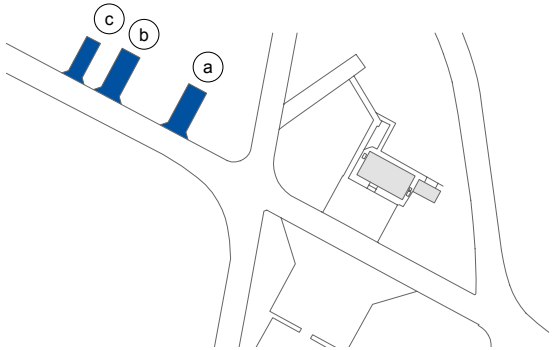


11. Driveway Ramps

Structural twist testing for passenger cars and light trucks.

- Concrete construction
- Ramp c has radiused inflection points (dimensions are nominal on centre line)

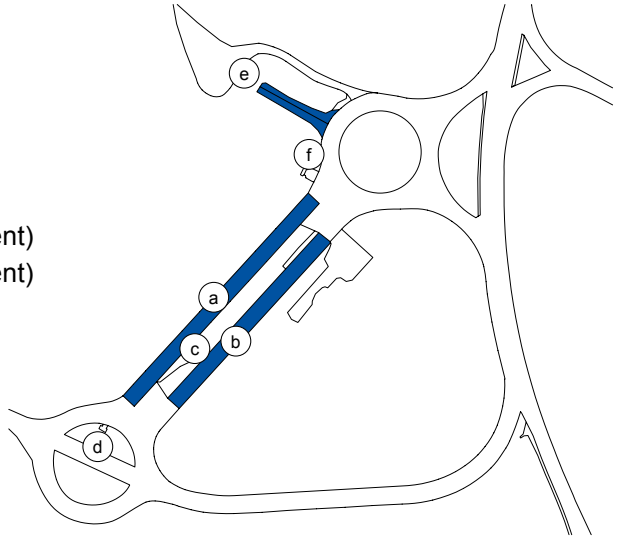
11a. 16º + 8º
11b. 12º + 4.5º
11c. 0º + 12º



12. Truck Slopes

Evaluation of extreme hill capability including winch performance, suitable for all classes of vehicle including large military and off-highway.

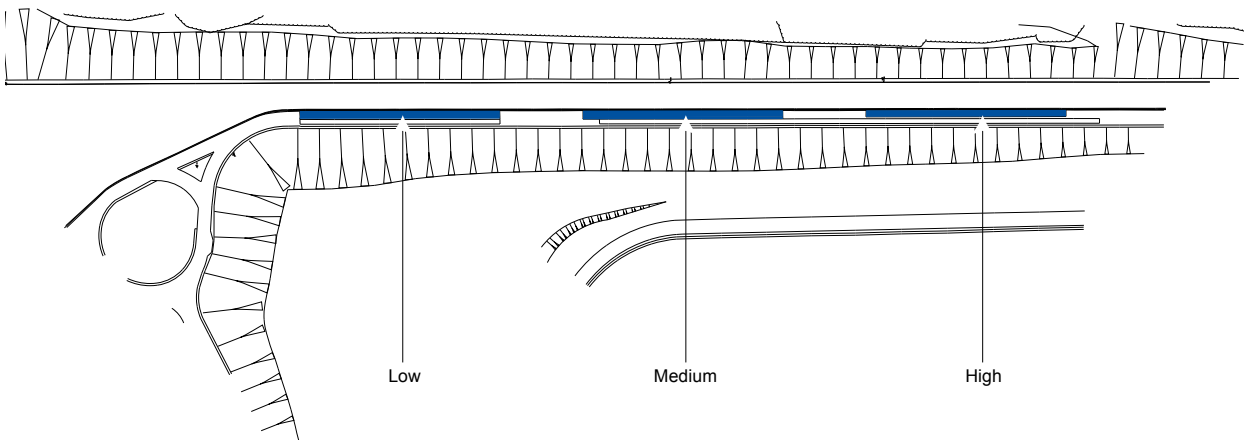
12a. 20% sine slope (80m, 2 way 6m concrete pavement)
12b. 25% sine slope (66m, 2 way 6m concrete pavement) with split friction rollers
12c. Split friction rollers
12d. Winch anchor post
12e. Gravel (25m, 12% loose surface)
12f. Reverse dock barrier



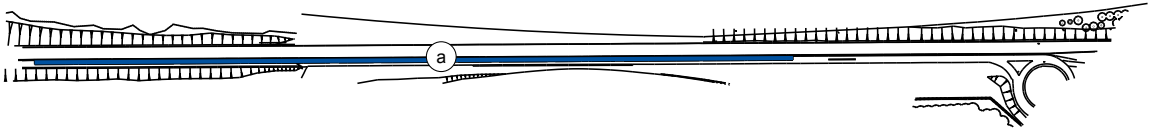
13. Sine Waves

Varying pitch and amplitude Sine Waves, both in and out of phase, for high frequency input to vehicle interior and structure.

- Concrete waves of differing amplitude and pitch
- Low and medium have 50% out of phase strip



	Pitch	Amplitude	Facility Length
High	610mm	50.8mm	91.45m
Medium	915mm	12.5mm	91.45m
Low	305mm	6.5mm	91.45m



14. Random Waves

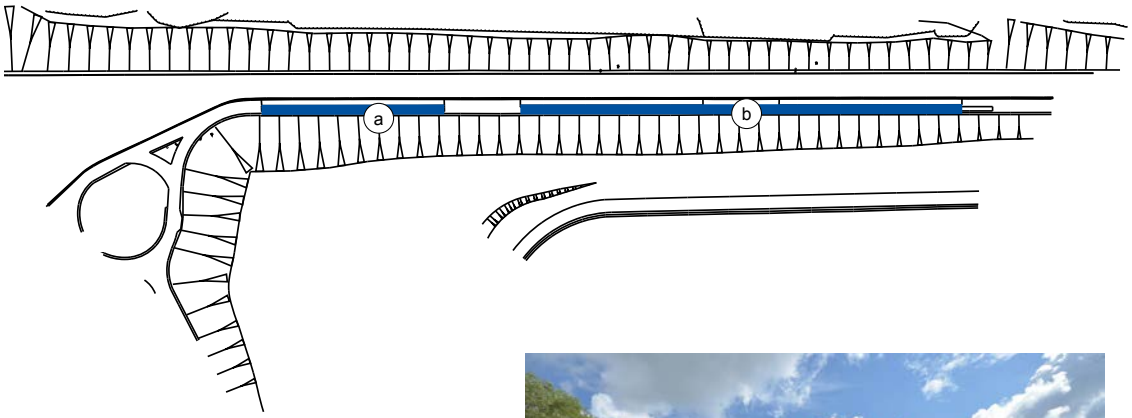
Undulating surface, both in and out of phase, inducing maximum suspension travel and high amplitude low frequency input to vehicle structure.

14a. Concrete pavement 3m wide laid to ‘random’ inclinations. 50% out of phase strip (length 738m)

15. Noise Generating

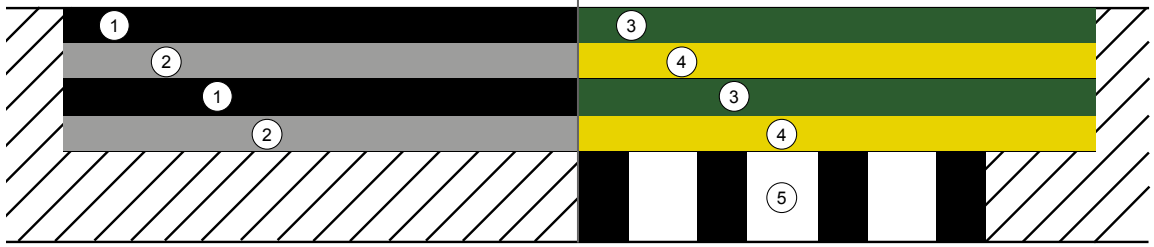
Range of surfaces and constructions to generate interior noise for vehicle refinement purposes.

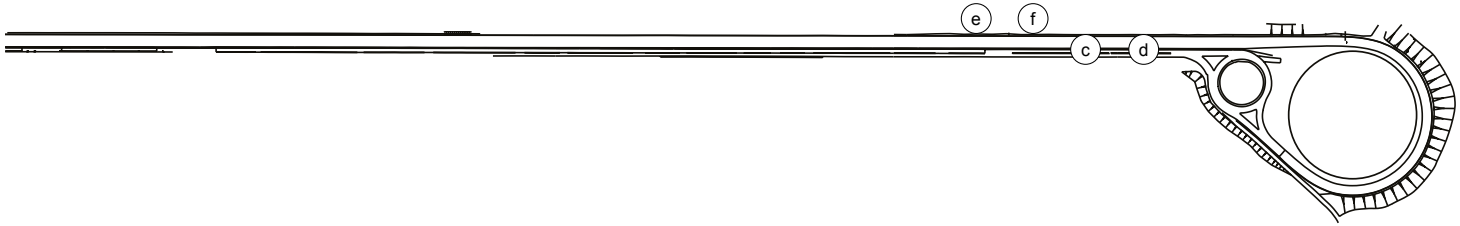
15a. Concrete pavement with transverse sawcuts (9mm x 3mm deep @ 28mm CRS – 90m x 2.1m width)
15b. Chipping surface – Large granite chippings set in concrete pavement (228m x 2.1m width)
15c. Strip of cat's eyes (44 cat's eyes along 90m length)
15d. Strip of 'chipping surface' (one wheel, 0.6m wide and 152m long)



15e.
1. Smooth asphalt
2. Coarse asphalt

15f.
3. Stud damaged concrete
4. Cross grooved concrete
5. Anti-skid patches



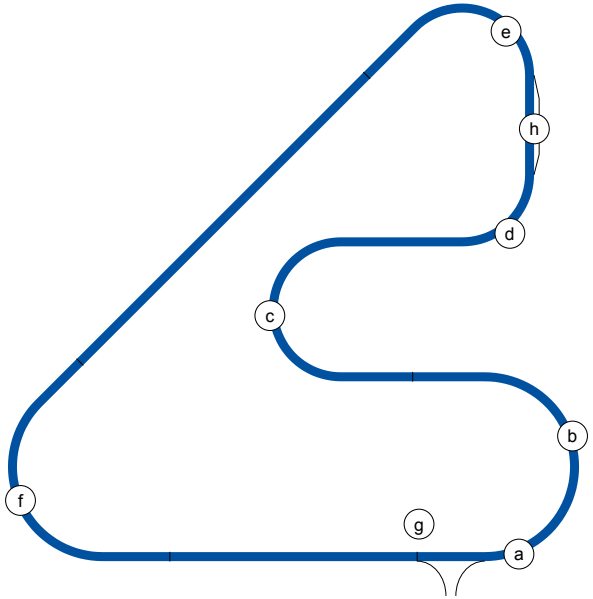


16. Belgian Pavé

Fast evaluation of NVH, durability and vehicle structures using an industry-standard surface.

- One way facility
- 1.45km of engineered block paving
- Total length of circuit 1.52km
- Pavement width 6m
- Straight section laid ‘rough’ with cross ditches and random depressions
- Bends banked and laid ‘smooth’

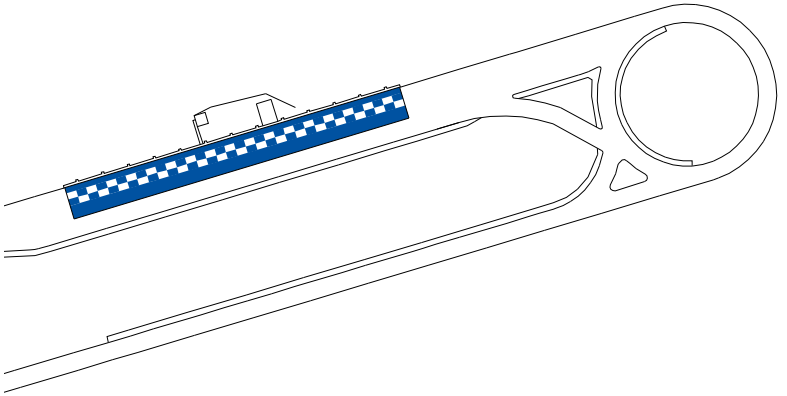
16a. Start of Belgian Pavé
16b. 61.0m radius bend, 7.5º bank
16c. 47.5m radius bend, 10º bank
16d. 47.5m radius bend, 10º bank
16e. 47.5m radius bend, 10º bank
16f. 61.0m radius bend, 7.5º bank
16g. End of Belgian Pavé. Shallow water trough for damper cooling
16h. Layby



17. ABS and Traction Control

Wet surface with split capability for the calibration and evaluation of primary safety systems.

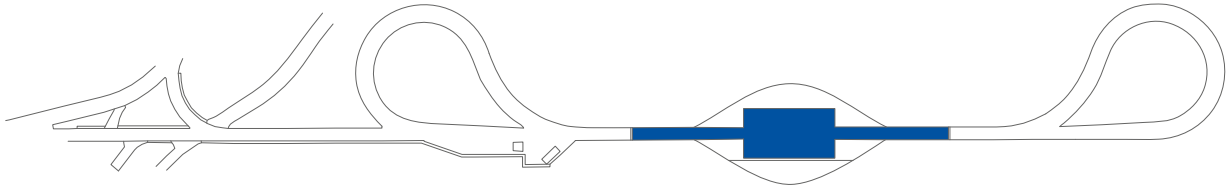
- 78m of wetted checkerboard, polished concrete and rough surface
- Total length of circuit 640m



18. Drive-by External Noise

Noise measurement to international standards.

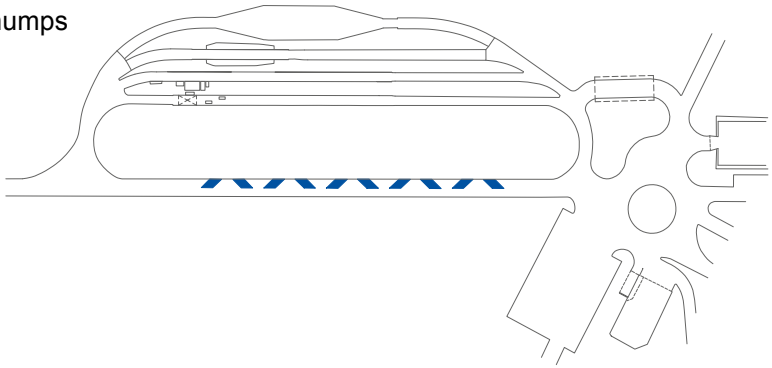
- Asphalt surface to ISO 10844:2014
- Return loops each end
- Secluded and exclusive location, with nominal ambient sound pressure levels of 36 dB(A)
- Compliant to ISO 10844:2014 Test track specifications for measuring noise emitted by road vehicles and their tyres
- Compliance includes geometric dimensions and sound absorption characteristics
- Total length of noise surface 26m



19. Twist Humps

Torsional chassis inputs for the development of vehicle structures and corrosion protection.

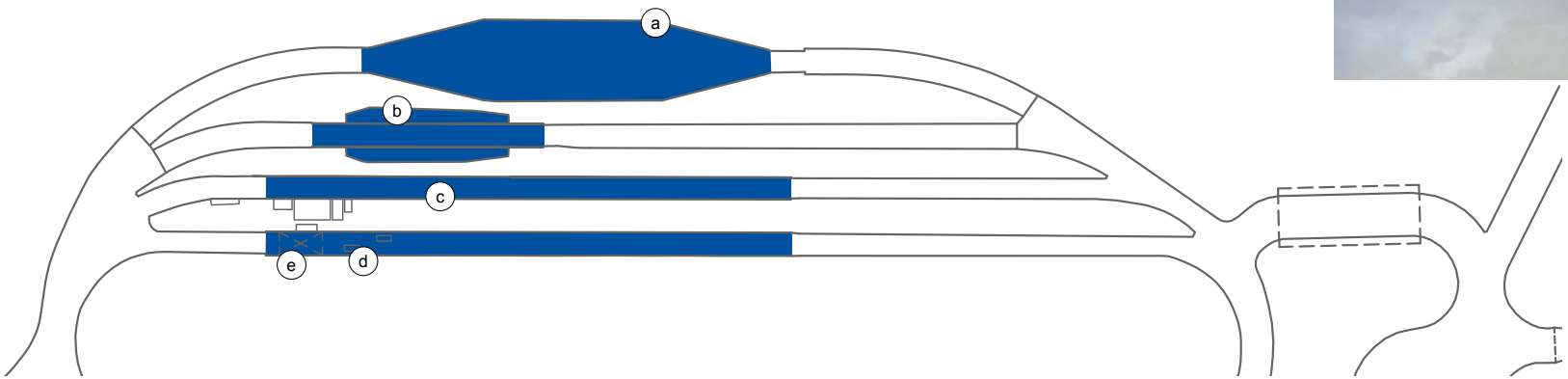
- Series of 10 handed angled humps (tarmac construction)
- Each hump 4.6m length 140mm high



20. Troughs

Shallow and deep wading performance. Accelerated evaluation of corrosion protection, carefully tailored to any world market.

- One way facility

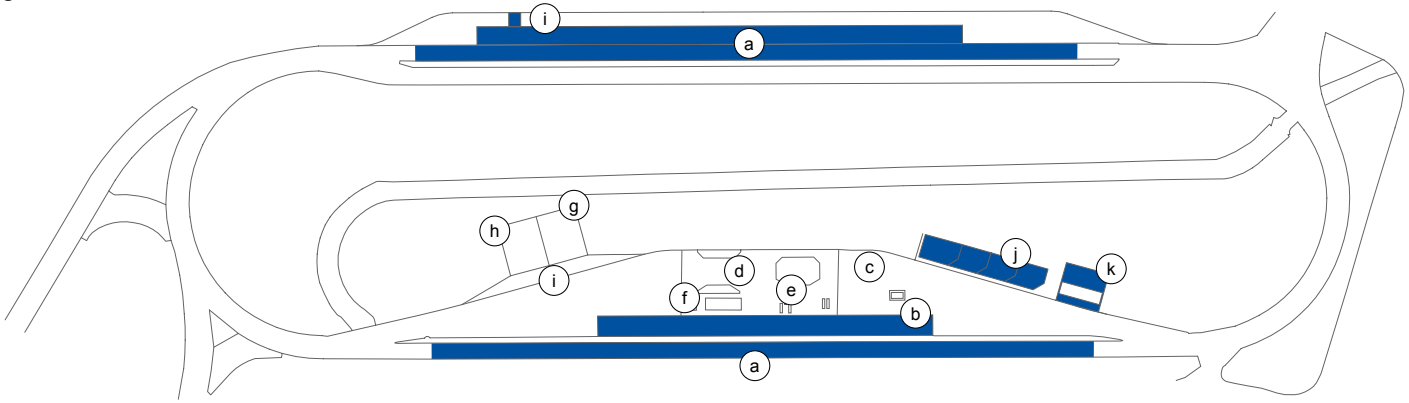


20a. Mud/wading trough. Water wading to 1m (sloping sides for inclined wade) or can be used with any mud
20b. Grit trough (with 2 offset suspension humps) 15m length
20c. Deep wade trough (up to 1.2m deep x 90m length)
20d. Salt splash trough. 6mm nominal salt solution depth (90m length x 3.6m wide)
20e. Enveloping salt spray rings

21. Rough Tracks, Kerbs and Features

Suspension and structural evaluation for large, specialist vehicles.

- Generally of tarmac construction with features in concrete
- Total length of circuit 674m



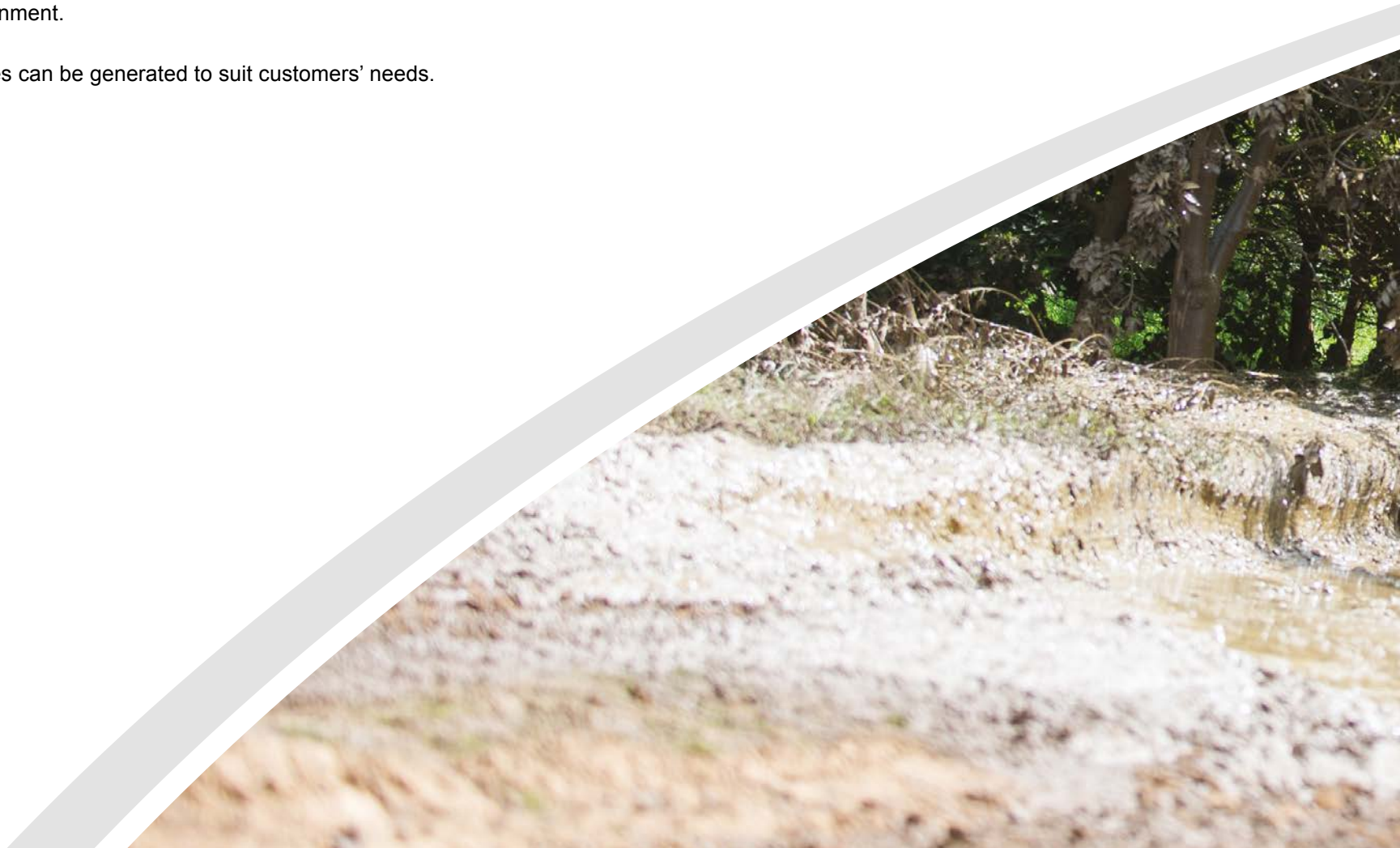
21a. Truck rough track (2 @ 167m, 230 square blocks 25/50mm projection)
21b. Military setts (73m, 230mm x 1220mm blocks projecting 50mm)
21c. Maximum pothole
21d. Kerbs (100mm, 30º, 45º and 90º)
21e. Anchor plates for kerbs/abuse
21f. Anchor plates/pits for kerbs/abuse
21g. 150mm kerb
21h. 100mm kerb
21i. Potholes (100mm and 120mm)
21j. Concrete Steps – Calibrated 90º steps: 7.5m x 0.35m, 0.5m, 0.75m, 1.0m
21k. Gap Crossing – Variable gap ditch crossing: 1.0m – 3.0m in 0.2m steps

Off-Road Tracks and Features

Set in 100 acres of hilly countryside, the Millbrook off-road tracks provide a comprehensive range of terrains for every type of vehicle from soft-roaders to full high-mobility military-specification vehicles.

A range of man-made obstacles, such as axle articulation humps and the sand pit area perfectly compliment the natural terrain of long challenging hills through to tight twisty tracks, recreating every type of environment.

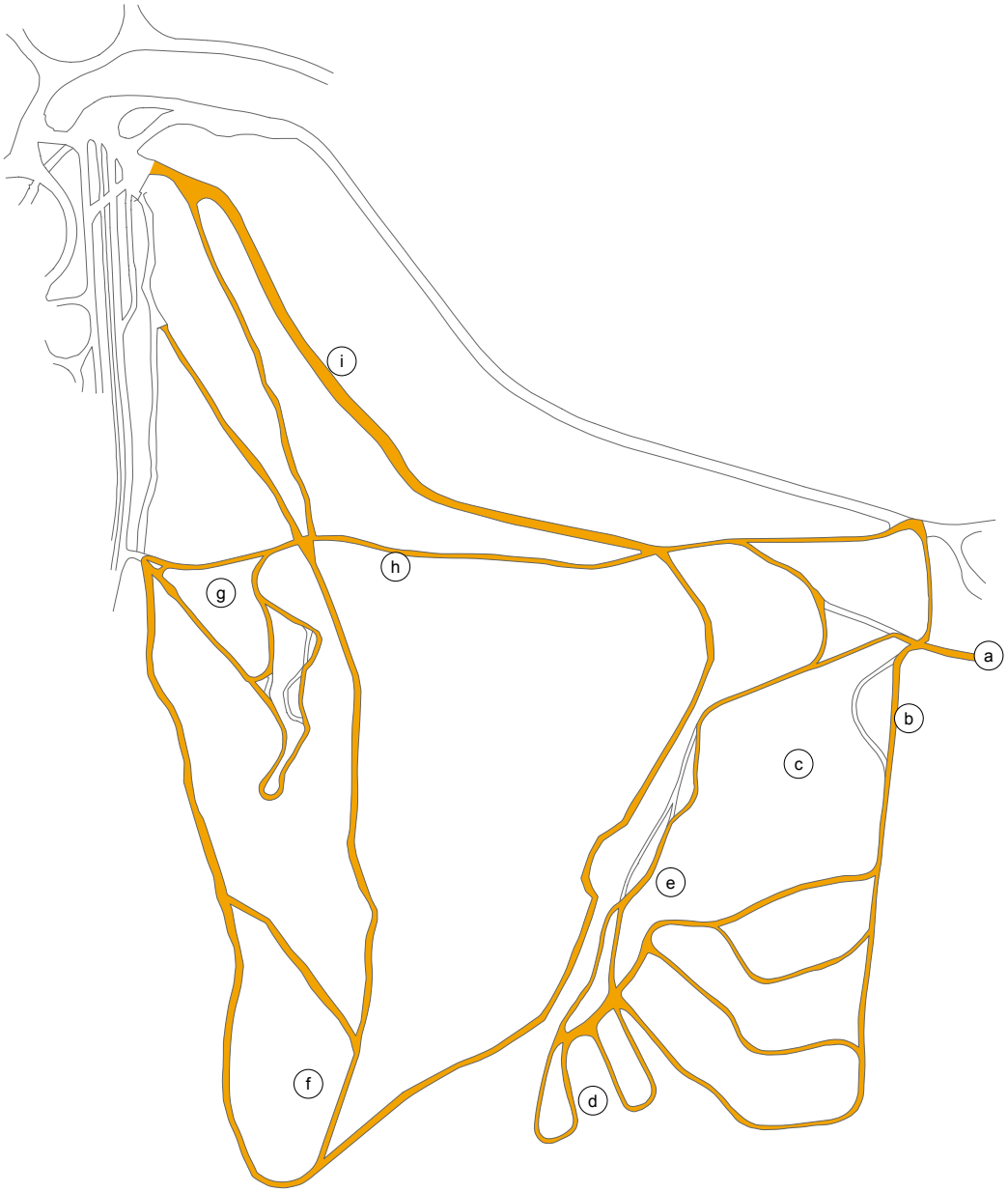
Particular surfaces and features can be generated to suit customers' needs.



22. Off-Road and Severe Off-Road

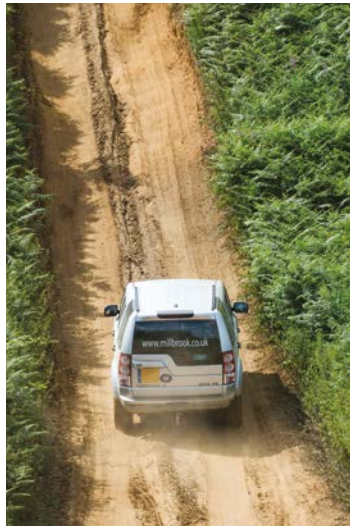
A unique facility for the evaluation of powertrains, transmissions, dynamics, braking and active systems.

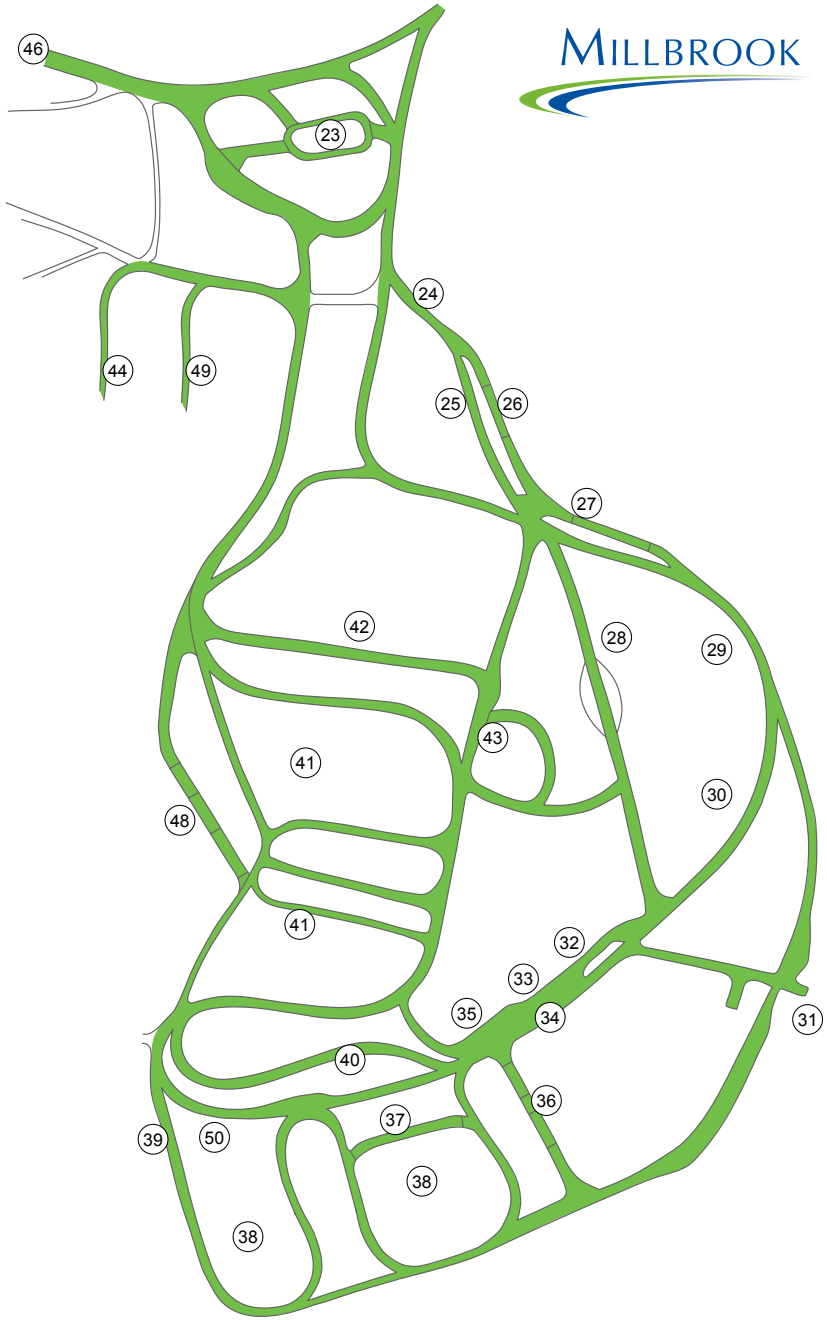
22a. Facility entrance
22b. Offset Sinusoidals
22c. Sand Pit
22d. Horse Shoes
22e. Dragon's Back
22f. Heydon Hill
22g. Severe Off-Road
24h. Jungle Trail
22i. Sand Road



Off-Road Technical Features

23. Wading Pond
24. Semi-Axle Bumps
25. Axle Bumps
26. Severe Vehicle Twist
27. Rock Run
28. Wading Trough
29. Concrete Ditches
30. Concrete Kerbs
31. Ditch Run
32. Mortar Holes
33. Log Roll
34. Log Run
35. Steps
36. One in One (45º)
37. 25º Traverse
38. Gravel Hills
39. 35% Gravel Hill and 155º Breakover
40. Snake Climb
41. Sand Hills
42. Deep Ditches
43. Twist Climb
44. Offset Sinusoidals
45. Structural Test Features (see main map)
46. Berm Road
47. Gravel Road (see main map)
48. 60% Hill (Concrete) Slope
49. Severe Articulation/ Hummer Hollows
50. Recovery Vehicle Winch Anchors
51. Gravel Pits (see main map)

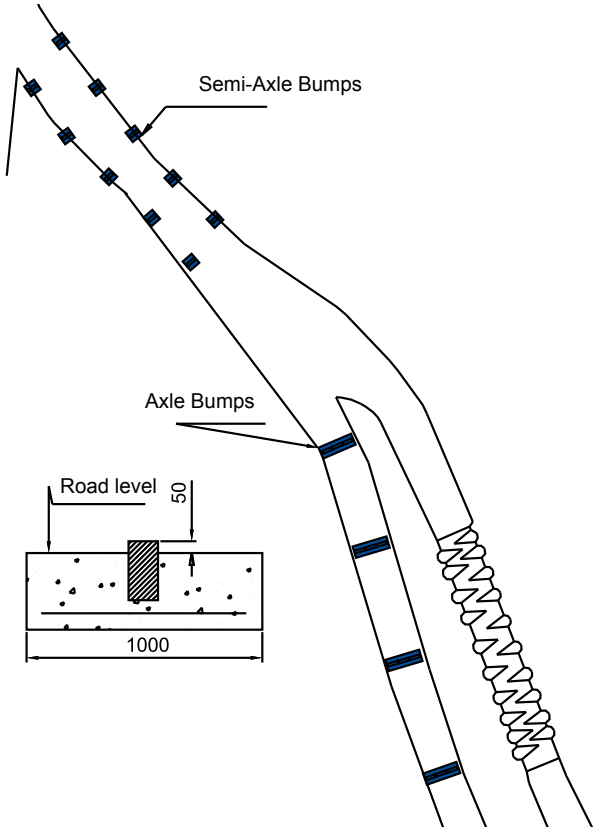




23. Wading Pond

A substantial facility for understanding in-water performance.

- Length 26m at depth
- Width 8m at depth
- Maximum depth 0.75m
- Variable depth
- Two entrances



24. Semi-Axle Bumps

Road ridges for the evaluation of suspension refinement and durability across either or both vehicle sides.

- 5 LH and 5 RH concrete bumps
- 50mm high x 125mm projection
- Hardcore road

25. Axle Bumps

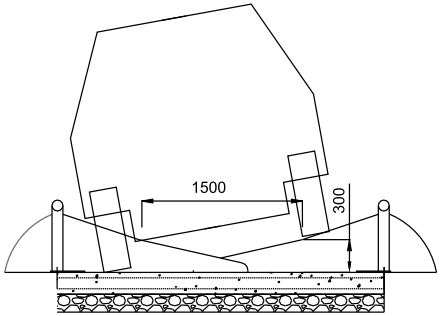
Road ridges for the evaluation of suspension refinement and durability across both vehicle sides.

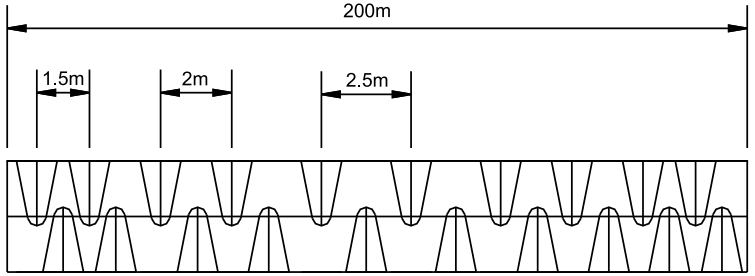
- 4 full width 3m bumps
- 50mm high x 125mm projection
- Hardcore road

26. Severe Vehicle Twist

Repeatable structural twist and high suspension articulation for vehicles with extreme terrain capability.

- Series of twists for improved medium mobility vehicles at variable centres
- Centre drives for 300mm clearance/twist
- Edge drives for 500mm clearance/twist

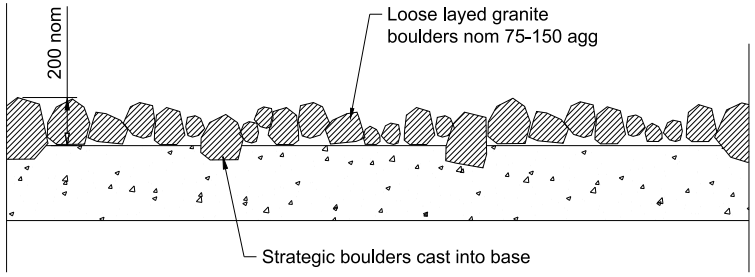




27. Rock Run

A surface similar to dry river beds.

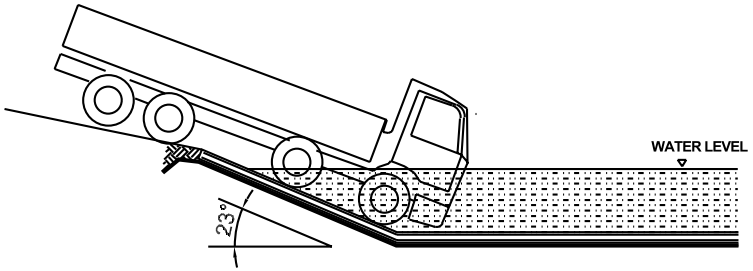
- Granite boulders, some set into concrete base
- Length 45m
- Width 3.5m



28. Wading Trough

Amphibious vehicle landing simulation with variable depth.

- Landing craft simulation
- Length 20.5m at depth
- Width 4m
- Maximum depth 1.5m
- 23º approach angle



29. Concrete Ditches

Repeatable simulation of extreme damaged surfaces, ideal for providing severe suspension inputs.

- Tapered profile
- Ditch length 7m
- Profile width (1m – 1.85m)
- Profile depth (290mm – 550mm)

30. Concrete Kerbs

- Height 150mm
- Trapesoidal profile 900mm base and 350mm apex x 150mm high
- 14m long (variable angle approach)

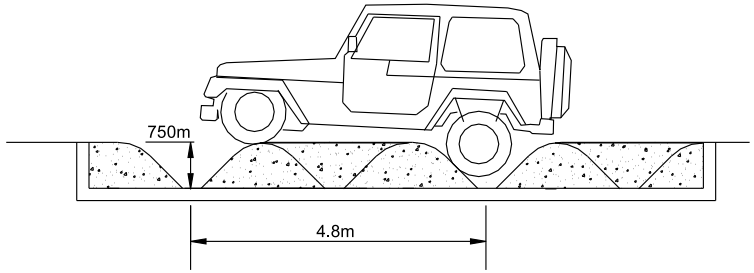
31. Ditch Run

Evaluating forest track capability for off-road vehicles of all sizes.

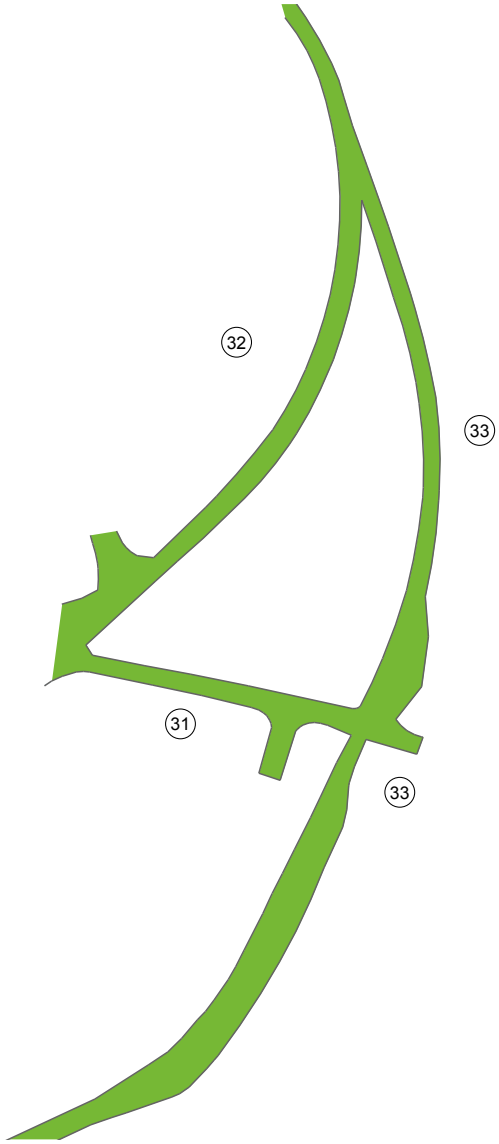
- 2 sets of random ditches
- By-pass road to each set
- Ditch spacing variable (7.5m – 20m)
- Ditch depth variable (0.4m – 0.7m)

32. Ditch Run

Repeatable simulation of extreme battlefield surfaces.



- 4 cross phased concrete holes
- Depth 750mm (can be reduced)
- Pitch 4.8m
- 1.9m phasing
- Sides nominally 45º



33. Log Roll

Evaluating specialist all-terrain capability across one of the most challenging surfaces.

- Series of loose logs
- Log diameter 200mm – 300mm
- Length 7m x 4.5m

34. Log Run

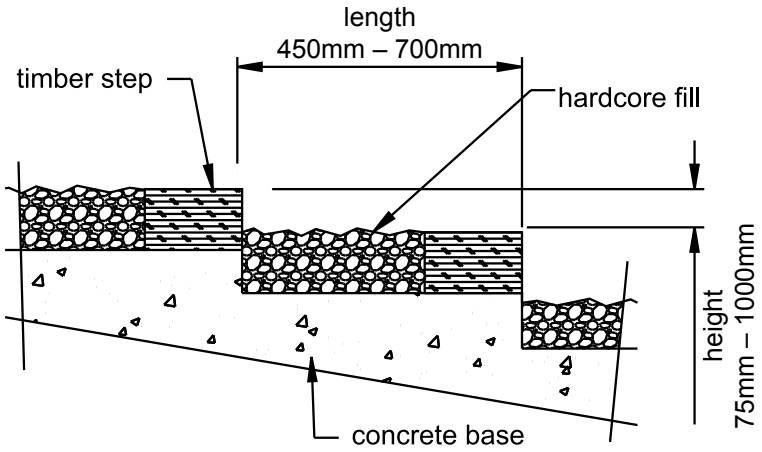
Repeatable low frequency inputs.

- Asynchronous undulating log surface
- Length 18m
- Maximum width 4m
- Amplitude approximately 350mm

35. Steps

Repeatable low frequency durability.

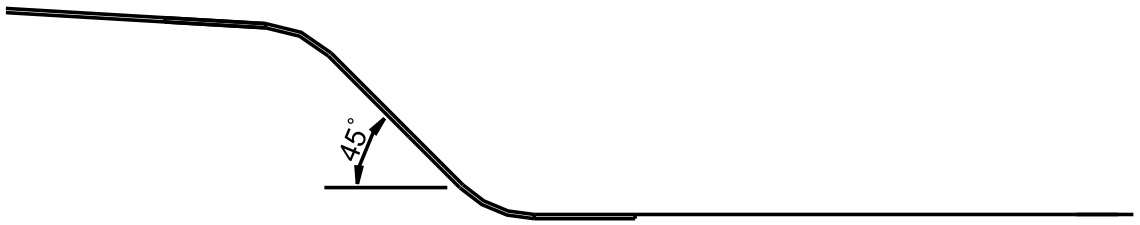
- Series of random steps
- Timber noses and loose surfaces
- Length 11m
- Width 2.5m



36. One in One

The ultimate hill for capability evaluation and demonstration.

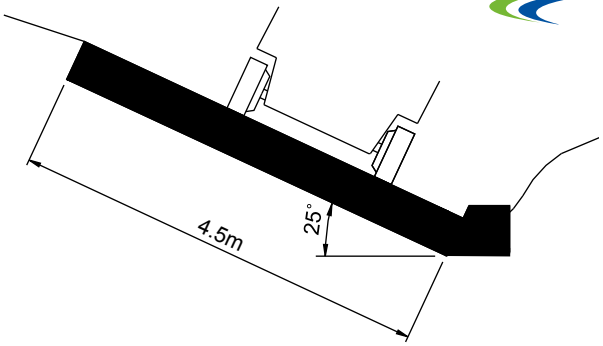
- 45º concrete slope
- Length at gradient 9.75m
- Width 3.5m

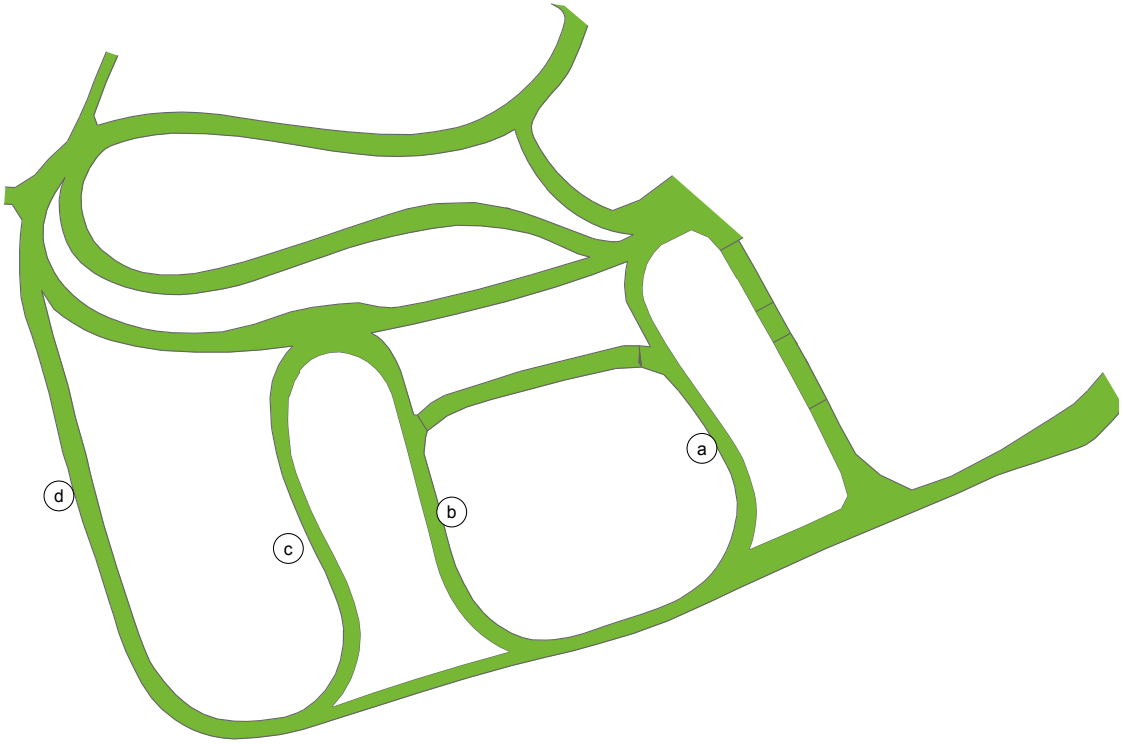


37. 25º Traverse

Tilt performance evaluation with side mounds to prevent roll-over.

- Concrete construction
- Length on slope 36m
- Width 4.5m
- Safety bank at base





38. Gravel Hills

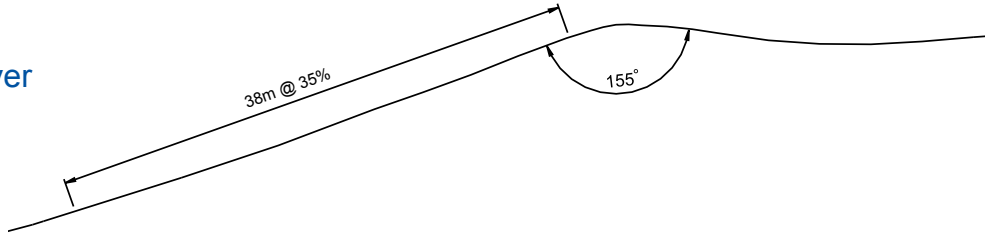
Repeatable hill performance evaluation facility of significant length, simulating gravel-based terrains.

38a. 29% gradient
38b. 26% gradient
38c. 30% gradient
38d. 35% gradient (see also 39)

39. 35% Gravel Hill and 155º Breakover

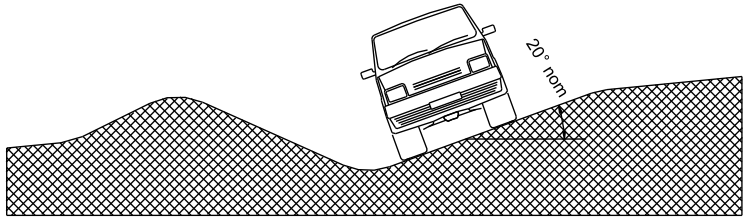
Medium mobility breakover

- 38m up slope @ 35%



40. Snake Climb

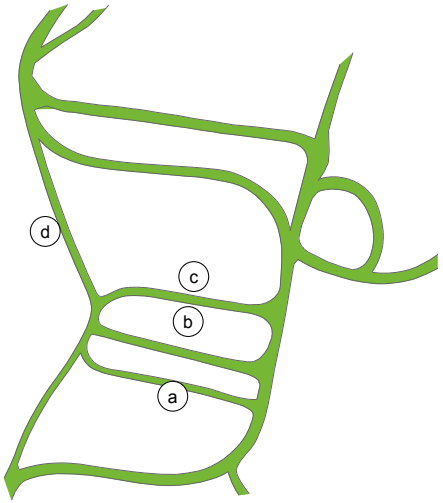
- Nominal 17% climb
- 100m of twisting loose surface
- Normal 20º cross slopes LH and RH
- Lower LH bend built as gulley
- Lower bend slopes both sides



41. Sand Hills

Repeatable hill performance evaluation facility of significant length, simulating sand-based terrains.

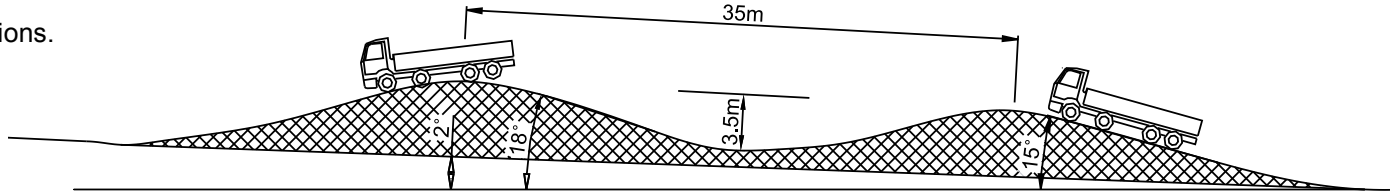
41a. 37% silt/soil
41b. 34% sand
41c. 33% sand on natural gravel foundation
41d. 30% sand hill



42. Deep Ditches

Capability evaluation feature for mud track operations.

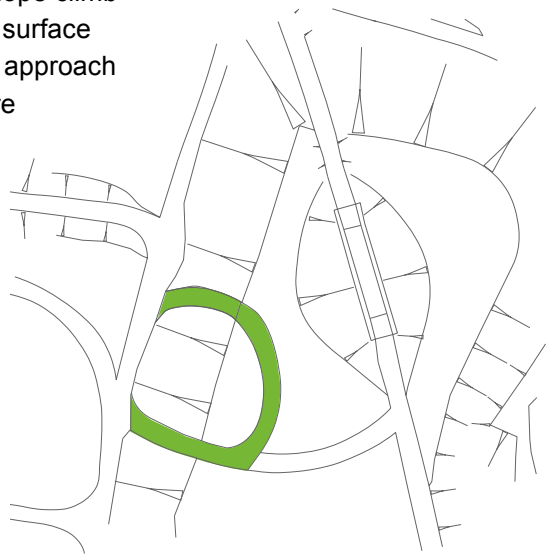
- Series of 3 large ditches
- Sand/silt surface
- Maximum ditch depth 3.5m



43. Twist Climb

Capability evaluation and whole-vehicle testing during one of the most challenging conditions for high mobility vehicles.

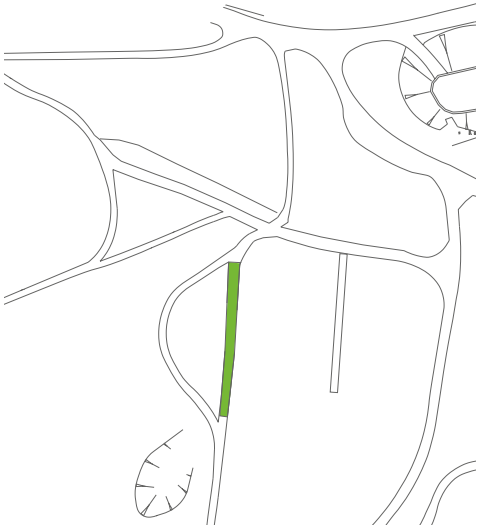
- Short slide slope climb
- Clay and silt surface
- Vehicle twist approach and departure



44. Offset Sinusoidals

A series of offset humps designed to induce maximum axle articulation for small and medium sized off-road vehicles.

- Nominal 3m centres
- Nominal 0.4m depth



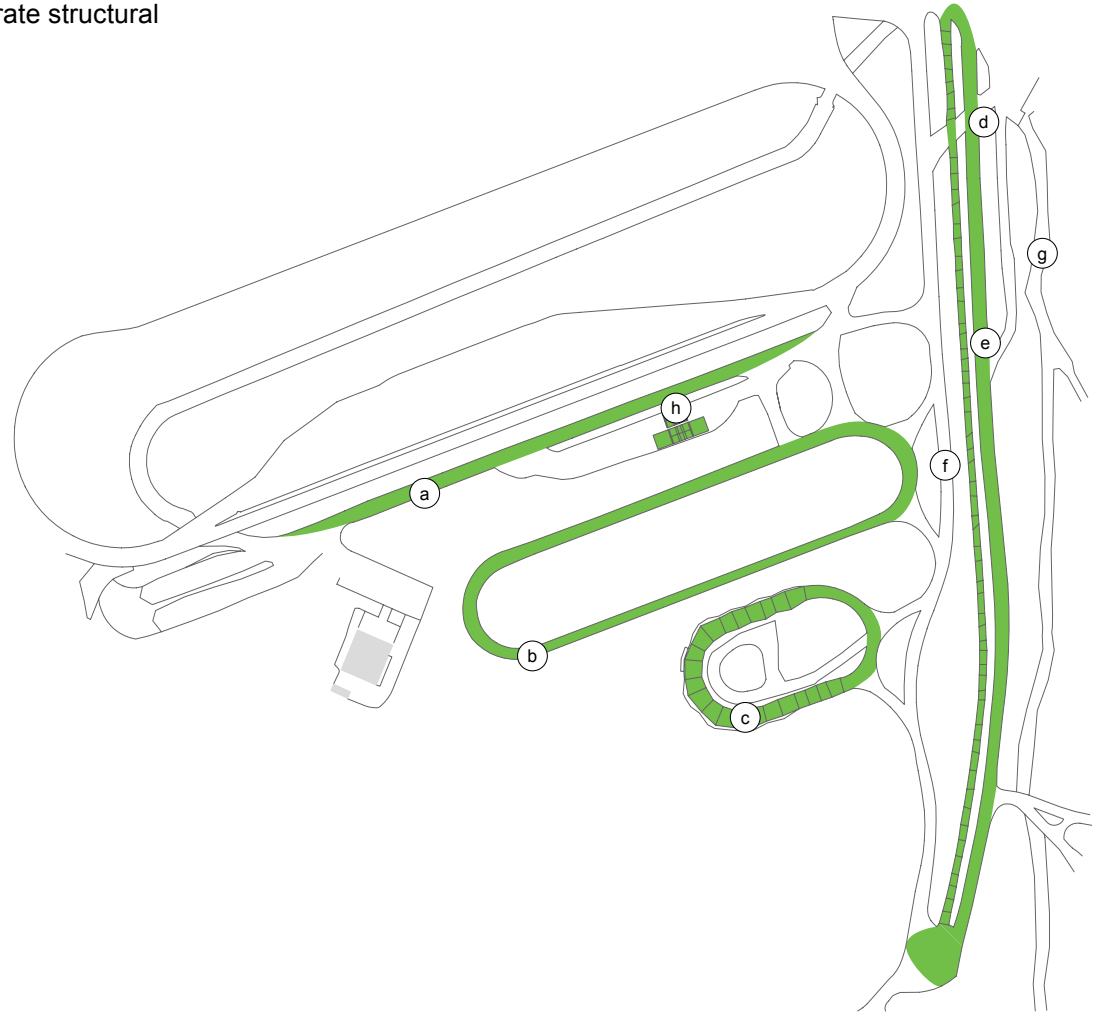
45. Structural Test Features

Consistent, engineered features to challenge all-terrain capability and accelerate structural testing for extreme conditions.

45a. Reversing road – 190m long compacted and blinded stone

45b. Intermediate twist ditches – 23 engineered opposed 45º concrete ditches in unmade road (316m circuit, 108m ditches)

45c. Water holes – 11 nominally sinusoidal ditch profiles with water in base (135m circuit, nominal depth 355mm)



45d. South trail (275m long x 4.5m nominal unpaved road)
45e. Ripple road (275m long series of nominally sinusoidal section humps and ditches in unmade road)
45f. North trail (275m long x 4.5m nominal unpaved road)
45g. Maximum twist ditches
45h. Articulation gauges

46. Berm Road

Highly aggressive road surface popular in many markets, ideal for accelerated testing of suspension, structures, corrosion, refinement and whole-vehicle durability.

- Two way loose surfaced road
- 750m of 6m nominal width

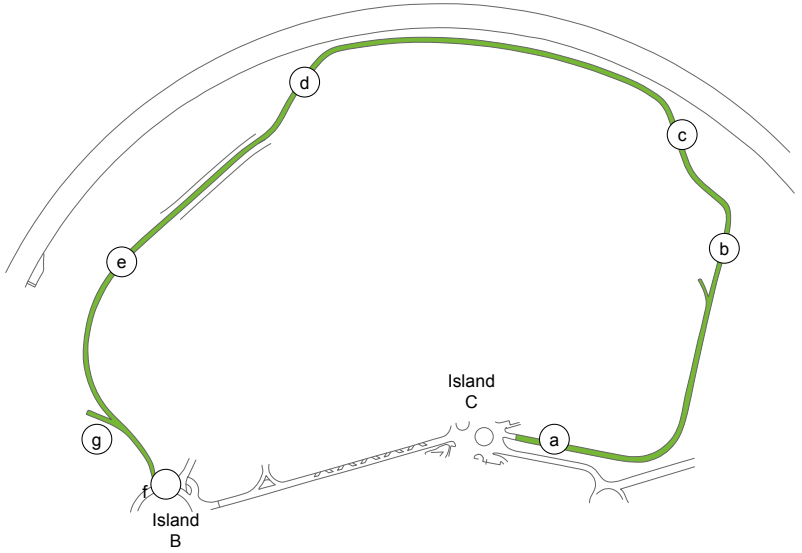
46a. Turn around
46b. Steady incline (178m @ 9.1%)
46c. Turn around

47. Gravel Road

Graded surface simulating one of the world's most common and aggressive road types.

- One way facility
- Loose unsurfaced road, dressed with gravel
- Total length of circuit 1.54 km
- 4.5m minimum width

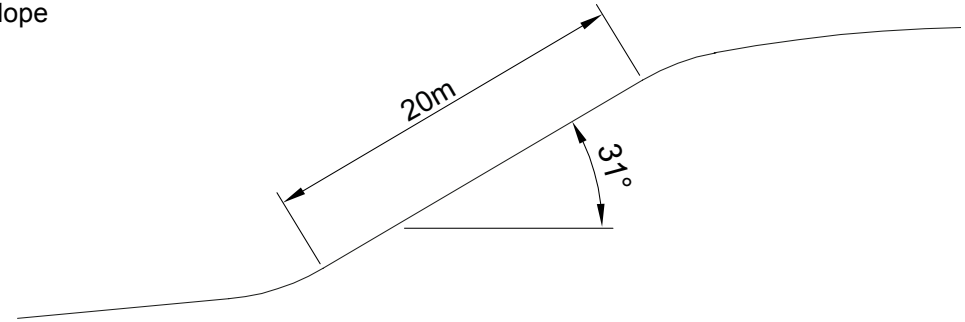
47a. Start of circuit
47b. 21% up
47c. 21% down
47d. 15% up
47e. 15% down
47f. End of gravel road
47g. Reversing Hill

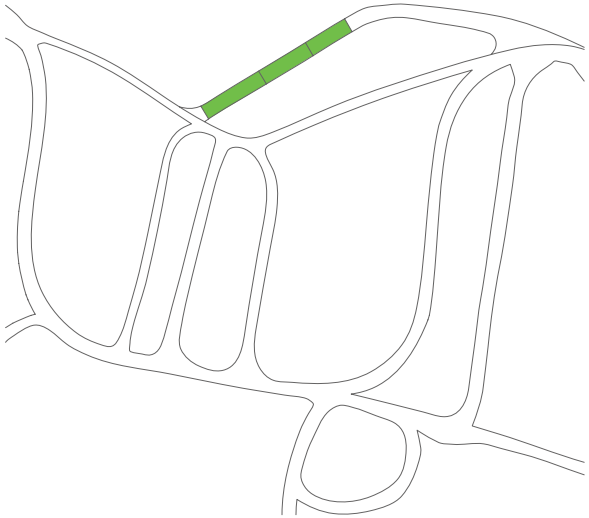


48. 60% Hill Slope

A calibrated concrete slope used for gradeability, mobility and hill hold brake tests.

- 31 degree slope
- 4.5m wide

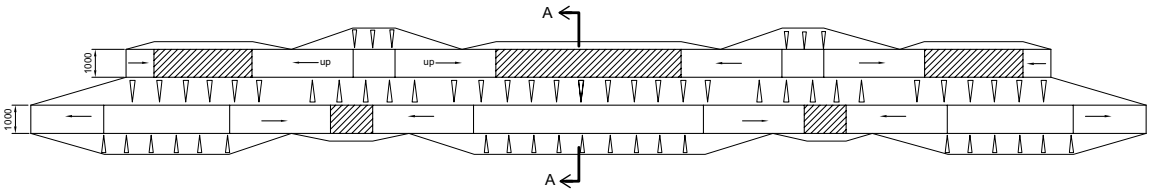


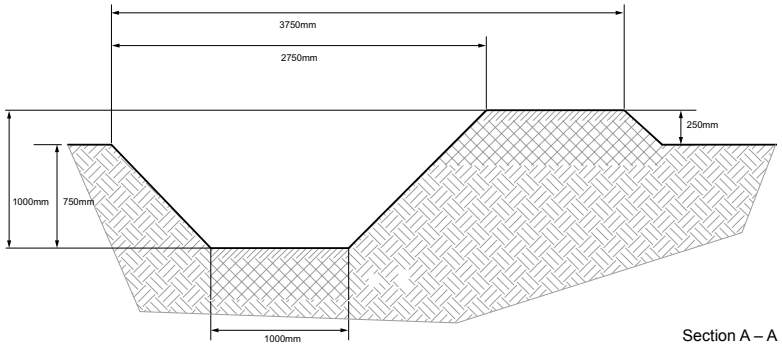


49. Severe Articulation/Hummer Hollows

Offset articulation ditches of varying pitch.

- 40m in length
- Maximum 1m deep





Section A – A

50. Recovery Vehicle Winch Anchor Points

Anchor points to support the deployment of a winch recovery truck on an off-road slope.

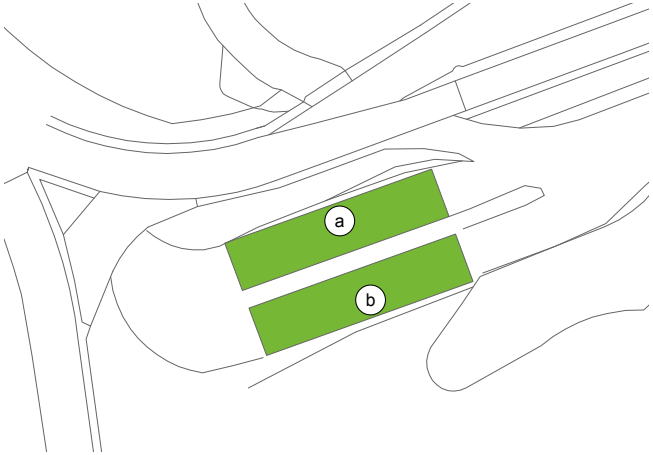
- 2 ground screw foundations to support feet of winch truck
- Capable of 35 tonne loads per shackle
- Capable of 50 tonne load on both

51. Gravel Pits

Two large pits filled with gravel used to test the tractability of vehicles.

51a. 28mm gravel
51b. 10mm gravel

- Gravel size can be changed



Customisable Features

Working with Millbrook provides access to some of the best commercially available test facilities and expertise anywhere in the World.

Most of the existing features are designed to offer a high level of flexibility and Millbrook has experience of building new features specifically for individual customer projects. Please contact Millbrook to discuss particular requirements.

Track Permits

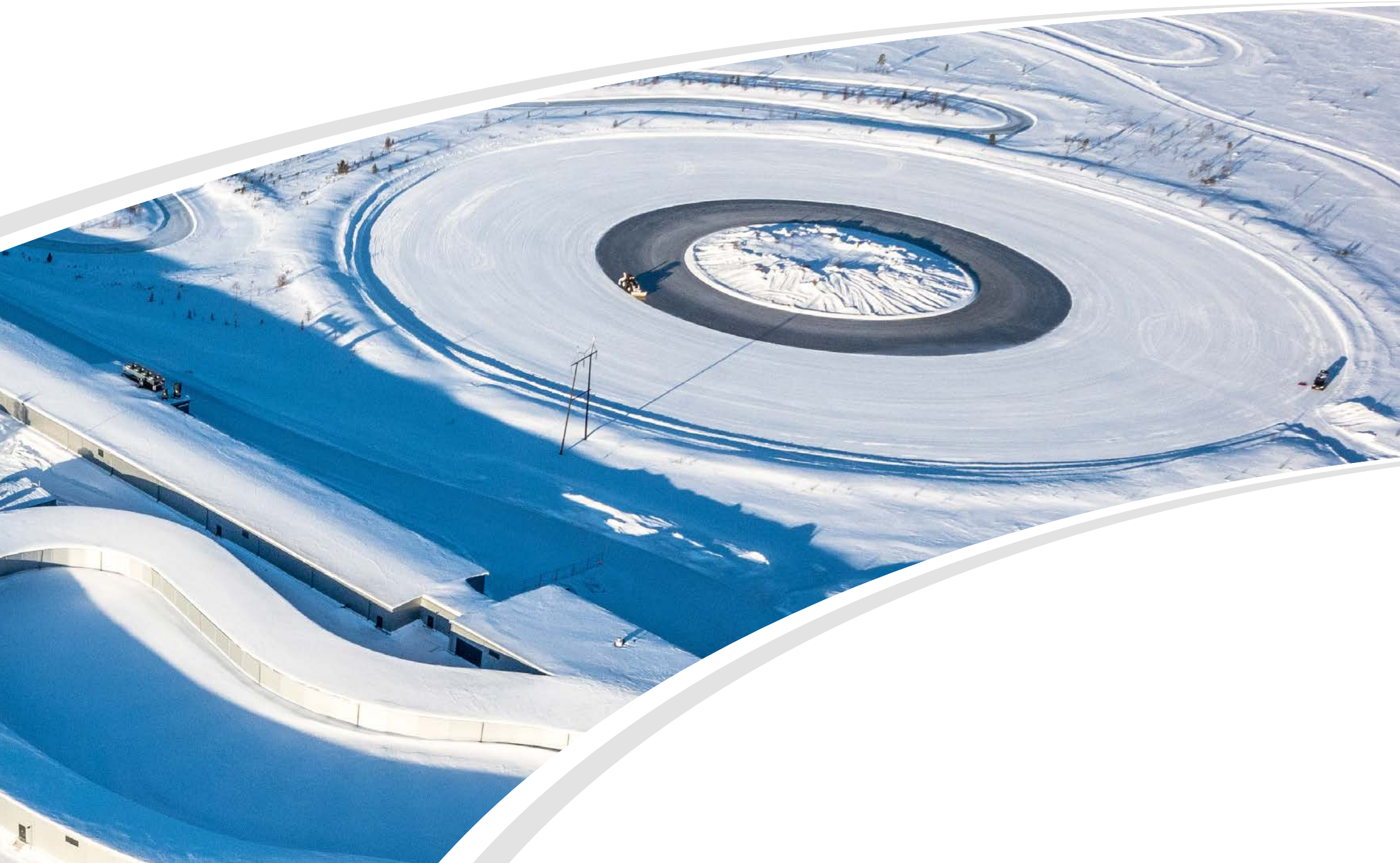
Drivers at Millbrook require a valid Track Permit or Access Road Permit as applicable. To obtain a permit please contact Track Control:

Telephone: +44 1525 408 228
Email: tracks@millbrook.co.uk

Test World

Millbrook's winter test facility, Test World, is based in Northern Finland and specialises in vehicle and tyre testing in winter conditions. It has extensive snow and ice tracks and the world's first indoor winter test facilities, making testing on natural snow available twelve months of the year.

TEST WORLD
A MILLBROOK GROUP COMPANY



Year-Round Winter Testing

The World's most innovative solutions for year-round testing of vehicles and tyres in winter conditions.

Indoor facilities enable testing in winter conditions on natural snow and ice. The surfaces are carefully managed to give excellent test results. From spring 2018 three new indoor areas will be available. They will increase the capacity for testing on natural snow and ice and introduce wet and dry braking, aquaplaning and split friction surfaces. The adjustable temperature and humidity will give an advantage to development, certification and labelling testing by allowing greater environmental control.

Testing on snow and ice

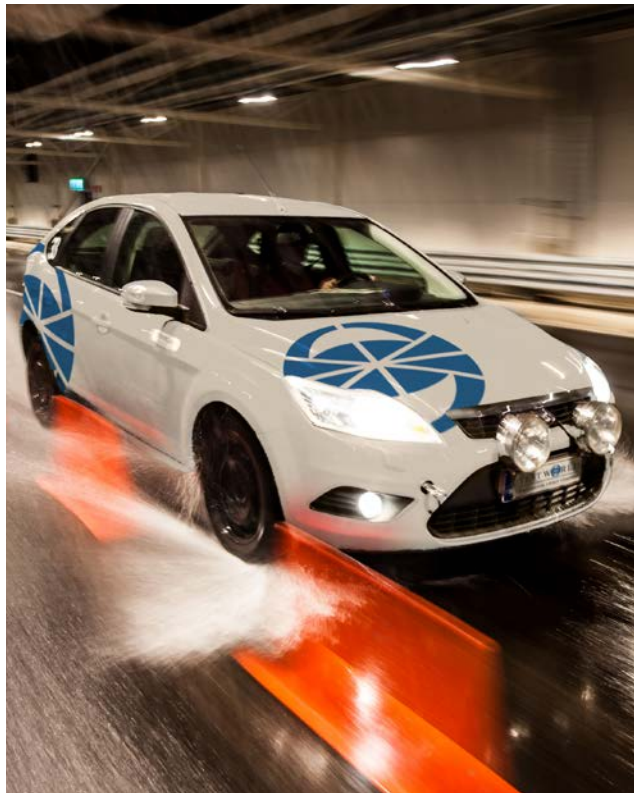
For subjective testing, Test World offers a closed-circuit snow handling track measuring 350m x 9m. For objective acceleration and braking work, it offers a snow and ice platform measuring 160m x 16m.

Test World is extending the existing indoor snow and ice platform and adding a second area, giving a maximum combined length of 410m. This will be sufficient to test the largest tyres (C3) used on trucks and buses, as well as to test brakes on passenger cars at higher speeds than possible in the existing facility.

Wet and dry braking, aquaplaning and split friction

Two asphalted facilities are being added alongside the snow and ice platforms for performing wet and dry braking and aquaplaning tests, as well as testing traction on split friction surfaces. They will be operated separately or together with a combined length of 410m.

Once construction is finished, the site will provide the majority of objective tests required by tyre manufacturers on one site, year-round.




Indoor 2
Indoor 5
Indoor 1
Customer Area 2
Indoor 4
Indoor 3
Customer Area 1
Indoor 4
Indoor 5
Indoor 3
Indoor 1
Indoor 2

Mellatracks Proving Ground

Mellatracks Proving Ground is Test World's main 1,100 hectare site providing a variety of tracks close to workshops and other facilities.

The proving ground is laid out to provide each visiting team with its own garage and set of handling tracks, so maximising test efficiency and confidentiality.

Test World's team prepares the snow and ice tracks to test anything from the smallest tyres to the largest on-highway vehicles.

Handling Tracks

4.	Ice Handling	1000 × 6m
5.	Ice Handling	700 × 6m
9.	Snow Handling	1200 × 6m
21.	Snow Handling	1200 × 6m
22.	Snow Handling	800 × 6m
27.	Snow Handling	1200 × 6m
31.	Snow Uphill	900 × 6m
32.	Snow Uphill	950 × 6m
43.	Snow Handling	1300 × 6m
44.	Snow Handling	1300 × 6m
45.	Snow Handling	1400 × 6m

Flat Tracks

1A.	Snow Flat	500 × 50m
1B.	Snow Flat	500 × 50m
1C.	Ice Flat	500 × 35m
2A.	Snow Flat	500 × 50m
2B.	Snow Flat	500 × 50m
23.	Snow Flat	400 × 40m
24.	Ice Flat	420 × 20m
41.	Ice Flat	420 × 20m
42.	Snow Flat	350 × 40m

Customer Specific Areas

51 – 54

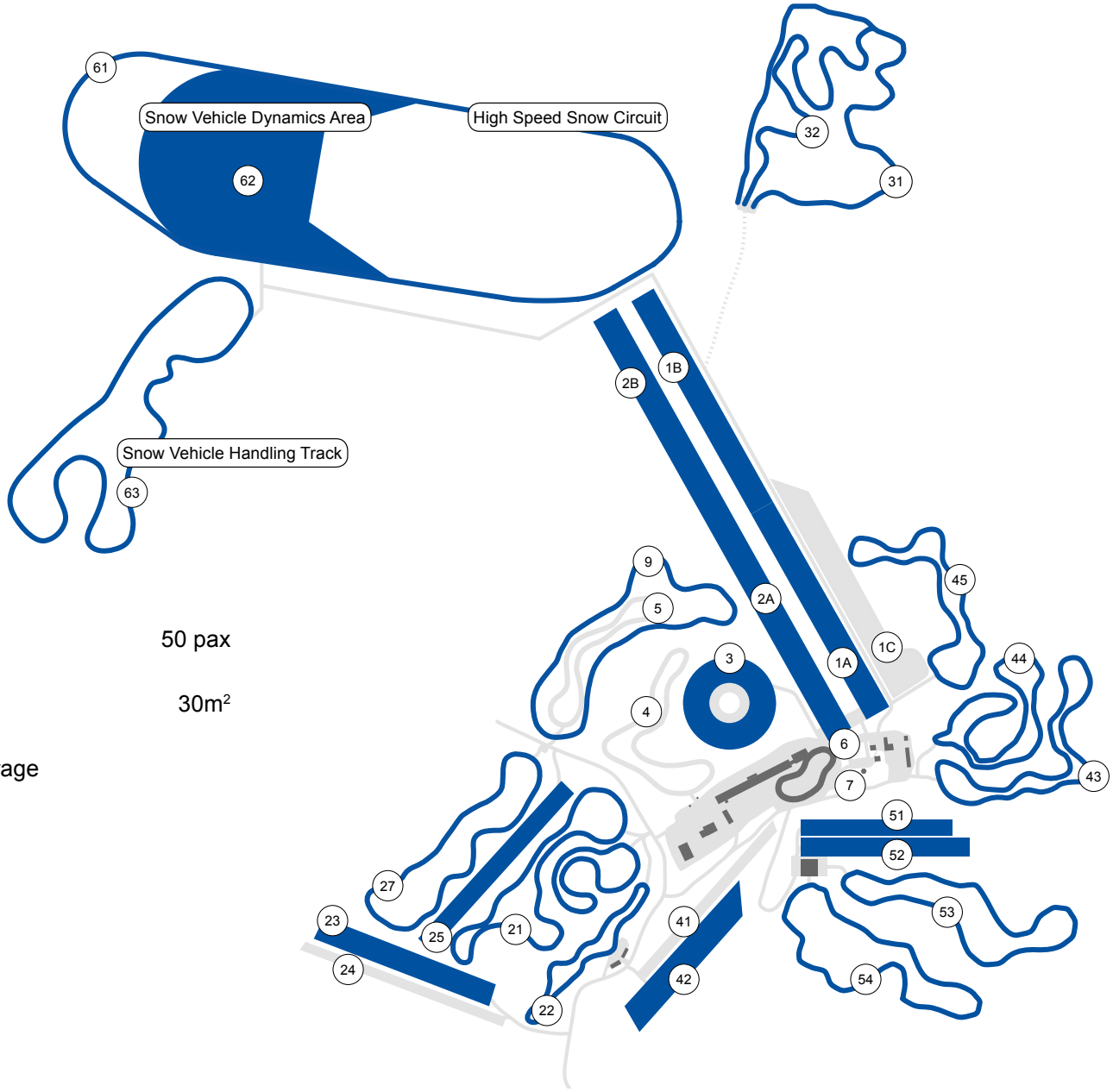
Other Tracks

3. Ice and Snow Circle	Ø 50–200m
6. Hill Climb	10°
7. Snowhill	25°
25. Snow Storage for Indoors	
61. High Speed Snow Circuit	3120 × 12m
62. Snow Vehicle Dynamics Area	380 × 380m
63. Snow Vehicle Handling Track	1830 × 10m

Other Facilities

Garage 1	240m²
Garage 2	110m²
Garage 3	63m²
Garage 4A	215m²
Garage 4B	38m²
Garage 4C	95m²
Garage Indoor 1	83m²
Garage Indoor 2	106m²
Indoor 1	3000m²
Indoor 2	5000m²
Office Indoor 2	44m²
Office 1	80m²
Office 2	30m²
Office 3	35m²
Office 4	48m²

Mellakka	
Restaurant	50 pax
Storage,	
Cold Chamber	30m²
Fuel	
Test World Garage	
Maintenance	



Airport Proving Ground

The Airport Proving Ground is conveniently situated in Ivalo and can be hired exclusively or accommodate up to three teams.

The site has the longest available outdoor season, with the tracks often open from October to late April.

Handling Tracks

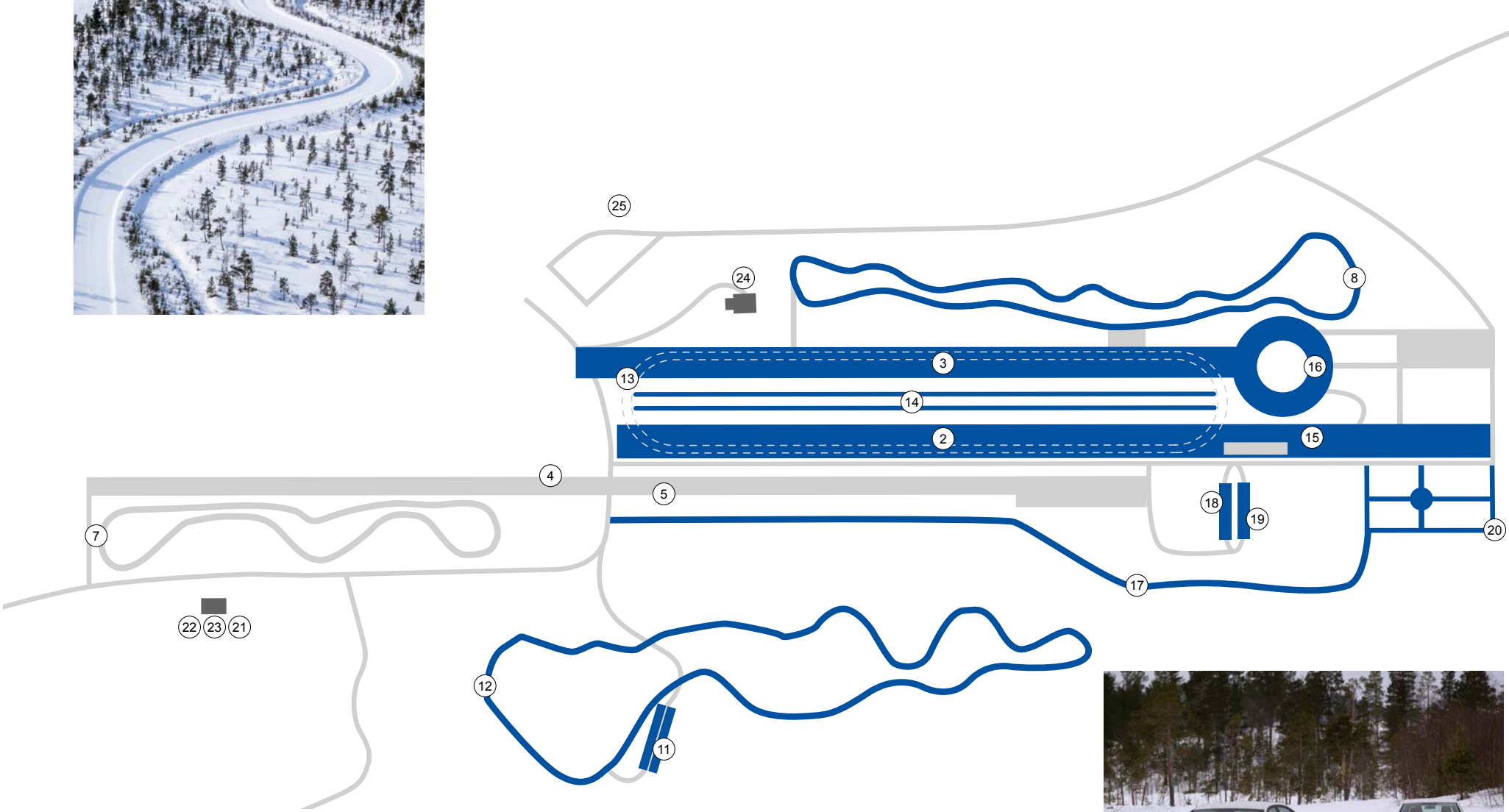
7. Ice Handling	1100 × 6m
8. Snow Handling	1400 × 6m
12. Snow Handling	1600 × 8m

Flat Tracks

2. Snow Flat	900 × 40m
3. Snow Flat	700 × 30m
4. Ice Flat	500 × 12m
5. Ice Flat	500 × 20m

Other Facilities

11. Split Friction Slope	40m, 14°
13. Oval Track	1400m
14. Soft Snow Tracks	600 × 6m
15. Split Friction Track	150m
16. Ice and Snow Circle	Ø 50–80m
17. Comfort Road	700 × 6m
18. Hill Slope	20m, 7°
19. Hill Slope	20m, 5°
20. City Block	
21. Garage A	100m^2
22. Garage B	66m^2
23. Unheated Garage C	150m^2
24. Garage 2	200m^2
25. Fuel Station	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In all emergencies, dial 454 (01525 408 454 from an external telephone) which is the internal emergency response call-out telephone number. This is only to be used in emergency situations.

No type of image recording device – including mobile phones with cameras – may be used in any area of the proving ground unless prior authorisation has been given.

Millbrook Group
Millbrook, Bedford, MK45 2JQ, UK
+44 1525 404 242
info@millbrook.co.uk

www.millbrook.co.uk