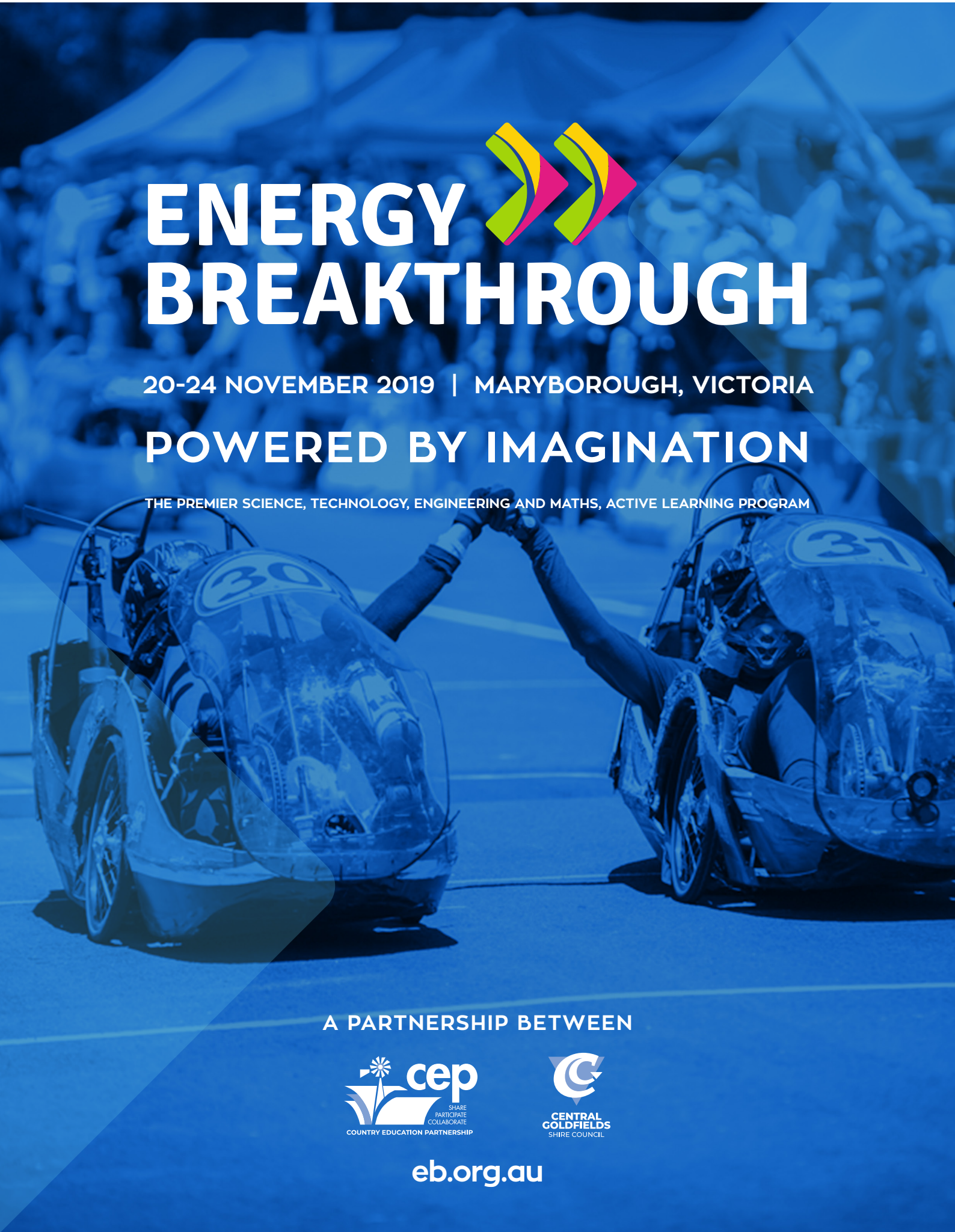
2019 SCHOOL'S HANDBOOK
PART B: INNOVATIONS



ENERGY BREAKTHROUGH

20-24 NOVEMBER 2019 | MARYBOROUGH, VICTORIA

POWERED BY IMAGINATION

THE PREMIER SCIENCE, TECHNOLOGY, ENGINEERING AND MATHS, ACTIVE LEARNING PROGRAM

A PARTNERSHIP BETWEEN

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CENTRAL GOLDFIELDS
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INNOVATIONS IN TECHNOLOGY

Proudly supported by Central Highlands Water

Version 2019.01

Introduction

- These specifications cover the Innovation In Technology category.
- Any significant changes from previous editions been highlighted and underlined in blue.
- **Key specifications that the Organisers wish to bring to the attention of Team Managers have been highlighted in bold.**
- If changes are made to these specifications prior to the event, Team Managers will be notified via email and a new edition will be published on the website.
- The Energy Breakthrough Organisers have the final authority to decide if any craft or team participates in the event, based on safety and their interpretation of the following rules.
- All enquiries regarding these specifications should be emailed to enquiries@eb.org.au

1 OVERVIEW

The Innovations In Technology category has been proudly supported by Central Highlands Water for over a decade. It provides a unique but accessible challenge for students of all ages to engage with a one day activity in Maryborough during the Energy Breakthrough.

The Energy Breakthrough presents a unique opportunity for students to extend their learning experience beyond the boundaries of formal education. The following regulations have been framed so that the efforts and experiences of all participants are maximised, to be bound only by the constraints of safety and the spirit of healthy, but friendly competition.

In 2019, there will be three types of challenges in the Innovations In Technology category:

- Crafty Design
- Moving Water
- Junkyard Challenge

2 ENTRIES

2.1 Categories, Classes and Quotas

Category	Class	Quota
Innovations in Technology	Crafty Design A Crafty Design B/C	40
	Moving Water Wet-N-Wild A Moving Water Wet-N-Wild B/C	10
	Junkyard Challenge Class A Junkyard Challenge Class B	12

2.2 Team composition

- All entries are to be team entries and must consist of current school students.
- All team members must be familiar with the operation of their craft or creation, and must participate equally in the assessments at the event in Maryborough.
- Team members do not have to all come from the same school. They could be part of a scout, church, or other community group, however they must all be current school students and be covered by the group's insurance.
- Teams in the Innovations in Technology category must have:
    - a minimum of four (4) and maximum of six (6) in Crafty Design / Moving Water.
    - a team of four (4) for Junkyard Challenge.
    - at least half of whom must be female.

2.3 Category caps, changes and waitlists:

- Crafty Design has no limit with the number of entries per school while a maximum of two entries per school will be accepted in Junkyard Challenge
- Additional entries from a school will be placed on a waiting list and will be notified if accepted into the event.
- Correspondence regarding the status of entries on a waiting list will be made directly to a Team Manager only.

3 ASSESSMENT

3.1 Overview

The Energy Breakthrough Innovations in technology is unique in that all teams must compete across the two areas of assessment: Design and Construction/Display and Presentation and Trials.

All sections must be attempted, and points are awarded in the following sections:

Crafty Design/Moving Water:

Section	Points
Design & Construction and Display and Presentation	75
Performance Test	25
Total	100

Junkyard Challenge

Section	Points
Design & Construction and Display and Presentation	n/a
Performance Test	100
Total	100

It is the responsibility of each team to ensure they complete all appropriate sections.

The schedules for each of activity are outlined in this Handbook.

Further details will be provided in an Information Kit distributed in November.

3.2 Scrutineering

Crafty Design models will be checked during the Display and Presentation section for safety issues.

Junkyard Challenge designs will be observed during their construction for any safety issues.

4 CHALLENGE 1 - CRAFTY DESIGN – WORKING WITH WATER

4.1 Overview

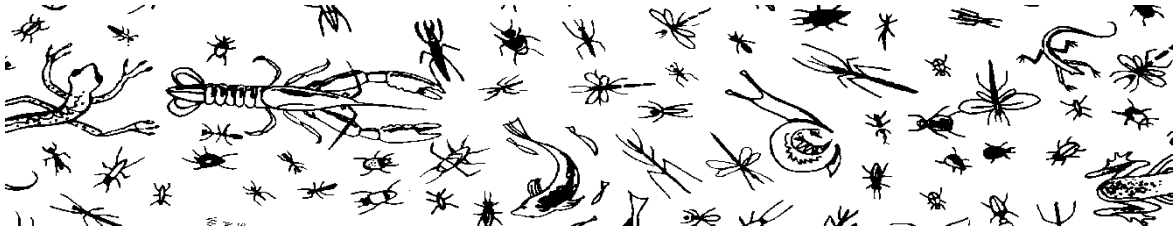
Ages: Open to Primary students in Years 3, 4, 5 & 6 (Class A) & Secondary students (Class B).

Challenge:

The challenge for Crafty Design is for the craft to travel under its own power, along a channel of 9.4 metres x 81.5 cm, carrying a reusable bottle filled with water (300 to 400ml).

Classes: Solar, Elastic or Mechanical Crafts

Compressed Gas or Compressed Air Crafts



4.2 Materials and Specifications

- Teams may use construction materials such as TEKO, LASY and LEGO, in conjunction with scrap or recycled material to create their craft.
- In 2019, students will no longer have to create a craft representing an invertebrate, but in their presentation, as well as discussing the development of their craft, they must talk about one invertebrate that lives in water.
- The craft should be stable in the water without student intervention.
- The craft must be able to run under its own power along a water channel of 9.4 metres long x 81.5 cm wide.
- Please note that the water depth of the channel is approximately 12 cm.
- Craft must complete one full length of the channel and two trials will be held.
- The craft must be able to maintain a direction within a lane, towards a designated target area on the end and must complete the course within a set time of three minutes.
- The craft's length and width must be less than 81.5 cm.
- The fuel source must be an alternative to fossil fuel.
- No dry cell batteries or capacitors are permitted to be used.
- To encourage greater innovation in design, students are encouraged to incorporate solar, elastic, compressed gas, or compressed air into their designs.

4.3 Judging Criteria:

- All information relating to assessment of Crafty Design is to be presented on a poster approximately 65cm wide x 85cm high (thick cardboard backing is recommended).
- Each team will be allocated 20 minutes in which to present and discuss their entry with the judges.

Judging will include assessments in the following areas and may be included on the poster:

Safety - including energy source; the load (reusable bottle); moving parts are shielded.

Innovative Construction - materials used; design originality and imagination; artistic form, student input, community involvement. Use of recycled material (teams should look to improving craft each year and modify). Recycling does not mean use of exactly the same model - recycling of materials is encouraged, NOT the recycling of crafts!

Planning and Testing - includes challenges and problems encountered during planning/construction; ability to identify how the model could be improved, modified, given time and appropriate materials.

Presentation – Introduction, speaking without notes, clear speech, use of diagrams, photos colour; originality; evidence of teamwork; involvement of school, community and/or industry. Highlighting environmental issues, water conservation, and use of alternate energy sources and recycling.

Model/Craft – The craft has been designed and constructed by students; potential ability to move in water; successfully negotiates two trials; craft shows detail in its construction and appearance.

Environment – How this activity relates to the aims and values of the Energy Breakthrough. Knowledge about the chosen invertebrate

4.4 Performance Test and Time Trial:

All entries are required to demonstrate their craft in operation and complete two Performance Tests per craft in the tank.

The craft will be judged:

- how it shows advancement in technology
- along with its reliability, sustainability and efficiency.
- Higher marks will be awarded for completion of the task without any assistance from the team.
- Time for the trial will be awarded scores with the fastest obtaining the highest score, the slowest the least.
- Time will be taken for the best of the two Performance Tests.

5 CHALLENGE 2 - MOVING WATER – WET'N'WILD

5.1 Overview

Ages: Open to Primary students in Years 3, 4, 5 & 6 (Class A) & Secondary students (Class B).

Challenge: Teams must create a water cycle catchment model. The main aim is to represent a typical Australian catchment. The model should show pollutants entering the stormwater system as the water moves along and down the river.

A further challenge is to move WATER from one side of a mountain to the other on your water cycle catchment model.

5.2 Materials and Specifications

In doing this the following criteria apply:

- Teams cannot drill or tunnel through the mountain.
- Hot, dry summers in the area mean that the rate of evaporation is very high.

Therefore, teams must minimise the amount of water lost along the way.

- As well as providing irrigation water, the force of the moving water is to power at least two (2) devices along the way.

Show how the problem can be solved by constructing a scale model according to the following guidelines:

- As far as possible, the power of moving water must be used. One other power source may be used, but it must be an alternative to fossil fuel.
- Is it possible to use water as the only power source?
- No more than 10 litres of water will be supplied for use in demonstrating how the model works.
- Pipes, tunnels, tubes, whirligigs, turbines, waterwheels, etc can be incorporated into the model.
- The model must be no larger than one metre cubed.
- Virtually all of the water used by the model must be retrieved /recycled.
- The model should have 'real world' appearance, be colourful and full of action.
- Teams are encouraged to consider:
  a) how to use the water at the sea/ocean to generate power
  b) the use of dams for potential of stored energy.

5.3 Judging Criteria:

- All information relating to assessment of **Moving Water** is to be presented on a **poster** approximately 65cm wide x 85cm high (thick cardboard backing is recommended).

- Each team will be allocated 20 minutes in which to **present and discuss** their entry with the judges.

Judging will include assessments in the following areas and may be included on the poster:

Safety - including energy source; moving parts are shielded.

Innovative Construction - materials used; design originality and imagination; artistic form, student input, community involvement. Use of recycled material (teams should look to improving craft each year and modify). Recycling does not mean use of exactly the same model - recycling of materials is encouraged, NOT the recycling of crafts!

Planning and Testing - includes challenges and problems encountered during planning/construction; ability to identify how the model could be improved, modified, given time and appropriate materials.

Presentation – Introduction, speaking without notes, clear speech, use of diagrams, photos colour; originality; evidence of teamwork; involvement of school, community and/or industry. Highlighting environmental issues, water conservation, and use of alternate energy sources and recycling.

Model/Craft – The model has been designed and constructed by students; potential ability to move the water; successfully moves water; model shows detail in its construction and appearance.

Environment – How this activity relates to the aims and values of the Energy Breakthrough. Knowledge about the chosen invertebrate.

6 CHALLENGE 3 - JUNKYARD CHALLENGE – TERRIFIC TOWERS

6.1 Overview

Ages: Open to Primary students in Years 3, 4, 5 & 6 (Class A) & Secondary students (Class B).

The Challenge:

The Junkyard Challenge involves teams of 4 who will be provided with a range of materials useful to create an innovative structure standing at least 1.5 metre above the ground. The structure must support 4 x 1 kilogram weights supported at a minimum of 1 metre above the ground. 'Terrific Towers' will present participants with the challenge to build a tower and platform structure out of the resources provided in a 90 minute construction session (1.5 hrs). Each team will have a range of tools and resources available to them.

6.2 Equipment provided

The types of materials available will be a mystery to the teams, but they are likely to include recycled items – some useful, some not! It will be up to the team to decide which materials they would like to use and how they will build their structure.

Basic Pack:

EACH team will receive this BASIC PACK consisting of:

- Design pack: Paper & pencils.
- Retractable tape measure.
- Fine nib texta.

Tools:

- Scissors.
- Pliers.
- Hacksaw (2 blades)
- Retractable Stanley knife.
- Safety Glasses (2 per team).

- Cutting board (NOT TO BE USED IN STRUCTURE)

Connectors:

- Gaffer tape.
- Rayon cloth tape.
- Roll of thin tie wire.
- Zip ties.
- Bag of Rubber bands
- Ball of string.
- 2 bike tubes

6.3 Junkyard Materials

Materials will be available on the day to assist your construction! *(That's the mystery)*

- There will be a work station where several adults will supervise the children using the drills, spare Stanley blades also available.
- All team members will have their 'Tools and Equipment Licences' signed off by their supervising teacher /mentor prior to the event. Licences will be provided in term 4.
- All team members MUST display good occupational Health and Safety practices at all times – or risk being excluded from the event. (Safety glasses are a MUST when drilling).
- Optional: teams may display a team banner up to A2 size.

6.4 Process

- The teams will start with a 10-minute discussion time and then have 90 minutes to build their structure. Then teams will check their structure against the criteria.
- Each team may bring a mentor with them to help during the discussion phase and to assist in the sharing of ideas, supervise students and maintain safe practice.
- **After the first 20 minutes of build time all adults must step back into advisory roles only.**
- Points will be deducted for adult intervention after this initial 20 minutes period.
- Please respect that this is a thinking-doing-learning engineering experience for young people.
- The Mentors could be a parent/teacher. If the team is unable to organise a mentor, please let the Planning Committee know prior to the event.
- Students may Barter & Swap what is in the junkyard collection during the time.

6.5 Finished Product

Primary Class:

Teams in the **Primary** class **must** create a structure that is:

- a minimum of 1.5 metre tall,
- able to support 4 x 1 kilogram weights (4 x 1 litre bottles of water) (4kgs) at a minimum height of 1 metre above the ground.

Secondary Class

Teams in the **Secondary** class **must** create a structure that is:

- a minimum of 1.5 metre tall
- able to support 4 x 1 kilogram weights, 3 of which are supported at a minimum height of 1 metre above the ground, and the 4th on the top of the tower.

Bonus points will be award to teams who have each of the 1 kilogram weights on different levels of their tower.

Presentations will be made immediately after the test period is completed.

6.5 Judging Criteria:

A judging rubric will be emailed to participating schools in Term 4.

"The Terrific Tower Trophy"

Judges will be looking for the structure that resolves the task, effectively and elegantly. Fitness for purpose and aesthetically pleasing, will win the day.

Special Award – "Working under Pressure"

For the team that has demonstrated throughout the entire project – consistently sharing ideas & tasks and therefore working together to solve issues as they arise. Your machine may not work the best, but you could be the best working team.

6.6 Useful Links

Websites which will encourage the students' exploration of the broad range of crane structures from around the world, plus information links that can be useful are:

Towers

https://en.wikipedia.org/wiki/Tower

https://www.britannica.com/technology/tower

https://www.youtube.com/watch?v=H0_yKBitO8M

7 PROPOSED PROGRAM

INNOVATIONS IN TECHNOLOGY

THURSDAY 23 NOVEMBER

9am – 5pm Registration open

Location: Administration Centre

No activities.

FRIDAY 24 NOVEMBER

9am – 5pm Registration open

Location: Administration Centre

No activities.

Note: Innovations in Technology teams must register on Thursday or Friday. Saturday registrations will only be completed by prior arrangement with organisers.

SATURDAY 25 NOVEMBER

9.00 am - 1.00 pm

Crafty Design: 'Moving Water' & 'Wet'N'Wild'
Location: Display & Presentation marquees.
- Design & Construction.

- Display & Presentation.

11am - 1.00pm Junkyard Challenge
Location: Display & Presentation Marquee.
- Building; Testing constructions; Presentation.

2.00pm Crafty Design – 'Moving Water' Performance Test

Location: Water troughs, near Display & Presentation marquees.

3.30 pm Presentation Ceremony (Primary)

Presentations will commence shortly after the completion of the Performance test.
Location: Presentation Stage near Water troughs.

SUNDAY 26 NOVEMBER

No activities.

* PLEASE NOTE THAT THIS TIMETABLE IS SUBJECT TO AMENDMENTS.

Central Highlands Water is committed to environmental education.

They are proud sponsors of the Innovations in Technology category of the Energy Breakthrough and are looking forward to helping provide hands-on learning opportunities for participants again this year.

For more information about our education program, please contact:

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ENERGY BREAKTHROUGH
POWERED BY IMAGINATION
CIRCUIT LENGTHS
TRACK 1 – 1.58 km
VICROADS – 1.11 km
BURNS ST
HOLYROOD ST
Caravan Park
Camping
Lake Victoria
Jubilee Oval
Camping
Recharge Station
PIT 3 (EEV)
PIT 2
Repair Station Parts & Welding
Tennis Bay
Camping
TRACK 1
ADMINISTRATION CENTRE
PIT 1
Swimming Pool Complex
Wrist Banding
Stage
Hospitality Marquee
Norm Rassmussen Volunteer Lounge
Bridge
CHRISTIAN ST
ROAD CLOSED
Timing
Stage
VicRoads Bridge
Princes Park
Camping
On-Site Supermarket
Pushcart Marquee
Scrutineering, Design & Construction, VicRoads Licencing
Presentation Stage
Marquee
Display & Presentation Marquees
Central Highlands Water Innovations in Technology
Energy Expo
Sideshows & Carnival Rides
EARL ST
BENDIGO
Repair Station
VICROADS TRACK
Camping
PIT A
PIT B
PARK RD
CASTLEMAINE
TUAGGRA ST
Town Centre
BALLARAT
AVOCA
KEY
Toilets
Showers
Camping Area
First Aid
Food & Refreshments
ENERGY BREAKTHROUGH SITE
Assembly Point
Marshall Point & Number
Track Direction
Start/Finish
Pushcart Changeover Point
Repair Station
Recharge Station
Parking Area
On-site Supermarket
Hospitality Marquee
Wrist Banding Station
Stage #1
VicRoads Stage
Road Closure
Map not to scale
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