One New Zealand Stadium at Te Kaha

Sustainability Report

October 2024

BESIX Watpac | TE KAHA PROJECT DELIVERY | Christchurch City Council

tekahaproject.co.nz

Contents

Southeast corner, April 2024.


accessman

Project background

From All Black tests and Football World Cup qualifiers to big concerts and events, One New Zealand Stadium at Te Kaha, will be able to host them all.

The $683-million stadium, funded by the Crown and Christchurch City Council, will have a seating capacity of 30,000 for sports events and 36,000 spectators for large music events.

In 2020 the Government and the Council approved the multi-functional stadium to be built in central Christchurch between Madras, Barbadoes, Hereford and Tuam streets.

The site was blessed in April 2022, with early works beginning shortly after. In the 18 months that have followed, the stadium has risen from bare earth, now cutting an impressive figure on the city's skyline.

The project is being delivered on behalf of Christchurch City Council by Australian-based stadium construction experts, BESIX Watpac. They are supported by a consortium that includes the Council, Christchurch-based construction company Southbase Construction, local seismic engineering specialists Lewis Bradford, Christchurch architects Warren and Mahoney, and global stadium design experts Populous and Mott MacDonald.

One New Zealand Stadium at Te Kaha is on track to open in April 2026.

Developed design: View from the northwest corner.

Foreword

Ōtautahi Christchurch will soon be home to a state-of-the-art multi-functional stadium.

One New Zealand Stadium at Te Kaha will add to the central city's vitality, catalyse further development, help cement the city as a sporting and cultural centre, and boost the local economy by attracting visitors from around New Zealand and the world.

As one of the most ambitious infrastructure projects the city has ever seen, the Te Kaha Project has an opportunity to push the boundaries in the current standards in sustainability.

We aim to not only deliver a stadium that operates to modern standards, but also to ensure a sustainable approach is taken at every step in the design and construction phases.

Our core objectives are reducing waste, lowering carbon emissions and water consumption, while creating a positive social impact.

We aim to demonstrate a sustainable approach throughout the design and construction phases, in order to enable continued results throughout the operating life of the stadium.

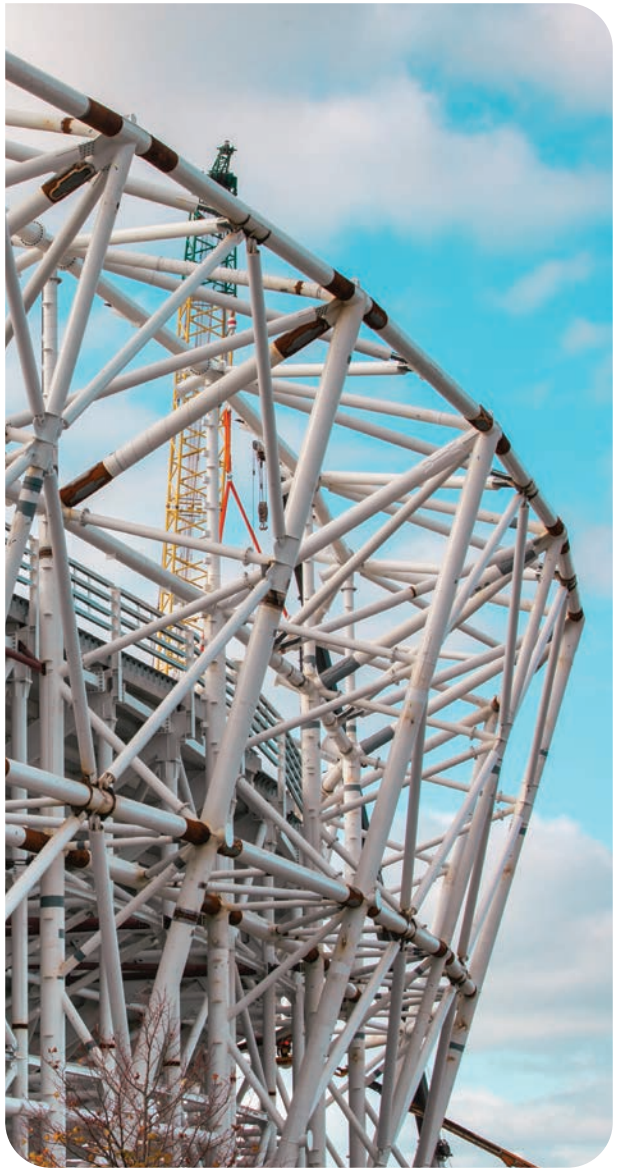
To achieve this, the Te Kaha Project Delivery Team and BESIX Watpac have partnered with UpStreamNZ to develop a range of sustainability goals for the design and construction phases.

The team has committed to monitoring and undertaking regular reviews of the targets, including any new initiatives or efficiencies introduced.

As we cross the halfway mark in the construction phase, this report aims to capture how the project is tracking against the agreed sustainability goals.

David Kennedy
Te Kaha Project Delivery Ltd Chief Executive
Christchurch City Council

TE KAHA
PROJECT DELIVERY | Christchurch City Council



South stand, May 2024.

Creating sustainable solutions for a better world

New technologies and approaches are enabling the construction industry to make positive strides towards achieving net zero targets.

When Christchurch City Council engaged BESIX Watpac to deliver the largest infrastructure project ever undertaken in the history of their city, our goal was to not only deliver a world-class stadium for the people of Christchurch, but to do so with sustainability front and centre throughout the design and build process.

Our approach is driven not only by the expectations of our client, but also a wealth of insight gained from BESIX operations and projects around the globe.

When we undertook the Te Kaha Project, we worked closely with Christchurch City Council and partners, to develop a range of initiatives that support measurable action on climate change, and reduction of whole-of-life embodied and operational carbon.

These initiatives were born out of a set of targets agreed at the outset, alongside our partners UpStreamNZ.

The design phase had five focus areas, where efficiencies and improvements were sought between the concept design and detailed design phases:

- Embodied carbon
- Operational energy and carbon
- Water consumption
- Mana whenua engagement and design integration
- Customer experience

A summary of the results is included in the section below, and a full report produced by Mott Macdonald is included as Appendix One of this report.

Twelve targets have been set for the construction phase in the following areas:

- Carbon emissions
- Encourage and enable cycling to work
- Construction phase water consumption
- Waste generation and landfill diversion
- Number of local businesses engaged
- Number of local workers delivering the project
- Working hours by Māori / Pasifika
- Workforce actively engaged in training and skills development
- Commitment to providing the living wage
- Wellbeing – mental health initiatives
- Community engagement with schools and universities
- Other sustainability related initiatives

These targets are regularly measured, assessed and reported on. The data that we are capturing is developing into a useful case study for future stadium construction projects.

At the midpoint of construction, the project is achieving or exceeding the majority of our targets. This is encouraging to see and sets us in a strong position for the remainder of the delivery of One New Zealand Stadium at Te Kaha.

Mark Baker
Chief Executive Officer
BESIX Watpac

BESIX Watpac

A collaborative approach for sustainability outcomes

With a capacity of up to 36,000 patrons, One New Zealand Stadium at Te Kaha will be one of the largest event venues in New Zealand. Acknowledging that a facility of this size will consume large amounts of energy – both to build and to operate – Christchurch City Council directed the Project Delivery Team to focus on achieving positive sustainability outcomes.

The Council aims to support measurable action on climate change and reduction of whole-of-life embodied and operational carbon, through the design and construction phase – to enable sustainable operations throughout the life of the stadium.

BESIX Watpac was engaged as the lead contractor on the project in part because of their track record of performance in this field on comparable projects.

The Council's Project Delivery Team work closely with BESIX Watpac across all aspects of the project, including combined efforts in the sustainability field.

Early in the project timeline, the team engaged infrastructure consulting firm, AECOM, to review the sustainability status of the project, and develop benchmarks based on comparable stadia around the globe.

The AECOM Sustainability Discovery Summary report was delivered in July 2022 and summarised the positive work that had been undertaken to improve the performance of the venue across a range of sustainability areas, including water and energy efficiency, materials waste and carbon, ecology, cultural heritage, customer experience and transport integration.

The report also presented four case studies of leading stadia around the world, which were selected as the basis for this project's benchmarks:

- Golden 1 Centre, Sacramento, California US
- Intuit Dome, Inglewood, California US
- La Trobe, Melbourne, AU
- Eden Park Stadium, Auckland, NZ

Based on these case studies, a set of sustainability performance metrics, and a process for measuring and sharing them with key stakeholders, was developed.

During the construction phase BESIX Watpac are undertaking monthly and quarterly reporting against the benchmark targets identified. Examples of these reports are included in full as appendices. A snapshot of how the project is tracking has been produced for this report.

Concrete pour, January 2023.


PEGASUS
ENGINEERING
PEGASUS
ENGINEERING LTD

Design Phase

Mott Macdonald were engaged to produce a one-off Sustainability Report for the design phase of the project. The report summarises the initiatives that have demonstrated improvements within the final Detailed Design when compared against the original Concept Design in the following areas:

- embodied carbon
- operational energy and carbon
- water consumption
- mana whenua engagement and design integration
- customer experience.

This section provides a snapshot of efficiencies gained between the Concept Design and Detailed Design phases.

See Appendix One for the full report.

Preliminary Design.

Embodied carbon

Goal: Improve on the embodied energy that would have been in the Concept Design scheme.

Recent trends towards energy efficiency within building services design over the past 10 to 15 years have driven down operational carbon, however the impact of embodied carbon has not been as widely studied over this period.

The design progression of One New Zealand Stadium at Te Kaha has closely studied embodied carbon. A final design assessment for embodied carbon has been made for the completed Detailed Design, which has then been compared to the initial Concept Design as a reference case.

Key initiatives implemented to reduce embodied carbon within the design include:

Modular materials selection and design

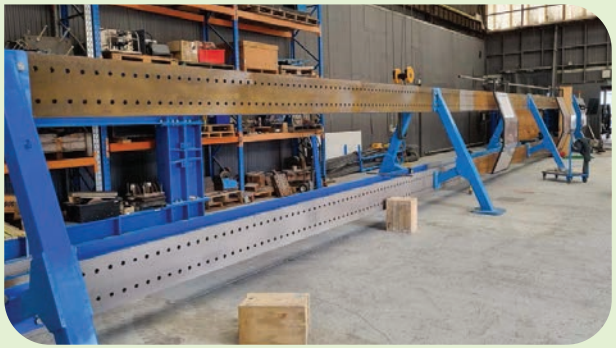
- Precast plat moulds standardised
- Script for every connection results in reduction in primary steel weight.

Structural Design

- Change from tension rods to Buckling Restrained Braces (BRBs)
- Mitigations for potential liquefaction
- Recycled material 'fly ash' used in concrete mix.

Constructability

- Change from temporary struts and screw piles to soft links to support radial trusses
- Design and procurement tailors to local expertise.



Buckling Restrained Braces (BRBs).

Prefabrication of modular steel work offsite

Dematerialisation

- Refined acoustic design to decrease specialist finishes.

Procurement

- Prioritising local materials
- Timber with third party accreditation.

Prefabricated steel work being installed in the northwest stand, July 2024.

Embodied carbon savings

Zone of decrease	% saved	tonnesCO_2-e detailed vs concept
Roof	**29%**	25,650 vs 33,150
Facade	**12%**	9,450 vs 10,600
Fit out	**5%**	6,000 vs 6,300
Foundations	**19%**	22,850 vs 27,350
Stands	**10%**	31,150 vs 34,300
Total Savings	**17%**	95,100 vs 111,700

Savings measured between Detailed Design vs Concept Design

Total savings equivalent to

316

Cars off the road annually

Based on 10,000km of average annual driving over 50 years.

7233

Truckloads of concrete

effectively removed from the project's carbon footprint.

Operational energy and carbon

Goal: Improve on the energy assessment of the Concept Design.

Through a range of design features implemented, the following operational energy and carbon savings have been integrated into the detailed design.

Annual operational carbon emission savings

Zone of decrease	% saved	tonnesCO_2-e saved detailed vs concept
Grow lights	**73%**	63.6 vs 237.6
General lighting	**58%**	26 vs 63
Food and beverage	**34%**	177 vs 270
Domestic hot water	**51%**	18.6 vs 38
HVAC	**50%**	155 vs 308
Total Savings	**44%**	**596 vs 1072**

Savings measured between Detailed Design vs Concept Design.

Operational carbon savings equivalent to

35

Rugby fields of native forest over 25 years

Developed design: Outside main entrance.

Developed design: Nightview from the northwest.

Water consumption

Goal: Improve on the water usage assessment of the Concept Design.

Through a range of design features implemented, a 14% decrease in total operational water consumption has been achieved. This equals 5300 litres per day.

Annual water savings

Zone of decrease	% saved	kl used detailed vs concept
WCs	**56%**	885 vs 1990
Urinals	**59%**	401 vs 985
Basins	**59%**	249 vs 332
Showers	**25%**	247 vs 330
Spa fill	**90%**	10 vs 100
Total Savings	**14%**	**11700 vs 13640**

Savings measured between Detailed Design vs Concept Design

Total decrease equivalent to

1.5

QEII pools worth of water per annum

Based on the 25m lane pool.

Mana whenua engagement and design integration

Goal: Cultural narrative to be meaningfully and authentically woven into the design of the facility and precinct.

The cultural narrative has been collaboratively developed between Te Kaha Project Delivery, BESIX Watpac and Ngāi Tūāhuriri. This will be expressed in the finished stadium through bespoke artworks, graphics and colours developed by an artist appointed by Ngāi Tūāhuriri.

Key areas where the cultural narrative will be showcased:

- The facility's façade
- Colour and design of stadium seats
- Signage and interpretation panels
- Landscaping around the stadium.

Preliminary Design.

Preliminary Design.

Customer experience

Goal: Facility and precinct to accommodate premium customer experience in line with Project Brief.

The stadium has been designed to create a unique atmosphere which maximises and enhances fan experience.

Some key design features include:

- Large variety of food vendors throughout.
- TV screens throughout concourse.
- Fully enclosed roof.
- Additional gender-neutral toilets to maximise inclusivity.
- Accessible drop-off/pick-up zones.
- Changing Places fully accessible public bathrooms.

Construction phase

BESIX Watpac monitor and report on a range of sustainability targets each quarter. This section provides a snapshot of how the project is performing at the halfway point of the construction phase (Q2, 2024).

Twelve targets were set for the construction phase of the project:

- Carbon emissions
- Encourage and enable cycling to work
- Construction phase water consumption
- Waste generation and landfill diversion
- Number of local businesses engaged
- Number of local workers delivering the project
- Working hours by Māori / Pasifika
- Workforce actively engaged in training and skills development
- Commitment to providing the living wage
- Wellbeing – mental health initiatives
- Community engagement with schools and universities
- Other sustainability related initiatives.

See Appendix Two for the full quarterly report (Q2, 2024).

East stand, January 2024.

Carbon emissions

Electricity

Target: 0.4007% of trade cost.

Achieved: We are currently tracking under target.

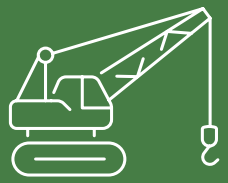
67,944
kWh used on building site in 2024.

Diesel and transport

Target: UpStreamNZ to track all diesel usage and transport movements and prepare a project benchmark for this metric.

Achieved: We continue to partner with UpStreamNZ to track key metrics and develop a benchmark for future stadium projects.

11,255
litres of diesel saved by subcontractors opting to use electric or hybrid machinery.



Emissions for diesel transport consumption

60,689
km travelled by all transport.

25,696
litres of diesel used for all transport.

69.22
tCo_2-e generated from all transport diesel.

Stationary diesel* consumption

74,748
litres of stationary diesel.

199.1
tCo_2-e generated from all stationary diesel.

*Equipment and machinery used exclusively on site.

Workers travelling to site

285
average number of staff on site each day.

27.4
tCo_2-e generated by staff travelling to site.

60.7%
of workers using diesel hungry modes to travel to site.

39.3%
of workers using carbon friendly modes to travel to site.

3.6%
annual increase in bus travel.

1%
annual increase in travel on foot.

Solar ready

A thorough investigation into the feasibility of installing solar panels has been carried out.

The structural and services designs of the stadium have made allowances for solar generation, with suitable locations for their installation identified.

While solar panels are not being included at this stage, they may be added in future as Christchurch City Council looks to develop a network-wide approach to solar energy generation across its facilities. One New Zealand Stadium at Te Kaha is ready to adapt as this work advances.

Encourage and enable cycling to work

Target: Up to 50 bike parks (to fit with demand)

Achieved: More bike parks added.

Workers biking to site

2023 **5.1%** 2024 **6.5%** (projected)

Number of return bike trips to site

2023 **1088** 2024 **3000** (projected)

Construction phase water consumption

Target: Track and monitor water usage for the BESIX Watpac office and construction site.

Office (274 Tuam Street)

300.2

m^3 total water used for Q2 2024.

Construction site (220 Tuam Street)

136

m^3 total water used for Q2 2024.

Waste generation and landfill diversion

Target: 50% diversion from landfill.

Achieved:

58%

of waste diverted from landfill across the project (includes repurposed contaminated soil, site and office).

391.9

tonnes diverted from landfill through recycling, innovations, and actions.

Snapshot – Q2 2024

99.76% of waste diverted from landfill

- **General waste** 97.1 tonnes **0.24%**
- **Contaminated soil (repurposed)** 40,507 tonnes **99.59%**
- **Scrap metal** 64.7 tonnes **0.16%**
- **Plasterboard** 2.9 tonnes **0.01%**
- **Wood waste** 0.8 tonnes **0.002%**
- **Cardboard** 0.4 tonnes **0.001%**
- **PVC** 0.3 tonnes **0.001%**

Early works, July 2019.

Richard Clio – Site Manager, Alpha South.

Phil Riding – Services Site Manager.

Jenny Divers – Construction Survey Lead, Graham Consulting.

Number of local businesses engaged

Target: 70% businesses engaged are local

Achieved:

76%

of consultants, subcontractors and supporting businesses engaged to date are local.

Number of local workers delivering the project

Target: 80% local workers

Achieved:

90%

of workers engaged to date are local (South Island).

Working hours by Māori / Pasifika

Target: 7% of working hours on site

Achieved:

8.3%

of working hours to date by Māori / Pasifika.

Workforce actively engaged in training and skills development

Target: 10% of working hours on site

Achieved:

12%

of workforce engaged in training and skills development.

Training and skills – Q2, 2024 highlights

- Site safe working at heights (BESIX Watpac and Southbase staff)
- Work Safe First Aid (Jinggong)
- Effective decision making (BESIX Watpac cadets).

Commitment to providing the living wage

Target: 100% paid at least the living wage

Achieved:

100%

of on site workers being paid at least the living wage rate, including subcontracts awarded to date (excludes apprentices and trainees).

Site BBQ – December 2023.

Wellbeing – mental health initiatives

Target: Bi-annual mental health events
Achieved: Target reached.

Q2 highlights

- Site BBQ – celebrating everyone's contribution to the project
- 3x Mates in Construction events – encourages positive wellbeing and suicide prevention.

Te Pūkenga (Ara) students on a site tour.

Community engagement with schools and universities

Target: Minimum of four activities per year
Achieved: 7 activities in 2024 so far.

2024 highlights

- Young Engineers – site tour
- Virginia Tech – 30 Engineering students site visit
- Te Pūkenga – Two work placement students
- Wonder Project – Hillmorton High School site visit
- School of Screw Piling – Industry Day.

BESIX Watpac Family Day.

Other sustainability related initiatives

BESIX Watpac and the wider group continue to promote sustainable outcomes that go beyond our target metrics.

Recent highlights

- Pink Ribbon fundraiser – raised $156 through staff morning tea for breast cancer
- BESIX Watpac Family Day – Archie Bros day out
- Men's Health Week – Tool Box Talks and H&S Committee discussions
- Women in Infrastructure – Site visit and presentation
- Lean in Circles – Female staff quarterly workshops.

Environment

One of the key project goals detailed in the Te Kaha Project Delivery Limited Statement of Intent (FY25-27) is to ensure the effects of project delivery are minimised for neighbours.

The project team maintain a regular flow of information through the project webpage, newsletters, emails, and other communication channels. In addition, neighbours are invited to quarterly community meetings, where the project team can receive direct feedback on any concerns.

In addition to the sustainability metrics discussed in this report, BESIX Watpac also undertakes monitoring and reporting on construction effects that could impact nearby residents or business operators, including noise, vibration, and dust. These are measured against relevant industry standards, with proactive mitigation techniques in place to address any issues.

Snapshot of environmental monitoring

Noise levels generally sat below 75 dBA, with instances where the results peak for short durations between 80 – 85 dBA, and some minor exceedance of 85 dBA during the reporting period (June 2024).

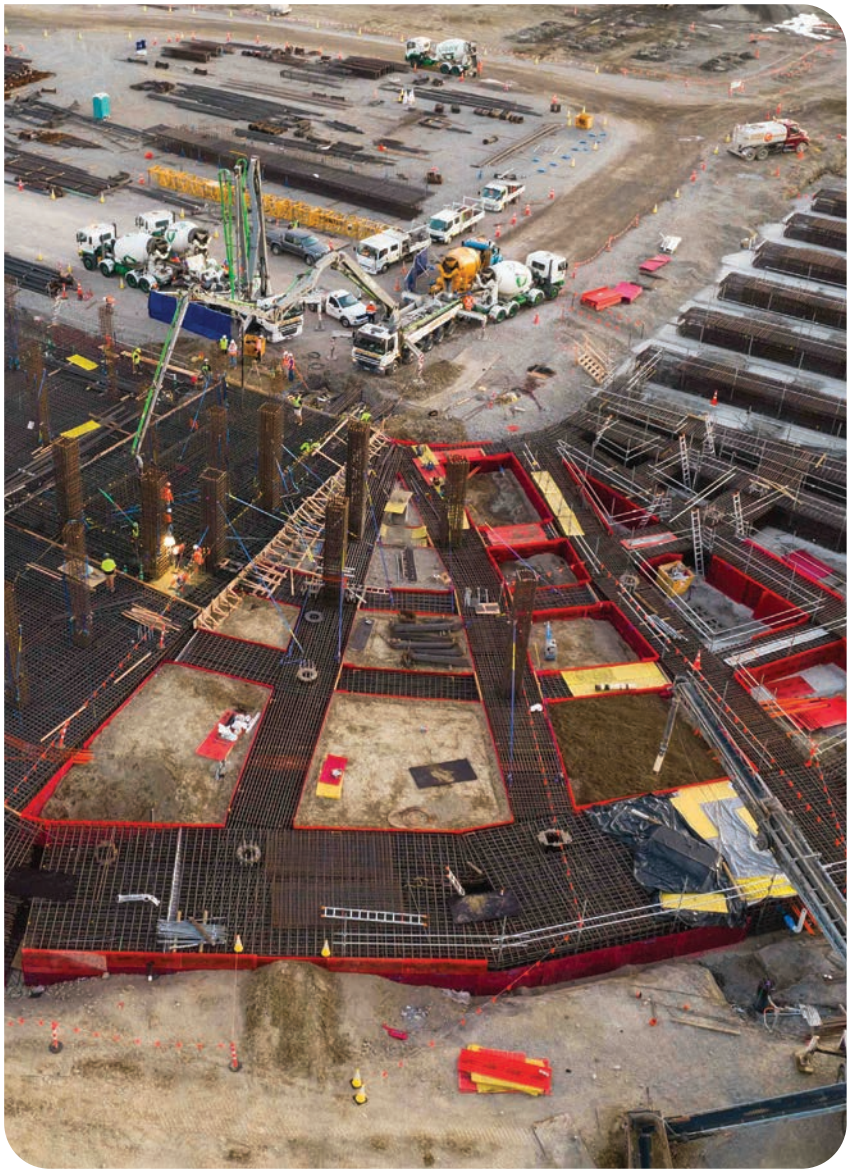
These results are within the recommended limits for construction noise received in residential areas (NZS 6803:1999).

Vibration levels are continuously monitored. For the reporting period, vibration levels complied with internationally accepted industry standards (DIN 4150).

Dust levels are monitored daily, and mitigation measures are in place to limit its effects. These include maintaining speed limits on site, dampening down the earth with water gathered from onsite stormwater storage basins, and the use of polymer dust control products.

In addition, the majority of the site has been stabilised with material that has less dust generating properties, and the building footprint is mostly covered with concrete.

Data supplied by BESIX Watpac in the July 2024 Board Report.



Concrete pour, January 2023.

Appendix One

Design Phase one-off report prepared by Mott Macdonald

KŌTUI

Te Kaha

Canterbury Multi Use Arena

Sustainability Report

Prepared for
Christchurch City Council

Approved by
BESIX Watpac

Prepared by
Mott MacDonald New Zealand Ltd

Date
June 2024

Contents

Introduction

BESIX Watpac is leading the delivery of the 30,000-seat (25,000 permanent seats and 5,000 temporary seats) covered Te Kaha arena for hosting major sporting contests and international concerts, with a scalable seating capacity to ensure it is adaptable for smaller concerts, shows and events. The arena has a maximum capacity of 36,000 patrons in full major concert mode when the field of play can be utilised.

The purpose of this Sustainability Report is to summarise and record BESIX Watpac's initiatives that have demonstrated a reduction in embodied carbon, operational energy and carbon, water consumption, and an improvement in customer experience and Mana Whenua engagement and design integration within the final Detailed Design when compared against the original Te Kaha Concept Design.

As one of the largest infrastructure projects under development within Christchurch and New Zealand, the construction of Te Kaha aims to support measurable action on climate change and reduction of whole-of-life embodied and operational carbon.

The project also aims to balance environmental, economic, social and cultural benefits.

Te Kaha principle sustainability strategies within this report

	**Embodied Carbon**	To integrate low-carbon whole-of-life cost-optimised sustainability strategies in design and construction to support holistic operational efficiency
	**Operational Energy and Carbon**	To reduce energy use and operational carbon footprint in line with medium and long-term targets to be an efficient and cost-effective community facility
	**Water efficiency**	To reduce the long-term reliance on potable water
	**Customer experience**	Facility and precinct to accommodate premium customer experience in line with the project brief
	**Mana Whenua Engagement and Design Integration**	Cultural narrative to be meaningfully and authentically woven into design of the facility and precinct

Embodied Carbon

Recent trends towards energy efficiency within building services design over the past 10 to 15 years have driven down operational carbon, however the impact of embodied carbon has not been as widely studied over this period.

The design progression of Te Kaha has closely studied embodied carbon. A final design assessment for embodied carbon has been made for the completed Detailed Design which has then been compared to the initial Te Kaha Concept Design as a reference case.

Key initiatives implemented to reduce embodied carbon within the design include:

Modular materials selection and design

- The precast plat moulds were standardised as much as possible with the parabolic curve catered in the steel rakers rather than varying the plat moulds. Precast façade panels were kept consistent with moulds required. Double T's moulds were standardised as much as possible to cater for the required spans and loads, where larger spans and loads were required the project sourced existing moulds from other local contractors rather than fabricating new.
- A script was created for each and every connection to analyse the utilisation and design rather than typically grouping connections and upgrading all connections in the group to the worst case. This ensured connection design and weights were the most efficient and also reduced the seismic mass which resulted in a reduction in primary steel weights.
- Project team has engaged with the supply chain regarding preferred steel sizes and connection details

Structural Design

- The change from tension rods to Buckling Restrained Braces (BRBs) for the roof structure increased ductility for the site-specific spectra, therefore reducing roof primary steel tonnage by approx. 1,000T whilst also reducing the size of concrete foundations.
- Structural design for site-specific seismic spectra exceeds code-based minimum requirements, providing enhanced resilience
- Design of the Bowl structures within reasonable drift limits, thereby reducing the impact to non-structural elements
- Design of the ground-improvement scheme for the Arena to SLS2 criteria, therefore mitigating the potential impact of liquefaction issues for more moderate seismic events
- Inclusion of fly ash within the issued concrete mix design, reducing the impact on the environment as fly ash is a recycled product, reducing the amount of cement in the concrete design to 10,692m3 of concrete

Total savings equivalent to

7233

Truckloads of concrete

effectively removed from the project's carbon footprint

Constructability

- The change from temporary struts and screw piles to soft links to support each radial truss (40 no.) has reduced the temporary steel tonnage by approx, 100T and removed 80 no. screw piles
- Design and procurement tailored to cater for local expertise, enhancing local jobs by splitting packages down to suit local market capability (ie steelfixing, concrete place & finish, structural steel, metalwork) and reduce engagement of trades from outside the South Island, resulting in a reduction in transport producing emissions

Pre-fabrication

- Modular elements of the steelwork to be pre-fabricated off site

Dematerialisation

- Project has refined acoustic design to decrease the extent of specialist finishes without critically impacting the acoustic quality of spaces

Procurement

- Prioritising local materials to suit what is commercially available, reducing the carbon emissions produced by transport
- Procurement of timber with third party accreditation (e.g. Forest Stewardship Council) as a preference

Total savings equivalent to

316

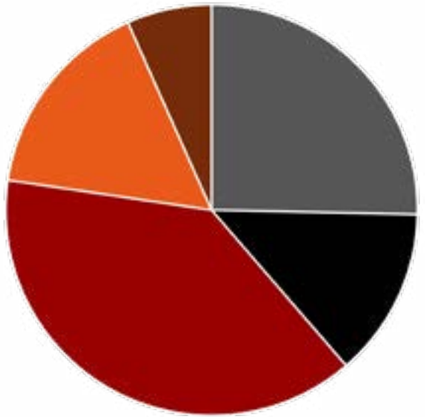
Cars off the road annually

Based on 10,000km of average annual driving over 50 years

Embodied Carbon Savings

Zone of decrease	% saved	tonnesCO2-e saved detailed vs concept
Roof	**29%**	25,650 vs 33,150
Facade	**12%**	9,450 vs 10,600
Fit Out	**5%**	6,000 vs 6,300
Foundations	**19%**	22,850 vs 27,350
Stands	**10%**	31,150 vs 34,300
Total Savings	**17%**	95,100 vs 111,700

Savings measured between Te Kaha detailed design vs Te Kaha concept design



Leaving a Legacy

Case study

The Te Kaha project has invested in the local infrastructure at Holmes Testing facilities located in Christchurch to upgrade their facility to accommodate the testing of Te Kaha BRB's.

This has meant we have been able to view the tests locally within Christchurch instead of being fabricated and shipped overseas to Asia for testing.

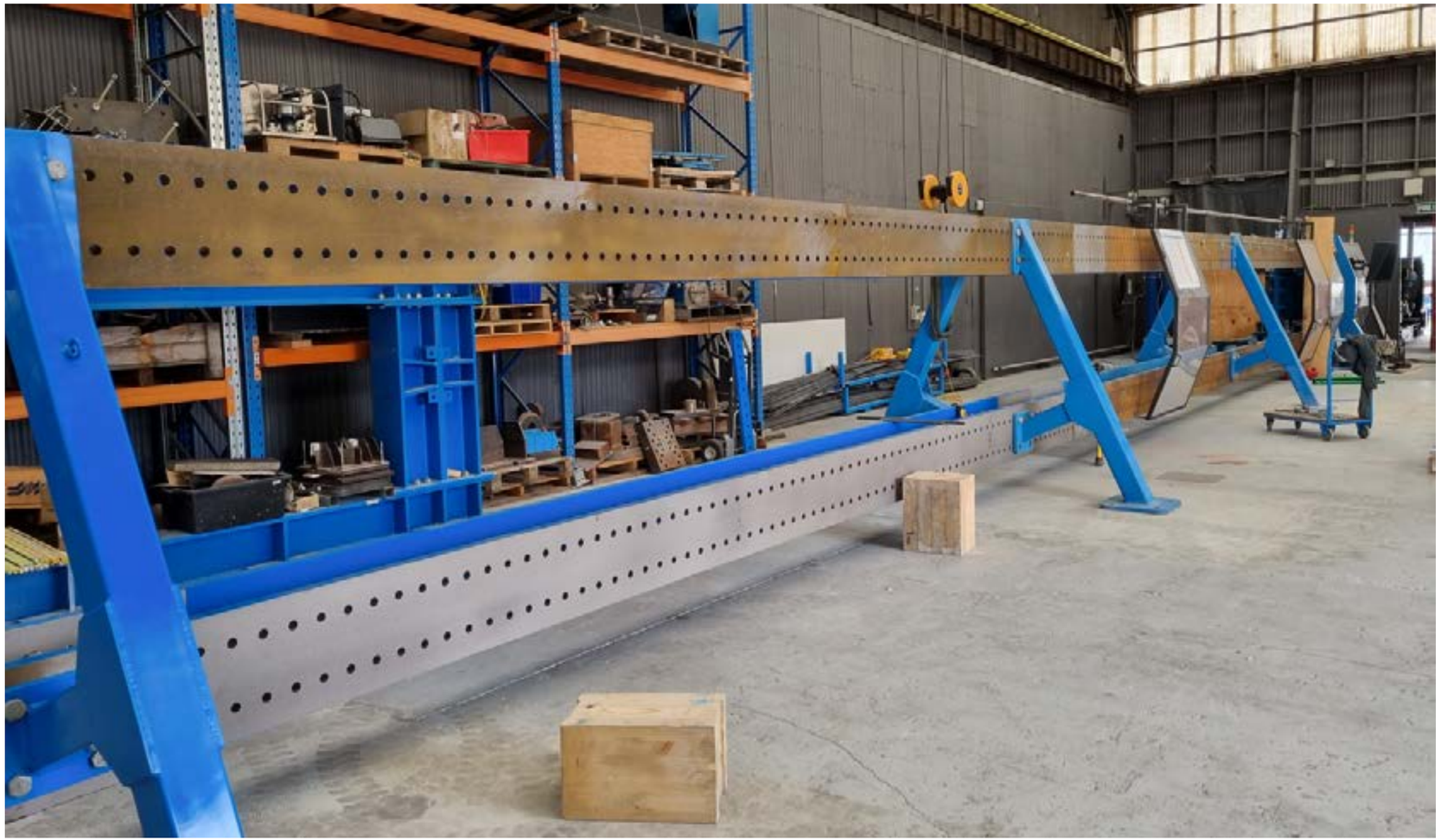
We had 16 BRB's tested, weighing between 6 to 15t each.

This upgrade allows Holmes solution to:

- Test longer BRB's
- Test higher capacity BRB's of which previously there was only one facility in the world that could cater for these tests
- Avoided shipping BRB's overseas and reduced carbon footprint
- Economic benefit to local businesses as a number of local businesses were involved in the facility upgrade
- Leaves a legacy in Christchurch for only one of two facilities in the world that can test BRB's of such length and capacity put this facility on the world map

The Te Kaha testing programme is the most comprehensive project-specific one ever conducted worldwide.

Watch this video from Holmes Solutions for more information:
Te Kaha BRB Testing Project - Holmes Solutions



Operational Energy and Carbon

Energy efficiency within the building services design has been prioritised from an early stage of the project; initially by modifying the brief to focus on passive design and then during Detailed Design by plant selection and design optimisation.

In developing the design for Te Kaha, we have included initiatives such as those listed below, that have decreased operational energy and carbon within the final Detailed Design when compared to the original Concept Design. A final design assessment for operational energy and carbon has been made for the completed Detailed Design which has then been compared to the initial Concept Design as a reference case.

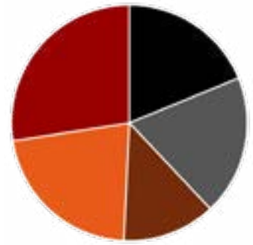
Te Kaha key passive design features implemented include:

- Access to and availability of natural daylight – ETFE roof
- Natural ventilation through the seating bowl and concourse
- Improved indoor air quality through Heating Ventilation & Air Conditioning (HVAC) filtration and materials selection, such as a fundamental requirement to use low Volatile Organic Compound (VOC) for joinery boards, carpets, vinyl and adhesives
- Climate responsive design to natural ventilation including consideration of wind speed, direction and temperature
- Large format horizontal fans within the seating bowl for thermal comfort in summer
- Consideration of a climate change scenario (+2°C) based on the Christchurch 2.5% HVAC design conditions
- Removal of HVAC from 3600m² transitory spaces

Te Kaha Operational energy efficiency considerations implemented include:

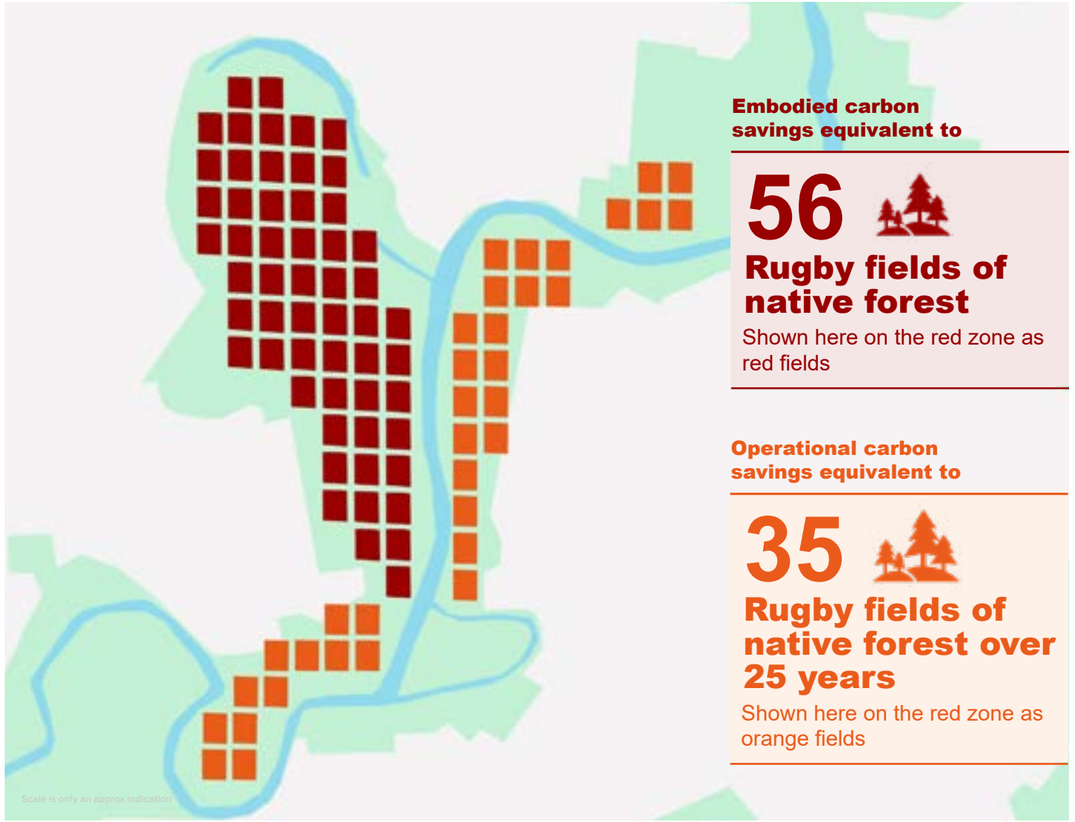
- HVAC Plant selected for high efficiency (154 Tonnes C02 per Annum. 2,084 MWh vs 1,289 MWh)
- Natural ventilation through the seating bowl and concourse enables the removal of active systems which would increase capital and operational costs.
- Ventilation heat recovery to change rooms, function rooms, level 2 suites and level 4
- Variable volume control on change room and function room Air Handling Units (AHUs)
- Level 2 suite HVAC systems to shut down when sliding doors are opened
- Central & local plant configurations to reflect zone use, operation and effective comfort control
- Intelligent Building Management System (BMS) controls and monitoring
- Energy management metering, monitoring and operational optimisation
- Natural daylight to offset grow lights as much as practicable
- Energy efficient luminaries and control gear to reduce operational energy use including LEDs (6 Tonnes C02 per Annum. 63MWh vs 26MWh)
- Intelligent lighting controls and monitoring to reduce energy use and maintenance
  - > Occupancy sensing to selected internal spaces
  - > Photoelectric sensors for the plaza
- No gas usage on-site, all heating and cooking processes to use electricity (93 Tonnes C02 per Annum. 2,084 MWh vs 1,289 MWh)
- All pitch maintenance plant to be electric operated apart from the tractor, which is unable to be electric based on requirements, reflecting a saving of approx. 10t of CO2 per year

Annual Operational Carbon Emissions Savings



Zone of decrease	% saved	tCO2e saved detailed vs concept
Grow Lights	73%	63.6 vs 237.6
General Lighting	58%	26 vs 63
Food & Beverage	34%	177 vs 270
Domestic Hot Water	51%	18.6 vs 38
HVAC	50%	155 vs 308
Total Savings	44%	596 vs 1072

Savings measured between Te Kaha detailed design vs Te Kaha concept design



Embodied carbon savings equivalent to

56

Rugby fields of native forest

Shown here on the red zone as red fields

Operational carbon savings equivalent to

35

Rugby fields of native forest over 25 years

Shown here on the red zone as orange fields

Water Consumption

Often in New Zealand, where we have enough rain, water scarcity is not a significant concern. The impacts of climate change however are difficult to predict and the issues around drought and water quality are already impacting other nations.

To help future proof against unknown impacts and decrease the impacts of future growth in the neighbourhoods surrounding Te Kaha, the adoption of water saving initiatives have been implemented throughout the design, including;

- Use of low flow water efficient fixtures and appliances
- No water-based heat rejection systems. Water based heat rejection systems utilise evaporation via cooling towers to reject the energy transferred from water cooled chillers and accordingly use significant quantities of water. Taking into consideration numerous variables (climate, size of venue, equipment selected etc), twelve month's consumption on an equivalent sized venue with water based heat rejection systems would exceed circa 2.5M litres of water consumption. Using air cooled condensers means that no water is required.
- Low water use cleaning (steam) in operation which reduces operational water usage associated with cleaning
- Sprinkler system on each floor fitted with isolation valves or shutoff points for floor-by-floor testing. Drain down points to be provided per floor.
- Water metering to major water uses within the building
- Selection of materials and finishes to reduce cleaning and maintenance requiring water usage (considering whole of life cost) Materials have been selected, such as the metal cladding, that require only wipe down rather than a complete water wash to achieve warranty. General cleaning equipment, including floor scrubbers and steam cleaners will be supplied based upon water efficiency.
- A final design assessment of water usage has been made for the completed Detailed Design which has then been compared to the initial Te Kaha Concept Design as a reference case.

14% ↓

decrease in total operational water consumption

Equalling 5300 litres per day

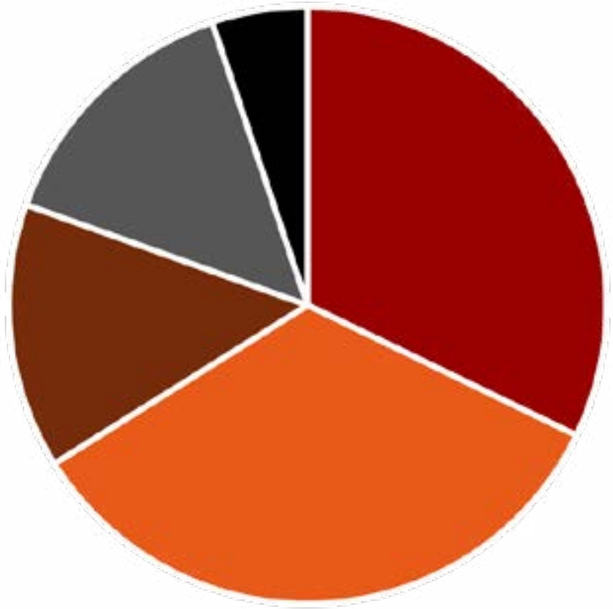
Savings measured between Te Kaha detailed design vs Te Kaha concept design

Total decrease equivalent to

1.5

QEII pools worth of water per annum

Between Te Kaha detailed design vs Te Kaha concept design. Based on the 25m lap pool.



Annual Water Savings

Type of water used	% saved	kL saved detailed vs concept
WC's	56%	1990 vs 885
Urinals	59%	401 vs 985
Basins	59%	249 vs 332
Showers	25%	247 vs 330
Spa fill	90%	10 vs 100
Total Savings	**14%**	11700 v 13640

Savings measured between Te Kaha detailed design vs Te Kaha concept design

Mana Whenua Engagement and Design Integration

The Te Kaha team is working with the community to construct a facility that leaves a social legacy – through local procurement, employment and training, Mana Whenua engagement and design integration.

The cultural narrative has been collaboratively developed between Te Kaha Project Delivery Limited, BESIX Watpac and Ngāi Tūāhuriri appointed artist of Kaitiaki Studios. The artist provided a proposal that outlines the framework for expressing the cultural narrative through the Te Kaha project. This is largely through art, supergraphics, and colour.

In these artworks Te Kaha celebrates our Takiwā (region) and captures the essence of Ōtautahi – using shape and form inspired by the surrounding natural landscape, the region's rich cultural histories, the aesthetic of old Christchurch and echoes the aesthetic of our new city.

Through the integration of the cultural narrative, Te Kaha aims to celebrate and welcome its manuhiri (guests) and showcase Ōtautahi's mana as excellent hosts. We acknowledge that this mana relies our natural environment with the abundance of mahikā kai (food gathering places) and encourages our people to build upon and care for our natural resource.

It becomes the centrepoint to whakamanuhiri our guests and champions our elite athletes and performers.

There are three main design elements identified as pillars for the development of our aesthetic. All aspects of the written narrative are visually connected throughout the artwork opportunities and have the potential to influence further than just the artworks.

- Mahika Kai & Manaakitanga
- Tāne & The Separation
- Embracing Our Takiwā

The cultural narrative has been integrated into the overall design of Te Kaha within the following building elements:

Façade

The façade has been designed in three elements. The strong, heavy podium; the light, reflective top band, referred to as the 'halo;' and the central mid band which features the artwork created by the artist.

To Whakamanuhiri our guests we first acknowledge the environment that surrounds us. This artwork reflects the environment directly behind each side of the facade as you circle the facility. It depicts the mahika kai that surround us, the ebb and flow of our waterways, the peaks of our maunga and the tides on our shores. Most importantly it carries the aesthetic of our old and new cityscape and acknowledges Ngāi Tūāhuriri as mana whenua.

Stadium Seating

Our arena seating showcases a traditional kowhaiwhai pattern, reflecting our cultural narrative.

The selected Mangopare pattern is associated with the Hammerhead Shark. It depicts an essence of persistence, strength, and tenacity, resonating deeply with our athletes, performers, and underscores the resilience of our region's people. It stands as a recognisable symbol of Māori identity, appealing to international audiences worldwide.

Signage

Signage and Interpretation Panels to be provided to aid understanding of the narrative and its incorporation with Te Kaha/Te Kaharoa.

Landscaping

- The landscape is organised into two zones that are informed by the original wet plains ecosystems. The landscape strategy explores the interaction of the planting and ecology derived from the original wet plains environment.
- Utilising all nature species within the plant selection.
  - > Wet Plains: Totara – Matai, older plains ecosystem.
  - > Ecological Zone – Wet Plains Totara – Matai, older plains ecosystem, moist and deep Kaiapoi soils.
  - > Wet Plains: Kahikatea – Manatu, lush, older plains ecosystem.
  - > Ecological Zone – Wet Plains Kahikatea – Manatu, lush, older plains Tai Tapu soils.

Facade


Stadium Seating Plan

Customer Experience

Te Kaha has been designed to create a unique atmosphere which maximises and enhances fan experience.

The key design features include:

Seating bowl and concourse design

- Upper tiers designed with an increased incline to enhance views to the field
- Decreasing the distance from the fans to the side line to create a “cauldron” effect
- A continuous open concourse through the west, south and east stands that provides a constant view of the field of play
- A large variety of food outlets distributed throughout from in-house electric kitchens and craft bars
- A variety of offering to the west corporate stand to accommodate different price points and experiences
  - > Open Corporate Reserve (OCR), Level 1 there are 104 OCRs which include upgraded seats and fridges comprising:
    - » 92 x 11 person OCR boxes
    - » 12 OCR boxes of varying capacity and configurations
  - > Suites, Level 2 there are 23 suites comprising:
    - » 60 person x 2
    - » 46 person x 2
    - » 42 person x 1
    - » 39 person x 2
    - » 30 person x 2
    - » 15 person x14
  - > 2046 premium general admission seats on Level 3, with dedicated premium food and beverage offerings.
- TV screens integrated throughout the concourse to allow patrons to remain engaged with the event, even when not seated
- Toilet sizes based on the most onerous numbers from both applicable guidelines – the NZ building code and Football Stadia Advisory Design Council (FSADC), to reduce wait times and improve fan experience
- Fully enclosed roof to ensure all patrons remain dry
- Multi-use flexibility and event size scalability to maximise event calendar and therefore broaden community engagement
- Mothergrid will be provided to allow for ‘cut down’ capacity events
- Precinct flexibility, with event overlay considerations factored into public spaces via provision of power, water and communications
- The arena and function areas within have been designed to achieve the required acoustic parameters
- Ribbon boards to be provided by Christchurch City Council
- Additional Gender Neutral Toilets provided in South and East Amenities to maximise inclusivity
- Accessible drop off and pick up area within the northern carpark
- Designated accessible viewing / seating locations within the arena
- Changing Places facility
- High performance Public Address (PA) system within the seating bowl
- Provision of Wi-Fi to selected zones
- Flexibility for multiple modes of operation to enable a wide variety of events
- Two large video boards for display of graphic content
- DAS being pursued

Feature lighting

- Lighting effects integrated into the sports lighting systems
- Colour change LED lighting to the exterior façade

L01 East Concourse

South GA Concourse

ENDURING

STRENGTH

Appendix Two

BESIX Quarterly Sustainability Report (Q2, 2024)

Sustainability Quarterly Report

Z002

Te Kaha

5 August 2024

Project overview

Project Site Address:

220 Madras Street

Christchurch 8011, NZ

BESIX Watpac State Division Address:

274 Tuam Street

Christchurch 8011, NZ

NZBN:
9429049137170

Revision history

Version	Date	Revision Description	Project/Site Manager sign off
01	31/01/2023	Initial Report	Adrian Jones
02	28/04/2023	End March 2023 Report	Adrian Jones
03	19/12/2023	End September 2023 Report	Adrian Jones
04	20/02/2024	End December 2023 Report	Adrian Jones
05	20/06/2024	End March 2024 Report (Q1)	Adrian Jones
06	05/08/2024	Q2 2024 (April-June) Report	Adrian Jones

Contents

Sustainability Quarterly Report

Introduction

Led by BESIX Watpac, Kōtui will deliver the 30,000-seat (25,000 permanent seats and 5,000 temporary seats) covered Te Kaha arena for hosting major sporting contests and international concerts, with a scalable seating capacity to ensure it is adaptable for smaller concerts, shows and events. The arena has a maximum capacity of 36,000 patrons in full major concert mode when the field of play can be utilised.

The purpose of this Sustainability Report is to summarise and record the status of BESIX Watpac initiatives against the sustainability metrics agreed for the project.

As one of the largest infrastructure projects under development within Christchurch and New Zealand, Christchurch City Council and the construction of Te Kaha aims to support measurable action on climate change and reduction of whole-of-life embodied and operational carbon.

The project also aims to balance environmental, economic, social and cultural benefits.

Our Sustainability Metrics

Category	Target	Implementation
Design Phase - (one off report)		
Embodied Carbon	Improve on the embodied energy that would have been in the concept design (CD) scheme.	Mott Macdonald will undertake an embodied carbon assessment at the completion of detail design and compare against the Te Kaha concept design.
Operational Energy and Carbon	Improve on the energy assessment of the Te Kaha concept design.	Mott Macdonald will undertake an energy assessment at the completion of detail design and compare against the Te Kaha concept design.
Water Consumption	Improve on the water usage assessment of the Te Kaha concept design.	Mott Macdonald will undertake a water usage assessment at the completion of detail design and compare against the Te Kaha concept design.
Mana Whenua Engagement and Design Integration	Cultural Narrative to be meaningfully and authentically woven into design of the facility and precinct.	Report on design integration, with reference to: ▪ Façade ▪ Stadium Seating ▪ Signage ▪ Landscaping
Customer Experience	Facility and precinct to accommodate premium customer experience in line with Project Brief.	Report on design integration, with reference to: ▪ Concourse ▪ In-house production ▪ F&B variety and styles ▪ Wi-Fi and DAS coverage ▪ LED ribbon and video boards ▪ Acoustic design

Category	Target	Implementation
Construction Phase (quarterly / bi-annual reporting and status update within monthly progress report)		
Carbon Emissions	Electricity 0.4007% of % of trade cost. Diesel Te Kaha project used as a case study. UpstreamNZ will track all diesel usage and prepare a project benchmark for this metric. Transport Te Kaha project used as a case study. UpstreamNZ will track all transport movements and prepare a project benchmark for this metric.	Electricity Report % decrease against benchmark for Te Kaha. Diesel Develop benchmark for use on future projects. Transport Develop benchmark for use on future projects.
Waste Generation & Landfill Diversion	50% diversion from landfill.	Report % decrease against benchmark for Te Kaha.
Number of local businesses engaged, including: subcontractors, sub-subcontractors and suppliers	70%	Maximize local jobs through a locally focused procurement and employment strategy Based on number of packages Local would include: ▪ Canterbury Region ▪ South Island
Number of local workers delivering the Te Kaha project	80%	Local focused design and procurement strategies to enhance working opportunities for Cantabrians Local would include: ▪ Canterbury Region ▪ South Island
Workforce actively engaged in training and skills development	10%	Workforce Training and Development Coordinator to develop and implement a targeted strategy aimed at creating workforce development opportunities and consultation with subcontractors, ongoing review of outcomes and solutions.
Working hours by Maori / Pasifika	7%	Industry Training Organizations and Te Pūkenga will be used to identify and support project strategy targets.
Community engagement with schools and universities	Minimum 4 activities per year	Examples include; ▪ Enscape / Revizto walkthrough ▪ Presentations to universities ▪ Site visits for university students

Category	Target	Implementation
Construction Phase (quarterly / bi-annual reporting and status update within monthly progress report) {continued}		
Commitment to providing the living wage	100% on site workers being paid at least the living wage rate, excluding apprentices and trainees.	Include the obligation in subcontract documentation.
Encourage and enable cycling to work	Up to 50 bike parks pending on take up.	Provision of cycle facilities.
Health & Safety – Mental Health initiatives	Bi-annual mental health function held on site.	Mates in construction type initiatives adopted.
Construction phase water consumption	Te Kaha project used as a case study.	Undertake regular reviews on Construction Phase Water Consumption and initiatives that are introduced and impact this has on the overall water consumption for the project.
Other Sustainability related initiatives		No specific target, record and share any other sustainability related initiatives that are undertaken on site during construction.

Design Phase – (one off report)

Sustainability Detailed Design Phase one off report final version was issued 20 June 2024 via WTPC-GCOR-031015.

Which addressed the following initiatives:

- Embodied Carbon
- Operational Energy and Carbon
- Water Consumption
- Mana Whenua Engagement and Design Integration
- Customer Experience

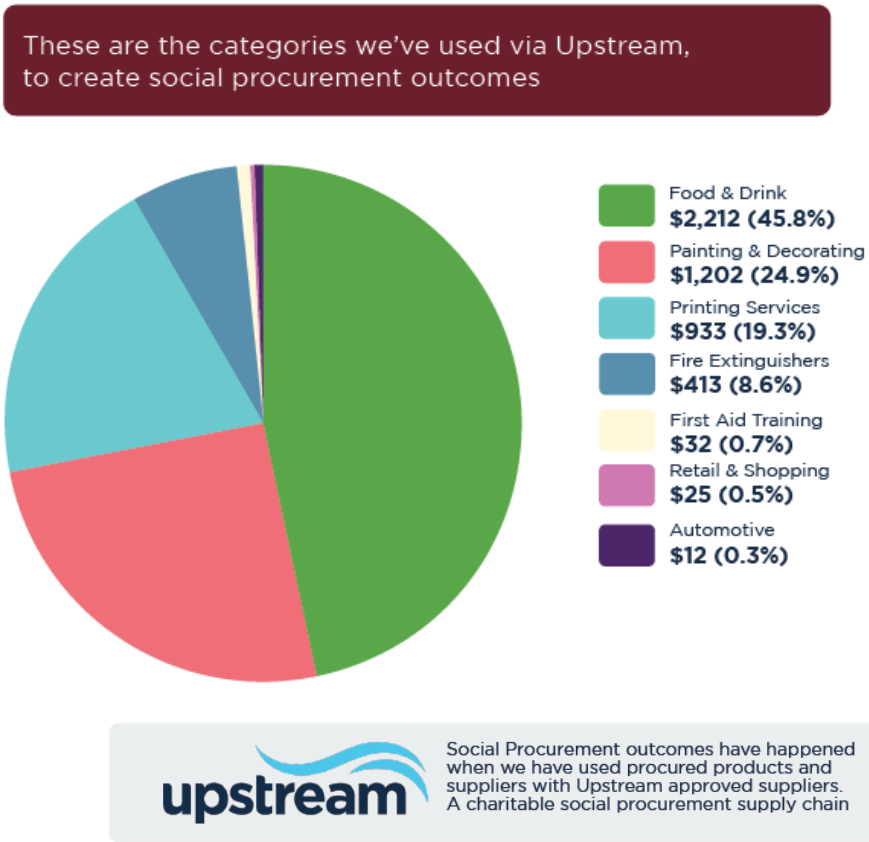
Sustainability Goals

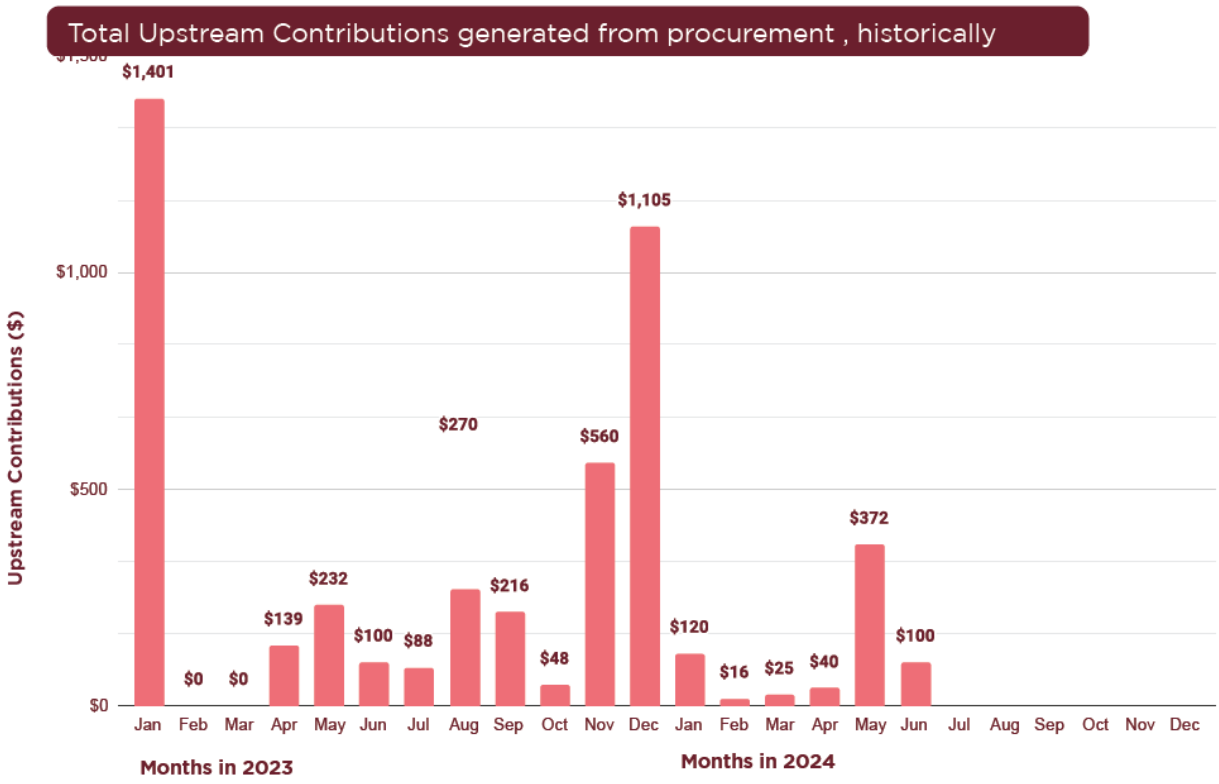
The below summarizes in detail our progress against the target metrics for reporting on sustainability achievements on the Te Kaha project.

With our partner UpstreamNZ we continue to promote sustainable outcomes for the Te Kaha project that go beyond those initial target metrics we undertook to achieve.

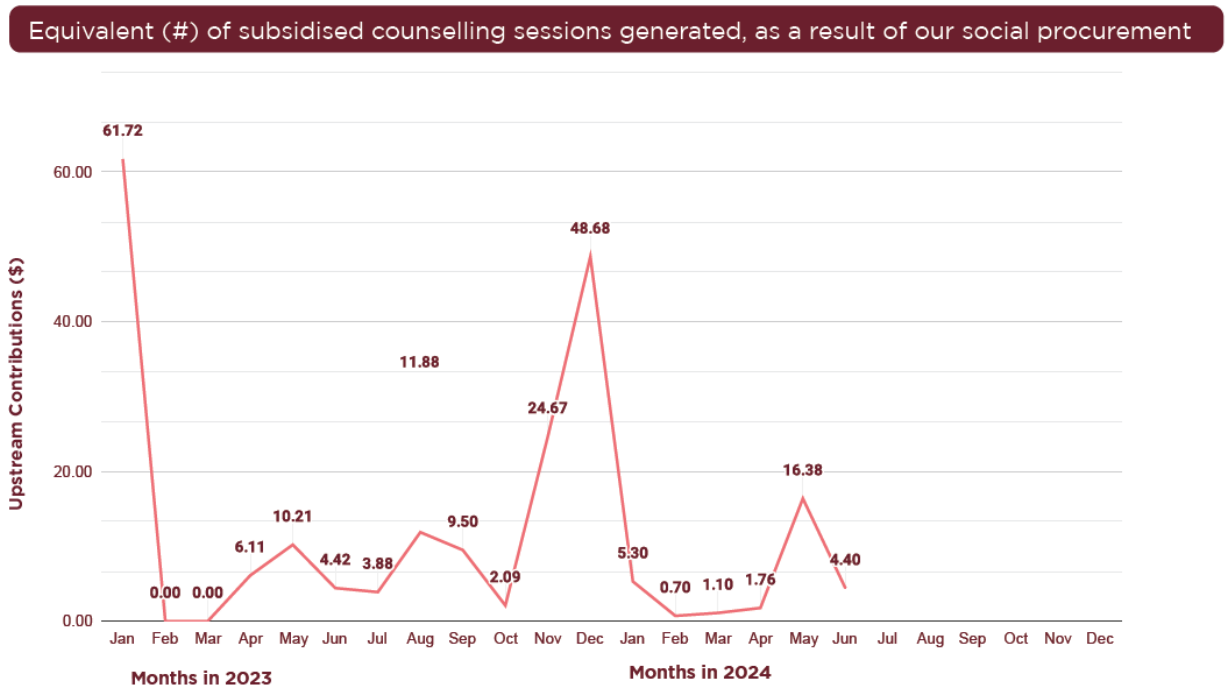
Through UpstreamNZ we have engaged the following works through social procurement which has generated 212 hours of community support for young people as a result.

- Painting contractor for the onsite workforce facilities.
- First Aid Training.
- Sourced cleaning and safety products.
- End of year Impact Boxes (All items made in Aotearoa & environmentally sustainable)
- BESIX Watpac branded umbrellas, Hard hat labels and other merchandise.
- Fire Extinguishers for the office and site inclusive of regular servicing.
- Printing of A1 colour plans & laminated plans.
- Site BBQ – Food & Drink supply.
- BESIX Watpac site staff obtaining private WOF's with a local (Tuam St) mechanic.
- Christmas ham fundraising initiative.
- Purchase of further whiteware for the office/cafeteria space.





For Q2 of 2024 we generated $511 for the community (equivalent of 22 subsidised counselling sessions) via our social procurement. Q1, 2024 in comparison generated $161.



Upstream Event

Upstream hosted a Procurement for Good Tell your Sustainability Story event on 9 May 2024 at Tūranga to provide companies an opportunity to hear how Upstream can make an impact through simple procurement decisions and assist to tell their sustainability story via their software. This was attended by Courtaney Carpenter who provided a brief overview of the partnership with Upstream on our regular reporting requirements via a Q&A panel that also included a representative from Southbase Construction discussing their engagement with Upstream via Social Procurement.

Electricity

***Target** – 0.4007% of % of trade cost.*

Current Status – BESIX Watpac continue to track under the target of 0.4007% of % of trade cost. We have partnered with Upstream to review our monthly electricity bills and compare data to provide total kW/h use, kW/h per month/quarter per worker onsite, average kW/h per month/quarter and total kW/h as noted below for both the Office (274 Tuam Street) and Site (220 Madras Street).

Office and Amenities (274 Tuam Street) - Electricity consumption

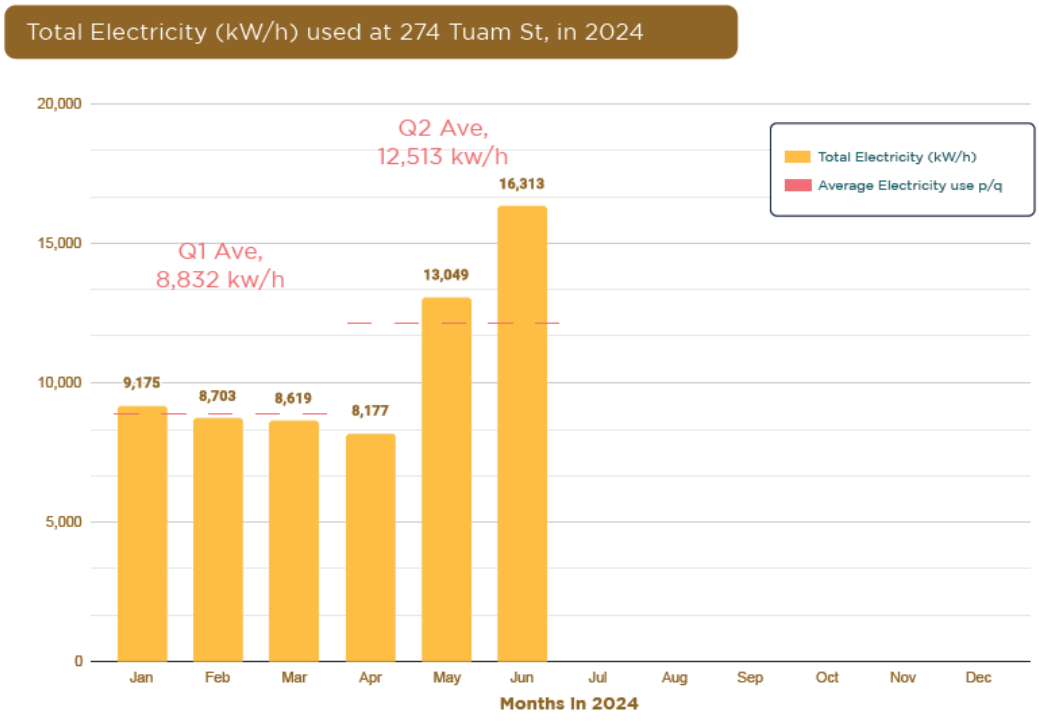
37,539
Total kW/h used over the period Q2, Apr-Jun 2024

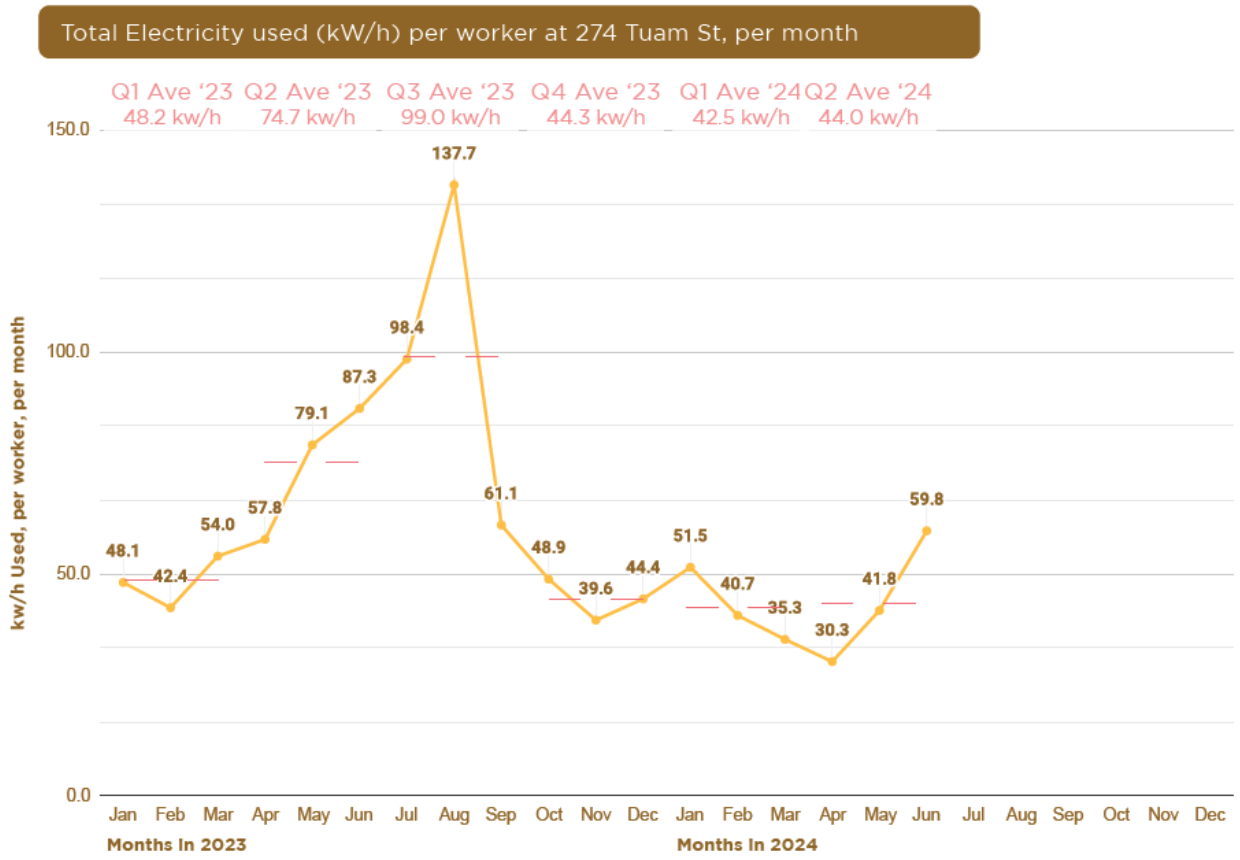
12,513
Average kW/h used per month for Q2, Apr-Jun 2024

43.95
Average kW/h per month used per worker on site over Q2, Apr-Jun 2024

285
Quarterly average of workers on site for Q2, Apr-Jun 2024

Q2 electricity usage in our office and amenities spaces has increased significantly as a result of the colder months and increased heating usage, along with provision of additional food storage and microwaves for the increased site numbers onsite to use during their breaks.





Te Kaha Site (220 Madras Street) - Electricity consumption

45,487
Total kW/h used over the period Q2, Apr-Jun 2024

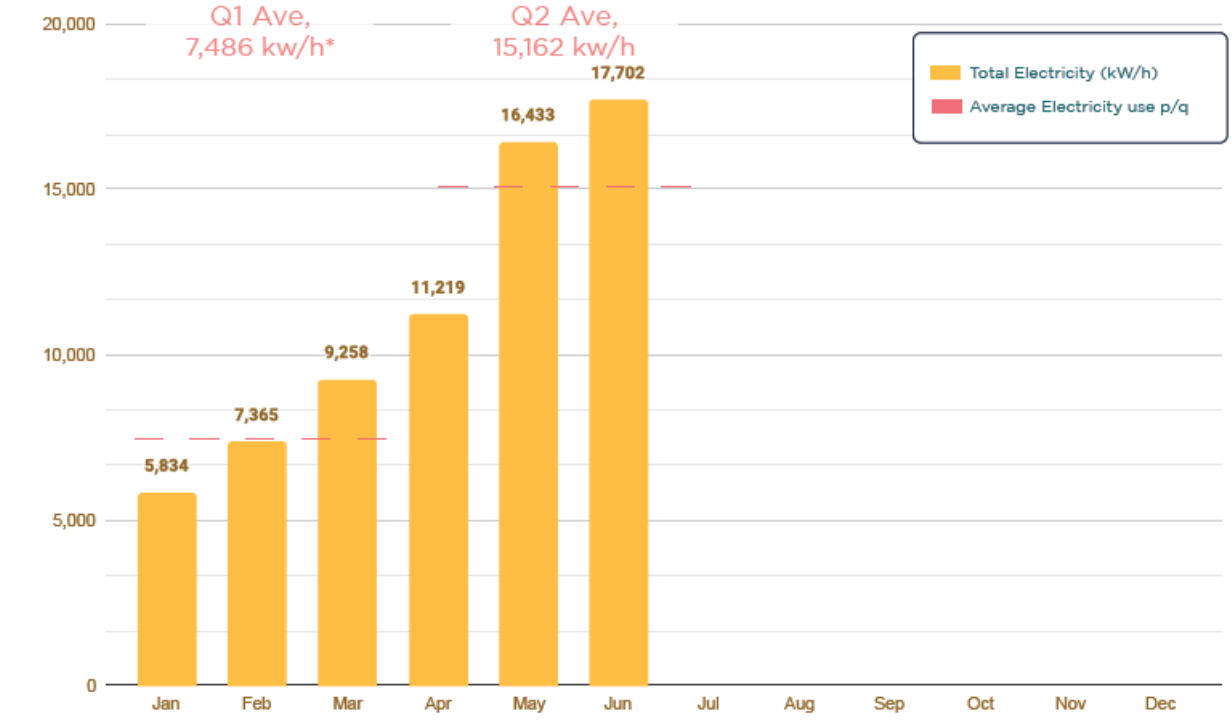
15,162
Average kW/h used per month for Q2, Apr-Jun 2024

53.16
Average kW/h per month used per worker on site over Q2, Apr-Jun 2024

67,944
Total kWh used on Te Kaha site for 2024

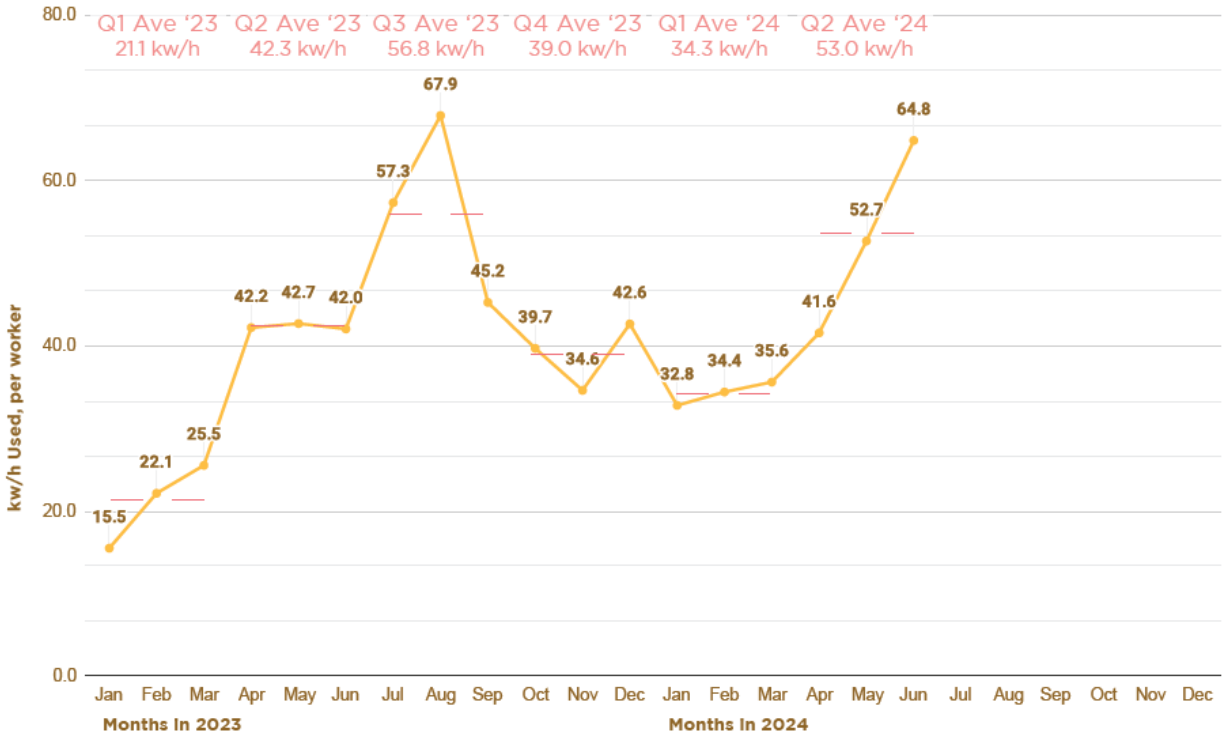
Electricity usage onsite continues to increase as the work phases move internally. This quarter we saw an increase of 22,897 kw/h from Q1 usage of 22,457 kw/h to Q2 usage of 45,487 kw/h.

Total Electricity (kW/h) used on Te Kaha Site, in 2024



There was a slight adjustment of the Quarter 1 Average from the last quarter report due to the timing of the final reading in March 2024.

Electricity used (kw/h) per worker on Te Kaha Site , each month



Diesel Usage / Transport

***Target** – Te Kaha project used as a case study. UpstreamNZ will track all diesel usage and transport movements and prepare a project benchmark for this metric.*

Current Status – We in partnership with UpstreamNZ continue to manage this aspect of the sustainability metrics, targeting the following areas which will generate a benchmark for future stadium development.

- Diesel usage is tracked through three (3) main streams as follows.
  - Emissions for Diesel Transport consumption - Diesel consumption data from BESIX Watpac and subcontractors will be input into the Oatas software system and monitored for improvement opportunities.
  - Stationary Diesel consumption - Stationary diesel data will be recorded from BESIX Watpac and subcontractors into the Oatas software system and monitored for improvement opportunities.
  - Transport diesel is recorded by adopting a site access log system where all deliveries are recorded at the entry gate such that transportation delivery patterns are monitored and opportunities to make transport more efficient reviewed.
- Transport to Site
  - Transport to Site – Regular (12-16 Weekly) surveys are completed at our BBQ's with site staff and workers participation to obtain data on modes of transport personally used to travel to work on that sample date. Additional modes were introduced mid-2023 to include data split of carbon hungry vs carbon friendly modes of transport.

Diesel Carbon emissions

We have analysed all trucks entering Te Kaha and determined the distances based off all recorded data sheets. We have then been able to calculate the diesel consumption and carbon emissions as a result.

60,689
Total (KM) Travelled by all transport for Apr-Jun 2024

963
Daily Average Travelled (km) by all transport, per workable day

25,696
Total (Litres) of Diesel used by all Transport for Apr-Jun 2024

69.22
tCo2-e generated from all Transport Diesel

20,320
Average Monthly (KM) travelled, for Apr-Jun 2024

63
Total amount of workable days during the period Apr-Jun 2024

8,565
Average Monthly (Litres) of Diesel used, for Apr-Jun 2024

23.07
Average Monthly tCo2-e generated from all Transport Diesel

Q2 has seen an increase in smaller, newer and more energy efficient trucks coming to site as more interior fitout trades commenced onsite.

Stationary Diesel

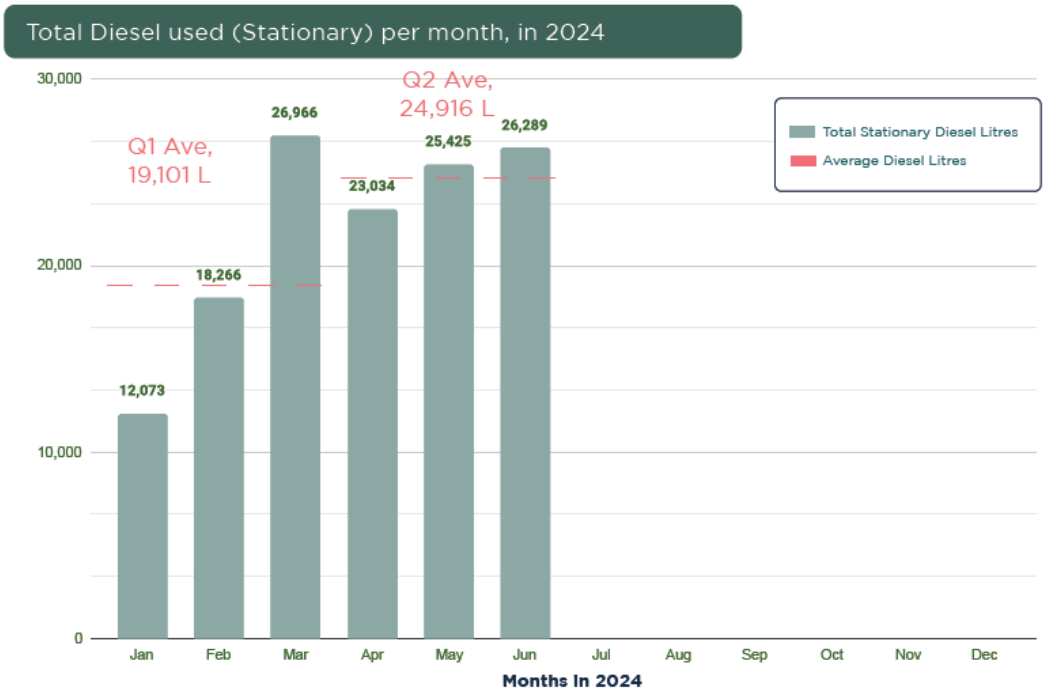
Stationary Diesel on site is used across a range of equipment and machinery onsite and is defined as stationary diesel since the machinery does not venture outside the site boundary and is diesel that is burned during operation on the site of Te Kaha.

74,748L
Total Litres of Stationary Diesel used on site for Apr - Jun 2024

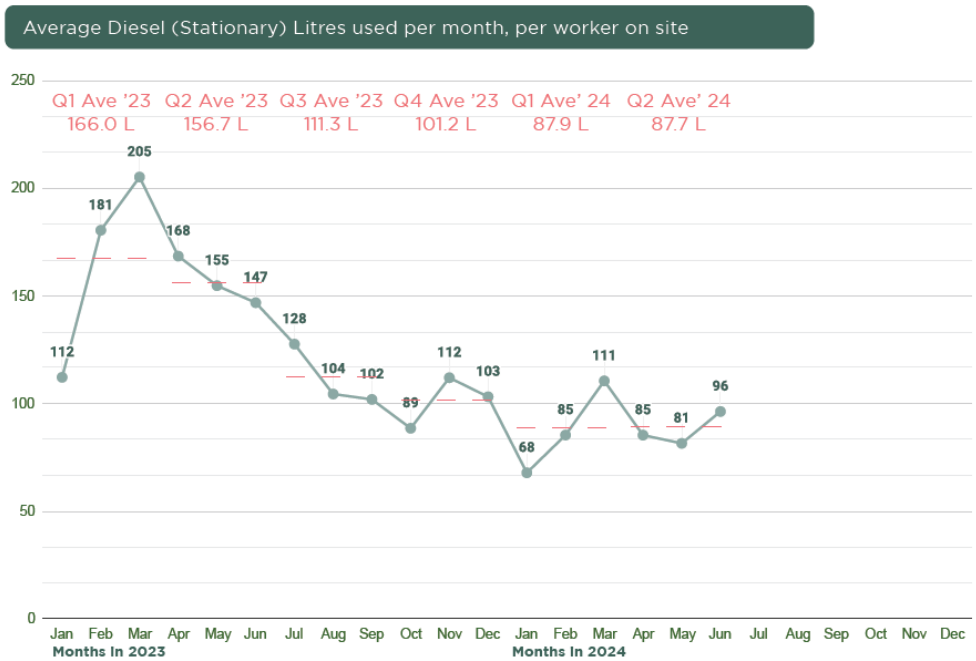
199.1tCo2-e
Total tCo2-e from Diesel (Stationary) being used on Te Kaha for Apr - Jun 2024

24,916L
The average amount of diesel (in litres) used per month

66.4tCo2-e
The monthly average of tCO2-e from Diesel (Stationary)



As the roof structure has progressed we also see that cranes and generators onsite are using 84% of all stationary diesel in Q2.



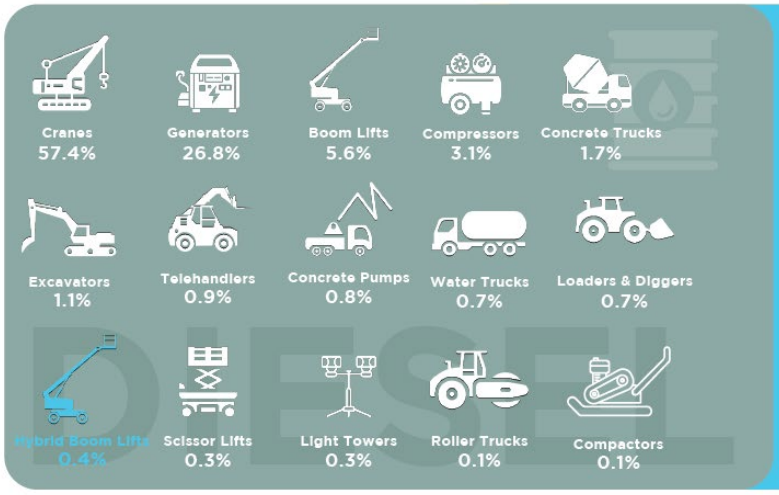
The number (#) of Equipment & Machinery Modes that used Diesel (Litres) during Apr - Jun 2024

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Boom Lifts (D)	12	15	18	22	23	25						
Compressor (D)	2	0	1	1	4	3						
Concrete Pumps (D)	9	11	13	9	15	7						
Compactor Plate (D)	0	2	0	0	1	2						
Concrete Trucks (D)	67*	130*	118*	87*	58*	20*						
Cranes (D)	16	19	22	17	15	19						
Excavators (D)	0	3	1	0	2	2						
Generators (D)	4	5	5	5	6	11						
Graders (D)	0	0	0	0	0	0						
Light Towers (D)	2	2	2	2	2	0						
Loaders & Diggers (D)	0	2	0	0	3	2						
Other Equipment (D)	0	1	2	0	0	1						
Roller Trucks (D)	0	1	0	0	0	1						
Scissor Lifts (D)	4	2	2	3	1	1						
Telehandlers (D)	2	4	4	4	3	4						
Water Trucks (D)	1	1	1	1	1	1						

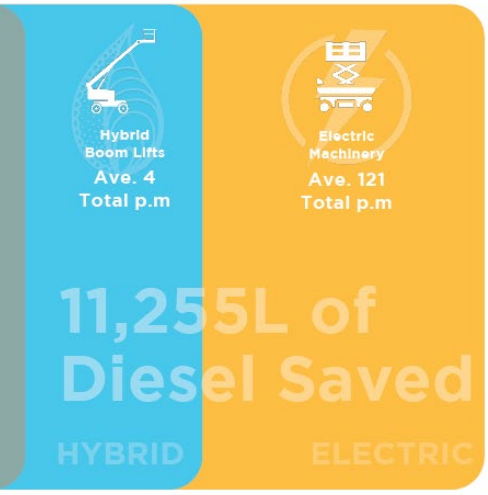
Concrete trucks – The number of return trips has been recorded as we don't have the data to determine the number of unique trucks

We saved an estimated 11,255 litres of diesel as a result of sub-contractors opting to use electric and hybrid machinery, instead of diesel powered.

The Equipment & Machinery Modes (Quarter Average %) that used the most Stationary Diesel (Litres) during Apr - Jun 2024



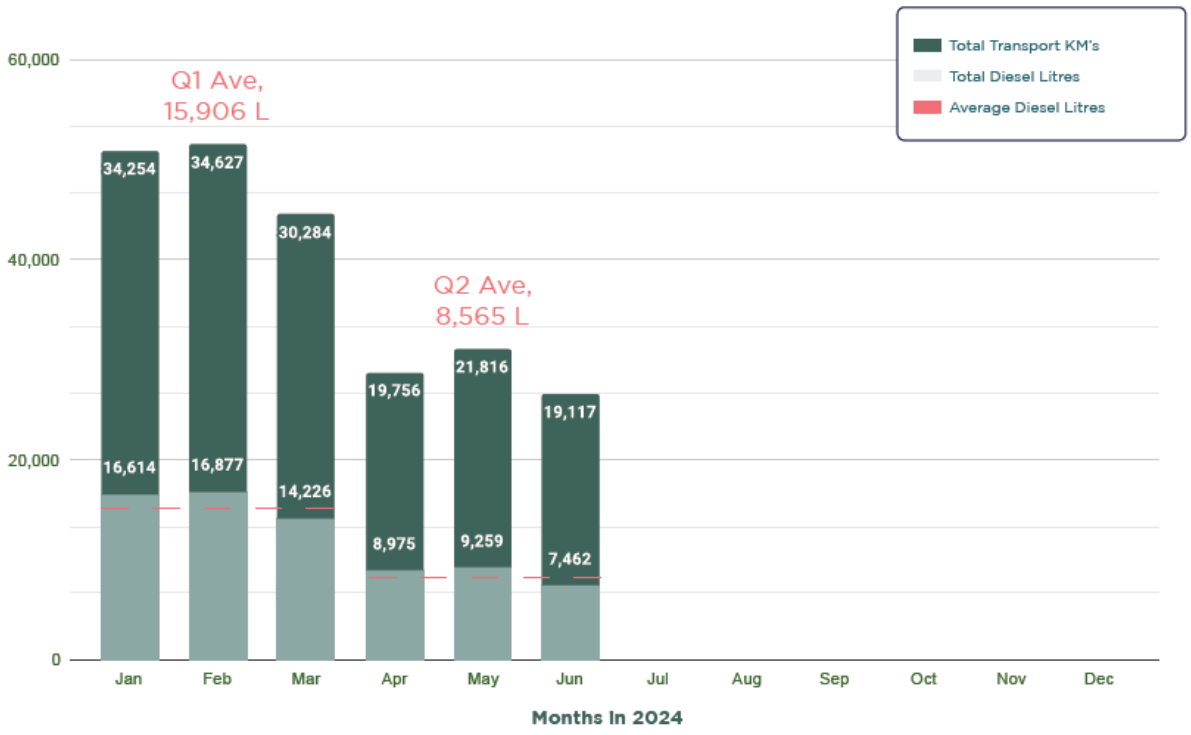
Total estimated diesel saved (Apr-Jun '24) as a result of having Hybrid & Electric equipment



Transport Diesel

Diesel (transport) continues to be collated monthly through collection and review of site access logs. This quarter continues to provide a broader insight into the modes of transport and deliveries to site reflecting the progress being made onsite and the evolving work phases.

Total Transport (Km's) & Diesel (Litres) per month, in 2024

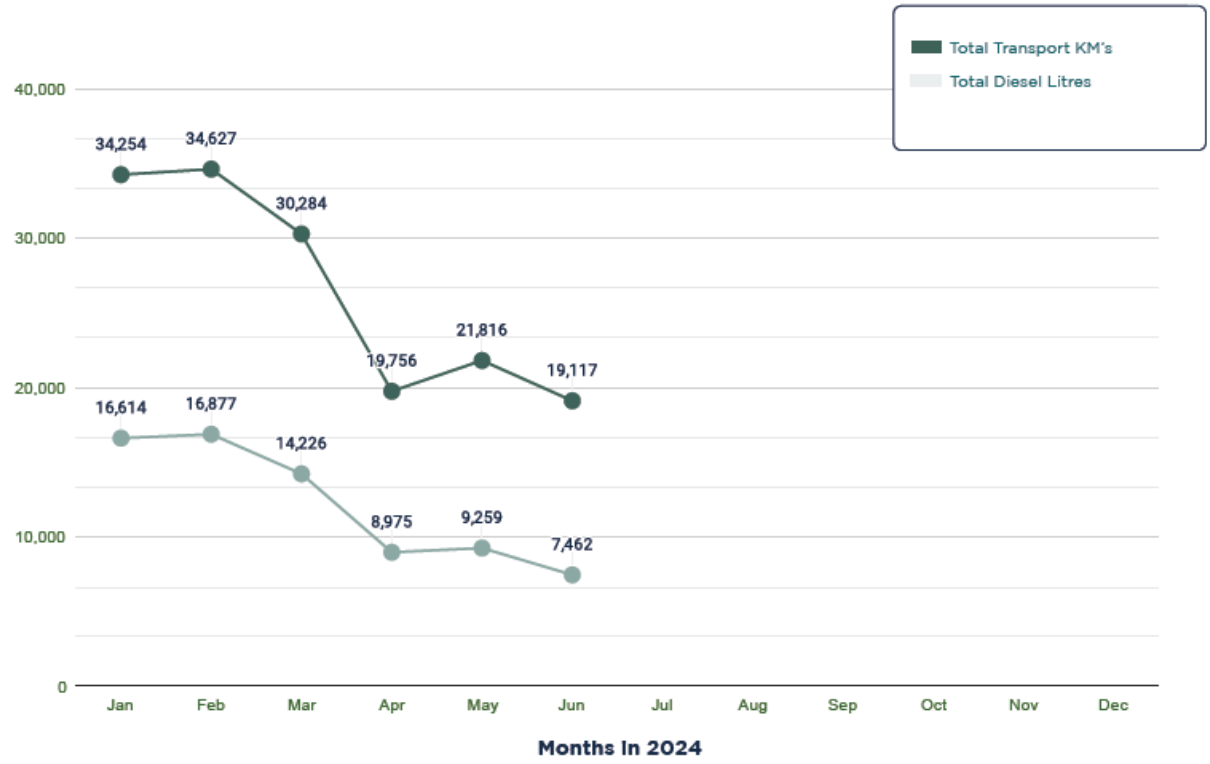


The (%) of the total diesel used per month, by each transport type in 2024

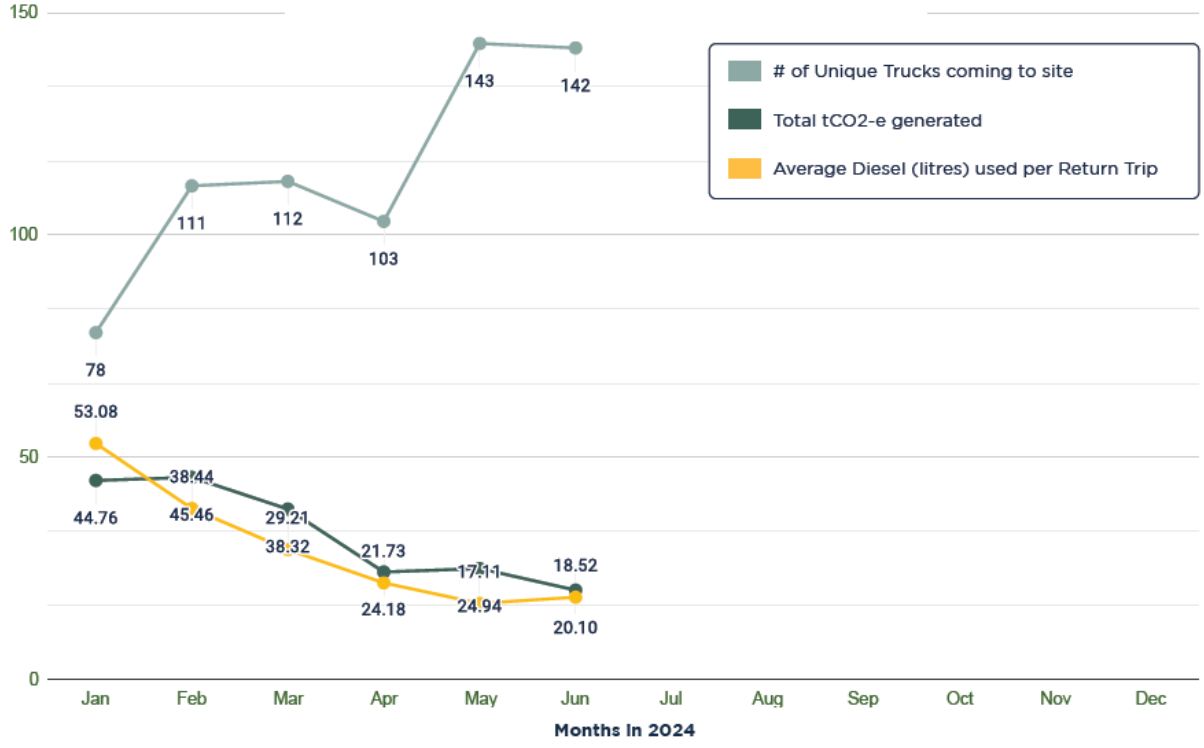
Total Diesel for Q2 '24
25,696 L

	J	F	M	A	M	J	J	A	S	O	N	D
Access Equipment	1.7%	14.8%	2.6%	3.4%	7.4%	7.6%						
Civil & Siteworks	3.2%	2.9%	2.7%	4.2%	6.9%	4.1%						
Concrete	6.1%	8.5%	9.8%	11.7%	8.7%	4.5%						
Façade	-	-	0.4%	-	0.9%	0.3%						
Fitout	-	0.1%	8.9%	2.4%	3.2%	5.8%						
Other Trucks	0.6%	0.7%	-	-	0.1%	0.1%						
Precast	12.0%	20.3%	14.0%	24.6%	21.5%	10.6%						
Steel & Reo	75.9%	51.8%	60.2%	51.1%	50.4%	65.4%						
Waste Collection	0.6%	0.9%	1.4%	2.6%	0.9%	1.6%						

Total Transport (Km's) & Diesel (Litres) per month, in 2024



Other various statistics as a result of analysing our transport



Transport to Site

We continue to survey the workers and staff on site at our regular site BBQ's to determine the themes of how people are coming to site. This survey is performed every 12-16 weeks and forms the basis of our calculations. Our findings and calculations are then based on workable days and average number of workers on site across the relevant quarter.

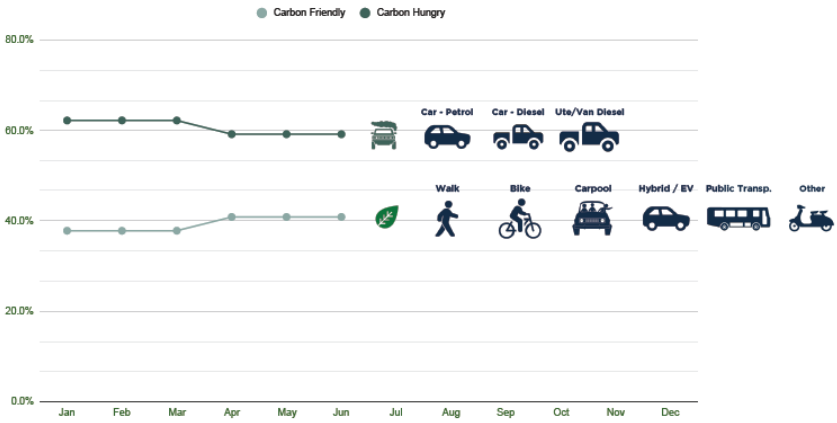
285
Average number of workers on site for Apr-Jun 2024

60.7%
Average % of Transport to Site options from **Carbon Hungry** modes in 2024

39.3%
Average % of Transport to Site options from **Carbon Friendly** modes in 2024

27.40tCO2-e
the amount of Carbon Emissions that we estimated we saved in across Apr-Jun 2024, as a result of workers biking, walking & taking other friendly modes of transport (compared to utes & cars)

How workers are coming to site, % of Carbon Hungry / Friendly Modes



How workers and staff are travelling to site, based on averages	Apr-Jun (Qtr2 '24)	'24 Ave.	Var (Q2'24 vs 2024 ave)
Car (Petrol)	7,658 R.T (42.4%)	37.3%	+5.1% ▲
Car (Diesel)	552 R.T (3.0%)	4.3%	-1.3% ▼
Car (Hybrid)	483 R.T (2.7%)	1.9%	+0.8% ▲
Car (EV)	70 R.T (0.4%)	0.2%	+0.2% ▲
Ute / Van (Diesel)	2,484 R.T (13.7%)	19.1%	-5.4% ▼
Walk	1,656 R.T (9.2%)	7.4%	+1.8% ▲
Bike	1,104 R.T (6.1%)	6.4%	-0.3% ▼
Carpool: Passenger (Petrol)	620 R.T (3.4%)	4.5%	-1.1% ▼
Carpool: Passenger (Diesel)	1,449 R.T (8.0%)	11.8%	-3.8% ▼
Carpool: Passenger (Hybrid)	70 R.T (0.4%)	0.8%	-0.4% ▼
Carpool: Passenger (EV)	0 R.T (0.0%)	0.0%	-
Public Transport	1,518 R.T (8.4%)	4.8%	+3.6% ▲
Other	414 R.T (2.3%)	1.7%	+0.6% ▲

R.T Returned Trips to Site
Carbon Friendly Modes

Workers travelling to site via Public transport had an increased difference of 3.6% than the yearly average along with workers travelling to site via walking also having an increased difference of 1.8% than the yearly average.

Waste Generation & Landfill Diversion

***Target** - 50% diversion from landfill.*

Current Status – We have diverted construction waste from landfill as represented below.

- Q2 2024 (April-June) diversion: **41.5%**
- Q2 2024 (April-June) diversion *(Incl repurposed contaminated soil, Site and Offices)*: **99.76%**
- Historically project overall diversion *(Includes Site and Offices)*: **58.0%**
- Historically project overall diversion *(Incl repurposed contaminated soil, Site and Offices)*: **99.3%**

This has been achieved through working with our partner UpstreamNZ to implement our waste strategy for the project, which included the following initiatives this reporting period.

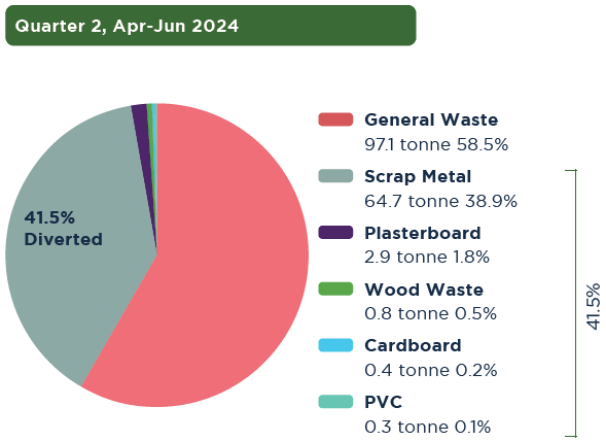
- We continue to work with the appointed Waste Management company to identify materials from the waste yard which could be repurposed and diverted from landfill
- We are collaborating with the labour force in charge of waste sorting at the Te Kaha site and find ways of improving diversion.
- New waste diversion streams introduced, plasterboard, wood, cardboard and PVC offcuts.
- Continuing to review monthly reports and conducting visual audits of waste contamination onsite, discussing with subcontractors where applicable for correct waste stream and supplied bins onsite.
- Changeover of bin lid colour in office downstairs to assist site safe in separating cardboard and plastic recycling.
- Reporting inclusion of repurposed contaminated soil onsite added in Q2 2024 report:
  - Reused onsite within the Foundation, Sediment Retention Ponds (SRP's), Field of Play (FOP) and surrounding site.
  - As a result of testing the soil and contamination levels being low enough we were able to divert from landfill and reused at Winstone Quarry as part of their rehabilitation programme.

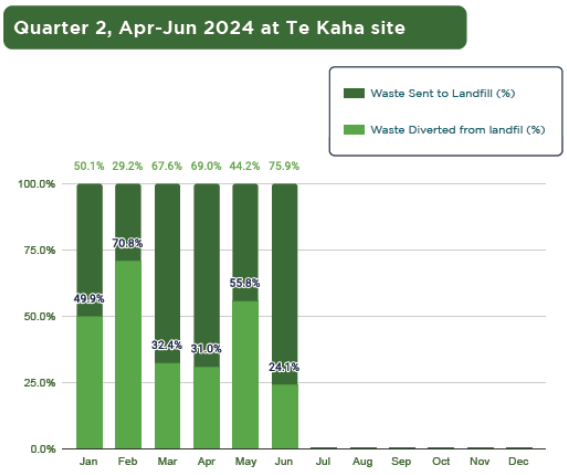
Quarter 2 2024 (April-June) diversion

166.2t
Total amount of waste (tonnes) removed from Site for Quarter 2, Apr-Jun 2024

97.1t (58.5%)
Of the waste in this area has been ***sent to landfill*** over Quarter 2, Apr-Jun 2024

69.1t (41.5%)
Of the waste in this area has been ***diverted from landfill*** over Quarter 2, Apr-Jun 2024



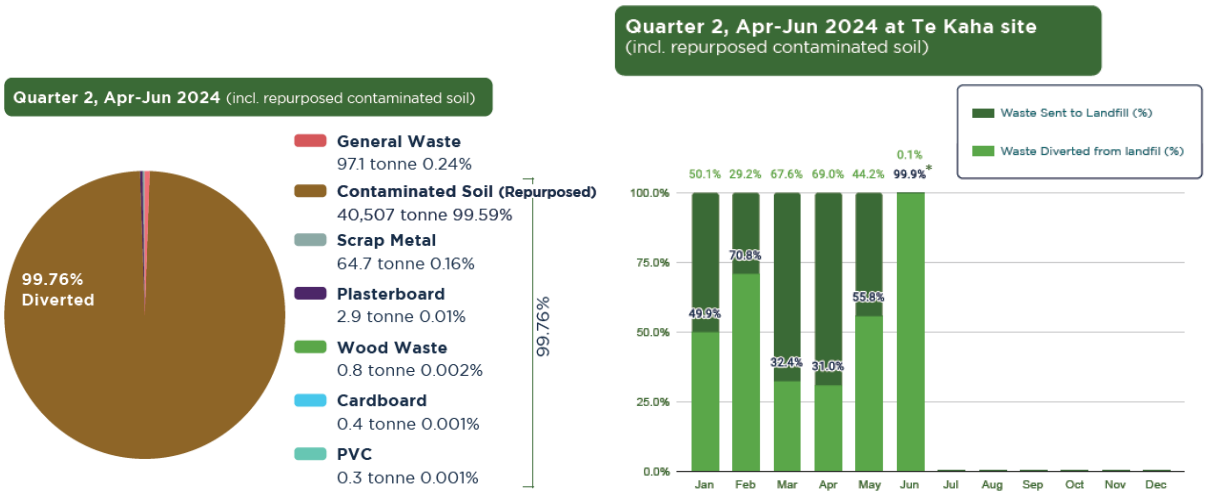


Quarter 2 2024 (April-June) diversion (*Incl repurposed contaminated soil, Site and Offices)*

40,546t*
Total amount of waste (tonnes) removed from Site for Quarter 2, Apr-Jun 2024

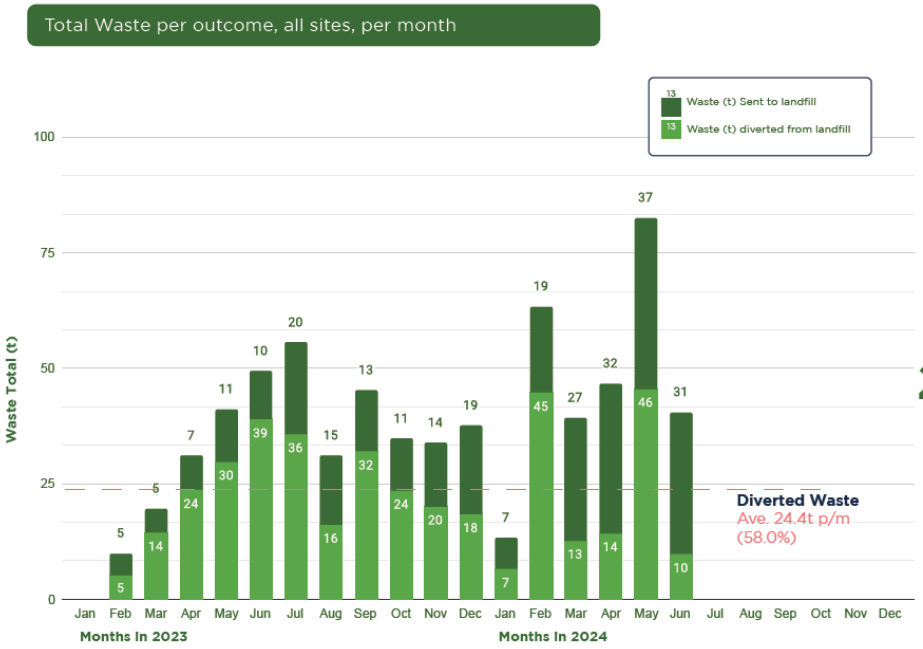
97.1t (0.24%)
Of the waste in this area has been ***sent to landfill*** over Quarter 2, Apr-Jun 2024

40,517t (99.76%)
Of the waste in this area has been ***diverted from landfill*** over Quarter 2, Apr-Jun 2024



Contaminated Soil has been reused on site and diverted to Winstone Quarry over previous reporting periods. The data has been filed under June 2024 and accounted for in this quarter (Q2 2024)

Historically project overall diversion *(Includes Site and Offices)*



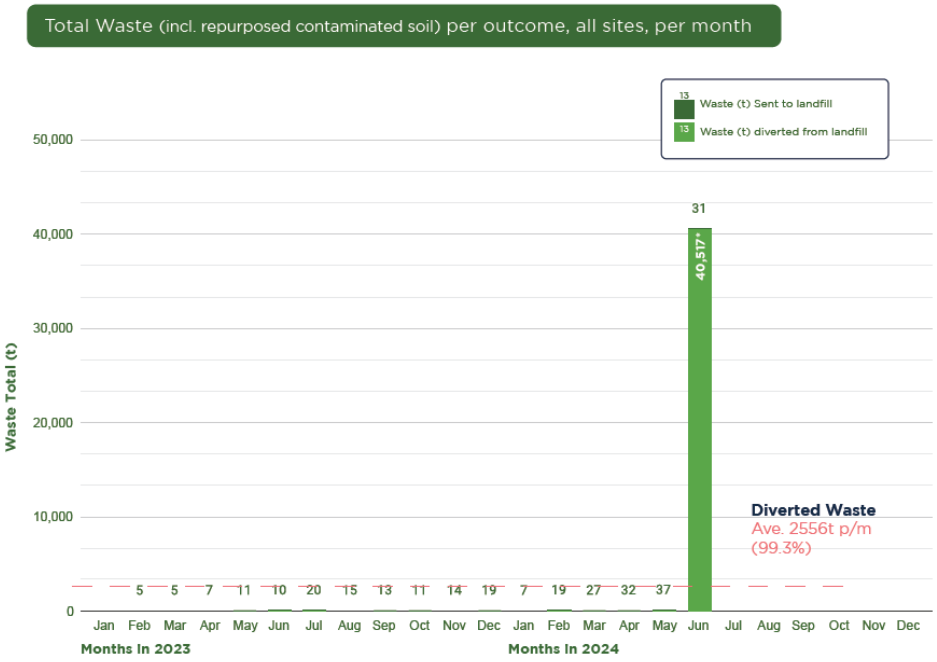
391.9t (58.0%)
of combined waste has been ***diverted from landfill*** through recycling, innovations and actions

historically

283.6t (42.0%)
of combined waste has been ***sent to landfill***

historically

Historically project overall diversion *(Incl repurposed contaminated soil, Site and Offices)*



40,899t*(99.3%)

of combined waste has been ***diverted from landfill* historically,** through recycling & repurposing materials, which included the contaminated soil we repurposed

283t (0.7%)

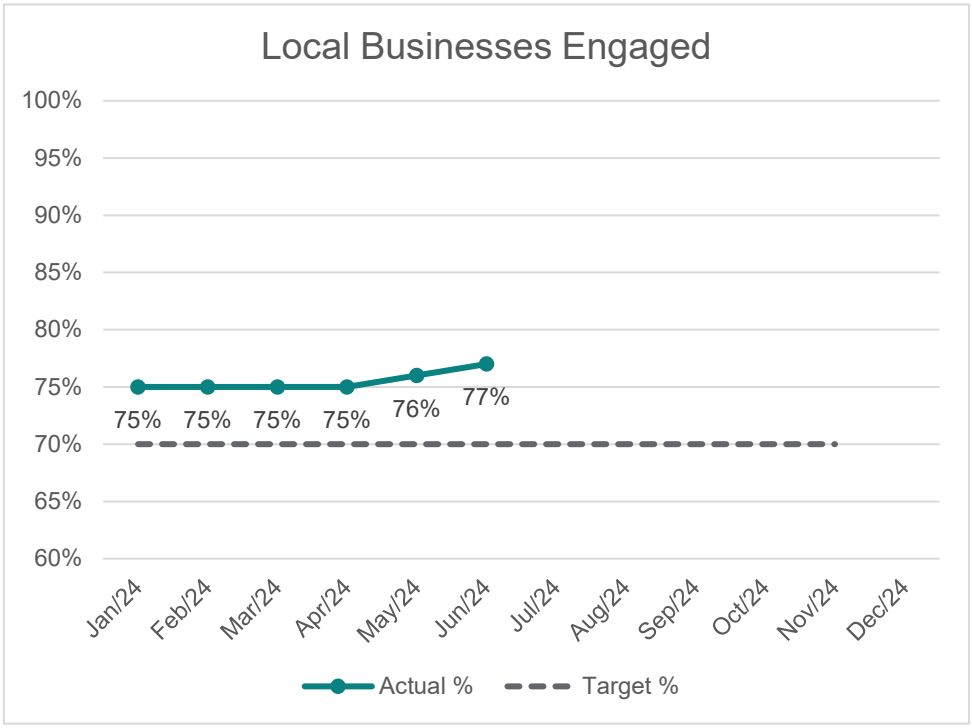
of combined waste has been ***sent to landfill* historically**

Contaminated Soil has been reused on site and diverted to Winstone Quarry over previous reporting periods. The data has been filed under June 2024 and accounted for in this quarter (Q2 2024)

Number of Local Businesses engaged (South Island)

***Target** - 70% local businesses engaged*

Current Status – 76% of Consultants, Subcontractors and supporting businesses engaged to date are local this quarter.



Number of local workers delivering the Te Kaha project (South Island)

***Target** - 80% of all inducted workers are local.*

Current Status - 90% of workers engaged to date on the project are local.

Workforce actively engaged in training and skills development

***Target** - 10% of working hours on site.*

Current Status – 12% of workforce engaged in training and skills development

NZ Building Cadets

BESIX Watpac Cadets (Fraser and Tiaan) travelled to Australia in Q2 to attend their most recent course for the graduate and early career program that covered effective decision making. With training provided in applying problem solving techniques to help decision making, identify appropriate solutions, use creativity, evaluate situations and people, predict outcomes and more.

BESIX Watpac External Training

BESIX Watpac and Southbase staff continue to complete Site Safe courses tailored to suit the relevant upcoming risks associated with each staff members responsibilities. Relevant staff have progressively completed working at height training this quarter along with regularly scheduled site safe renewal courses that expand health and safety knowledge.

Subcontractor Training

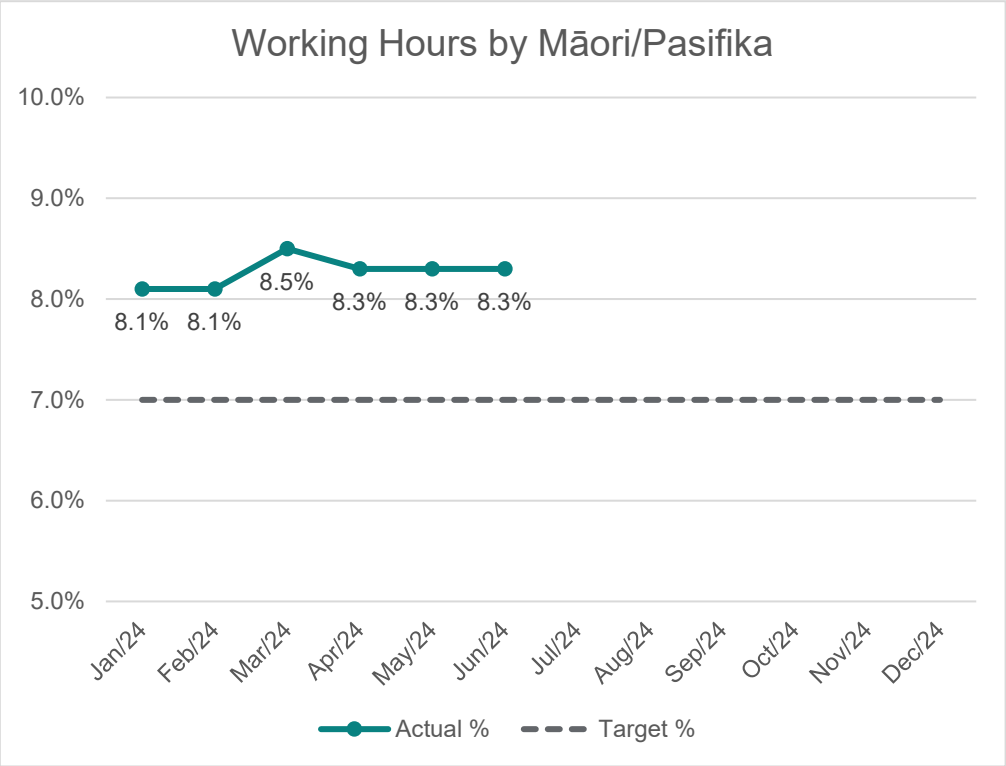
In April Jinggong completed the Work Safe first aid training for some of their staff onsite.

Along with further Mates in Construction training being held for numerous subcontractors onsite, refer to the Health & Safety – Mental Health Initiatives section for further details.

Working hours by Māori / Pasifika

***Target** - 7% of working hours onsite*

Current Status – 8.3% of working hours to date by Māori / Pasifika this quarter.



Community Engagement with Schools and Universities

***Target** - Minimum 4 activities per year*

Current Status – For the second year of the project (August 2023 – July 2024) as of June 2024 we have conducted seven activities to date as noted below.

- **17 August 2023** – Young Engineers Site Tour.
- **7 September 2023** – Wonder Project (Year 11 & 12 Hillmorton High School Students) Presentation and Site Visit.
- **September to November 2023** – Te Pūkenga (Ara) Overseas Graduate Diploma Construction Management Students – three groups of two work placement students.
- **11 October 2023** – Ara Students Site Presentation and Tour (Two groups of 20 students)
- **30 November 2023** – School of Screw Piling Site Visit through Revex Piling – Industry Day
- **March to April 2024** - Te Pūkenga (Ara) Overseas Graduate Diploma Construction Management Students – two groups of two work placement students.
- **13 May 2024** – Virginia Tech Site Presentation and Tour (30 Sophomore Students)

Te Pūkenga (Ara) Overseas Graduate Diploma Construction Management Students – Work Placements (2024 Intake)

Through our partnership with Te Pūkenga (Ara) we are completing our second year of hosting work placement students with this year consisting of two students at a time in two separate groups. Our second group of students, Pratik and Michael completed their placement in Q2.

Following hosting our most recent work placement students from Te Pūkenga (Ara) earlier in the year, we have onboarded Ameena Valiyakath Kuttipurath in a permanent role as our new document controller, a diverse role that provides interactions with all members of the team and subcontractors.

Virginia Tech

BESIX Watpac hosted a group of 30 engineering students from Virginia Tech onsite in May as part of their VT Rising Sophomore Abroad Program (RSAP). This program combines a semester-long course with a two week international module abroad to provide students a taste of how engineering disciplines are applied comparatively around the world and encourages further engagement in travel, study and work abroad during their time at Virginia Tech. This year's program contained students from varying engineering disciplines including civil, electrical, industrial, aerospace, biomedical and computer engineering.

Commitment to providing the living wage

Target *- 100% on site workers being paid at least the living wage rate, excluding apprentices and trainees.*

Current Status – 100% of Subcontracts awarded to date and executed include agreement to this Condition.

Encourage and enable cycling to work

Target *– Up to 50 bike parks pending on take up.*

Current Status – Following providing additional bike racks within our office/cafeteria space, the quantity of people travelling via biking has increased by 1.4% when comparing 2023 (5.1%) to 2024 (6.5%). Statistics revealed that workers biked to site 1088 times in 2023 and at this rate workers in 2024 are projected to do over 3000 return trips (by bike). We continue to monitor the uptake of site workers cycling to work and if any additional bike racks are required.

Health & Safety – Mental Health Initiatives

Target *– Bi-annual mental health function held on site.*

Current Status – We continue to hold a range of functions to celebrate our most recent milestone accomplishments while also recognising opportunities to raise important initiatives and discussion points at varying times of the year as noted below:

Site BBQ's

Our most recent site BBQ was held on 3rd May 2024 with our highest attendance to date, celebrating recognition of everyone's contribution to the project to date.

Mates in Construction

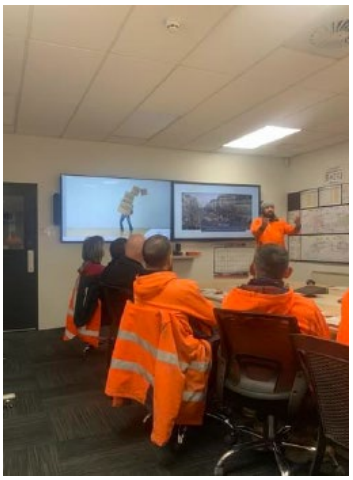
This quarter we continued to collaborate with new subcontractors onsite to pick up the trades that have since started and wanted to complete the mates inducted training. We hosted numerous mates inducted training onsite in our meeting room this quarter for the below companies:

- Cake staff attending a session on the 25 April 2024
- Ellis Air and Graham Surveying staff on 18 June 2024
- Evolve, Jinggong (Incl Triangle) and KME staff attending 25 June 2024

We have received positive feedback from those that attended and look to review further workshops to be hosted in our site offices along with flow on connector training.
Mates in Construction Charles and Nate also attended our most recent site BBQ held on 3 May 2024.

MATES INDUCTED

MATES CONNECTOR



Construction Phase Water Consumption

Target *– Te Kaha project used as a case study.*

Current Status – We continue to track and monitor our water usage for both the office and site as the project progresses.

Te Kaha Site (220 Madras Street) – Water Usage

136
Cubic metres (m3) water used for Q2, Apr-Jun 2024

125,000
(L) used for Dust Supression & Wash Downs

92.27%
% used for Dust Supression & Wash Downs

1,373
Daily water use (L) for dust supression/wash downs p.d

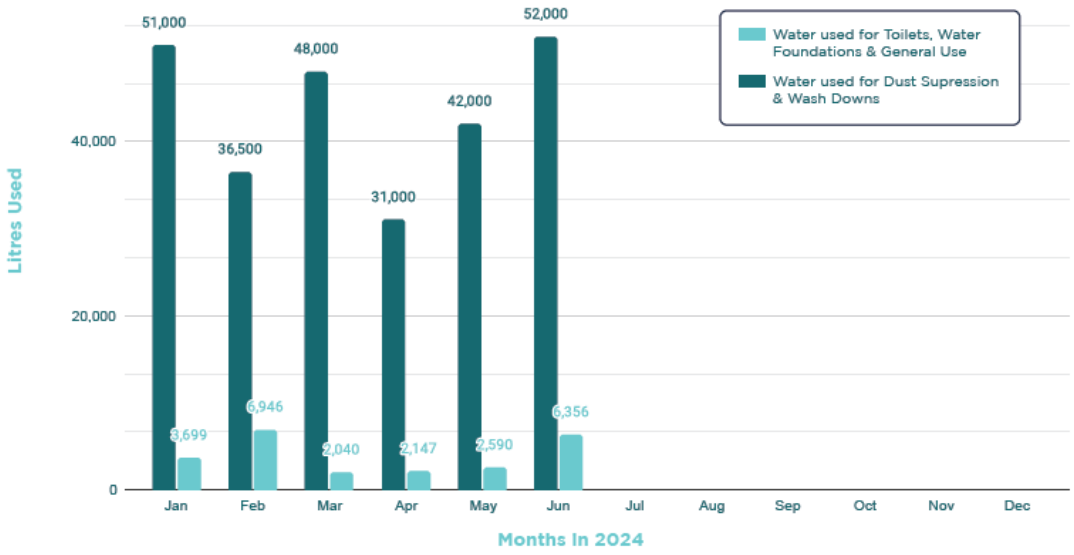
136,093
Litres (L) of water used for Q2, Apr-Jun 2024

11,093
(L) used for Toilets, Water Fountains & General use

7.73%
% used for Toilets, Water Fountains & General use

122
Ave. Daily water use (L) for general use, per day

Water use, per month (Litres) on Te Kaha site



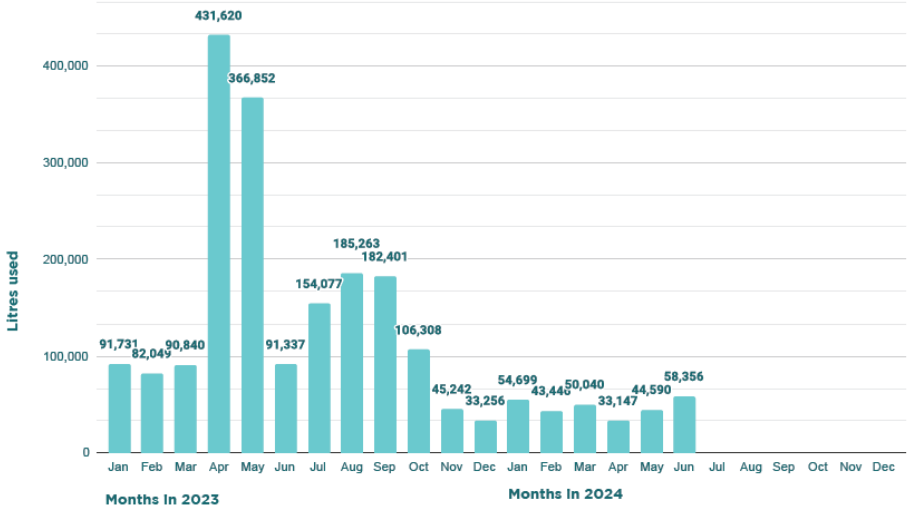
136m³
Total Water Used from all sources (in Cubic Metres) over Quarter 2, Apr-Jun 2024

33.2m3
Apr 2024

44.5m3
May 2024

58.3m3
Jun 2024

Total Water (litres) used on Te Kaha site, historically



Office and Amenities (274 Tuam Street) – Water Usage

300.2m3

Total Water Used (in Cubic Metres) for Q2, Apr-Jun 2024

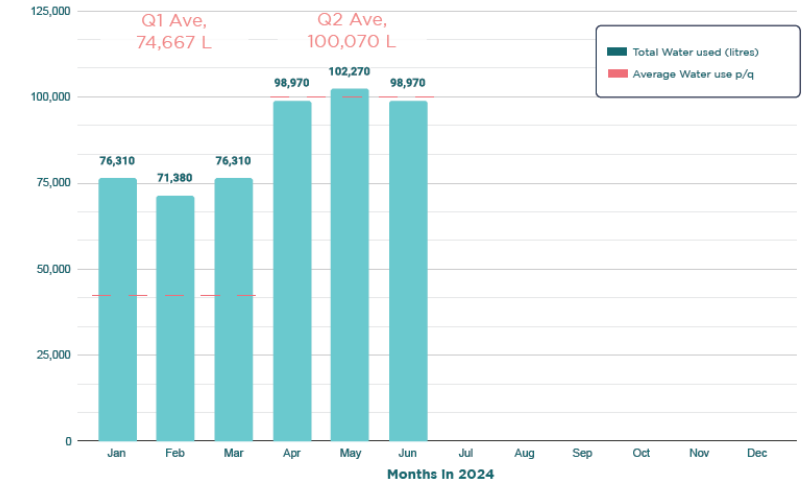
91

Days this usage relates to Q2, Apr-Jun 2024

3.29m3

Is the daily average that this area is using, over Q2, Apr-Jun 2024

Total Water (litres) used at 274 Tuam St, in 2024



285

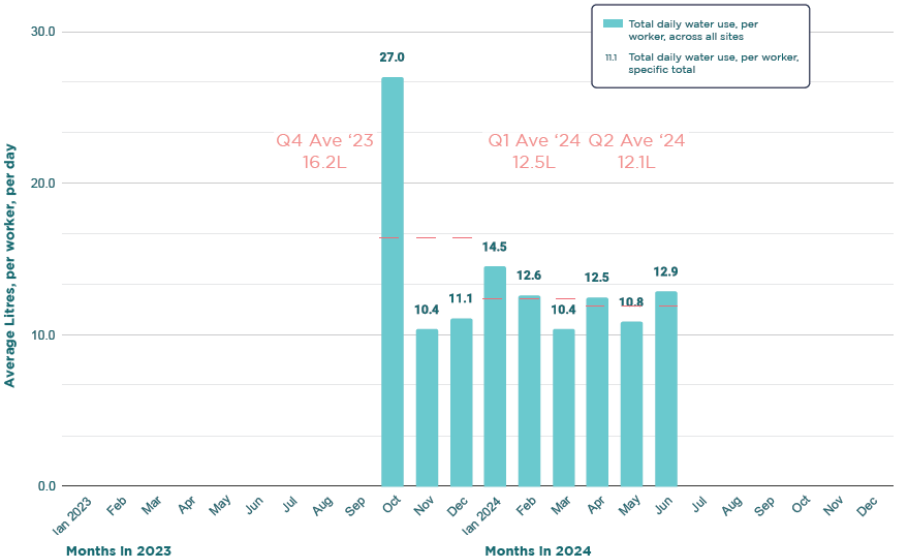
The ave. number of workers using the water facilities per day

11.63L

Is the average daily water use per worker on site, for Q2 2024

Water Usage Combined (Site and Office)

Average Daily Water use, per worker (Litres)



49L

Christchurch City Council water services predict that construction sites would use an average of 49L of water, per worker, per day. This water is for general use, such as drinking, toileting, showers etc.

12.9L

In June, this was total daily water use, per worker across the all Besix Watpac sites (which included Te Kaha, offices, break room)

26.2%

We are only using a fraction of the estimated use for construction sites

Other Initiatives

Target *– No specific target*

Current Status – BESIX Watpac and the wider group of Te Kaha consultants and subcontractors continue to engage in a range of other initiatives in the past quarter as noted below:

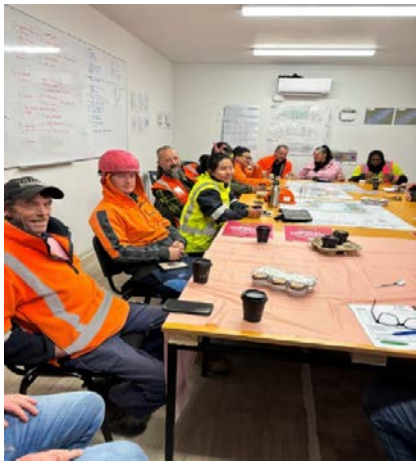
Lean in Circles

During Quarter two of 2024 our BESIX Watpac female staff continued to participate in their monthly lean in circle group catch ups with this quarter covering the below topics:

- 'Brand You' workshop reflection from previous workshop held in March (Q1)
- 'Financial Wellbeing' pre discussions held in monthly catchup's prior to the next workshop scheduled to be held on 3 July 2024 (Q3)

Pink Shirt Day

BESIX Watpac staff got behind supporting pink shirt day this year in line with the initiatives that are supported by Mates in Construction. This year we had a great turn out of staff wearing pink on the day, including purchases of the sponsored shirt that generates money donated to the initiative. Our Health & Safety Committee also held a morning tea supporting this cause with some locally sourced pink cupcakes from Thrive café (which supports the Chch City Mission) and discussed the meaning behind Pink Shirt Day being to promote kindness, compassion and understanding towards others.



Pink Ribbon

Our annual participation in Pink Ribbon day continued with BESIX Watpac having a staff morning tea and collecting donations in May raising a total of $156 that was donated to Breast Cancer Foundation NZ.

BESIX Watpac Family Day

Our second inaugural BESIX Watpac NZ Family Day was held 19 May 2024 at the local Archie Bros at Hoyts Entx where we all enjoyed a game of bowling and food afterwards.

Oceania Athletics Championships

Matthew Taylor one of our Site Engineer's continues with his running outside of work and recently travelled to Fiji with the NZ team for the Oceania Athletics Championships. As the BESIX Watpac team huddled around a computer screen to cheer him on remotely, we were all pleased to see him finish third for the 5000 metre race.

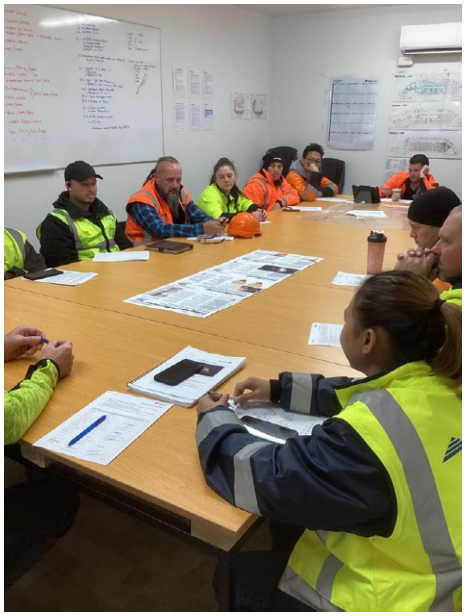
Major Championships - Other competitions							
Pl.	Discipline	Mark	Wind	Race	Competition	Venue	Date
3.	5000 Metres	14:15.06		F	Oceania Athletics Championships	HFC Bank Stadium, Suva (FIJ)	05 JUN 2024

Rānui House – Starry Night

BESIX Watpac supported Ranui House and the Bone Marrow Cancer Trust in their most recent fundraising event Starry Night held on Thursday 27 June 2024. This was an unforgettable cocktail function with canapes created by seven of Christchurch's top award-winning chefs, live music, raffle, silent and live auctions. The team and their partners had a great night celebrating and supporting a local cause that collectively helped raise $90,000.

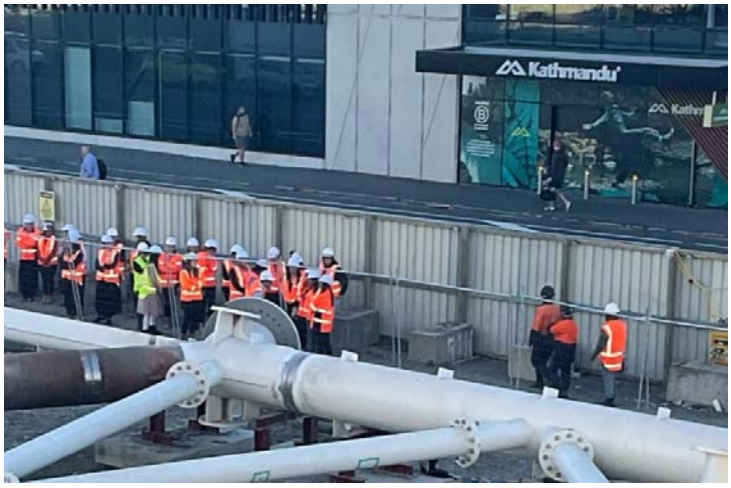
National Men's Health Week

The second week in June was National Men's Health week which is another initiative that is supported by Mates in Construction. This gave us an opportunity to promote awareness to health issues that affect men disproportionately and focused on getting men to become aware of problems they may have or could develop and gain the courage to do something about it. We discussed a range of topics within our regular Health and Safety Committee meeting as well as toolbox talks with other trades.



Site Visits

- Women in Infrastructure (18 April 2024)
  - BESIX Watpac hosted a site presentation and tour for thirty members of Women in Infrastructure.
- Planning Group (10 May 2024)
  - A group of local planners (from other Councils and ECan) visited site after a presentation at the CCC office.
- WSP (6 June 2024)
  - BESIX Watpac hosted a site tour and presentation for WSP Staff.
- Jasmax (19 June 2024)
  - BESIX Watpac hosted a group from Jasmax onsite providing a site presentation and tour.




CRUSADERS
CRUSADERS

Appendix Three

BESIX Monthly Sustainability Report (July, 2024)

3. Environmental & Sustainability

3.1 Environmental

3.1.1 Audit Reports / Visits

Refer to Section 7.1

3.1.2 Construction Effects

3.1.2.1 Noise

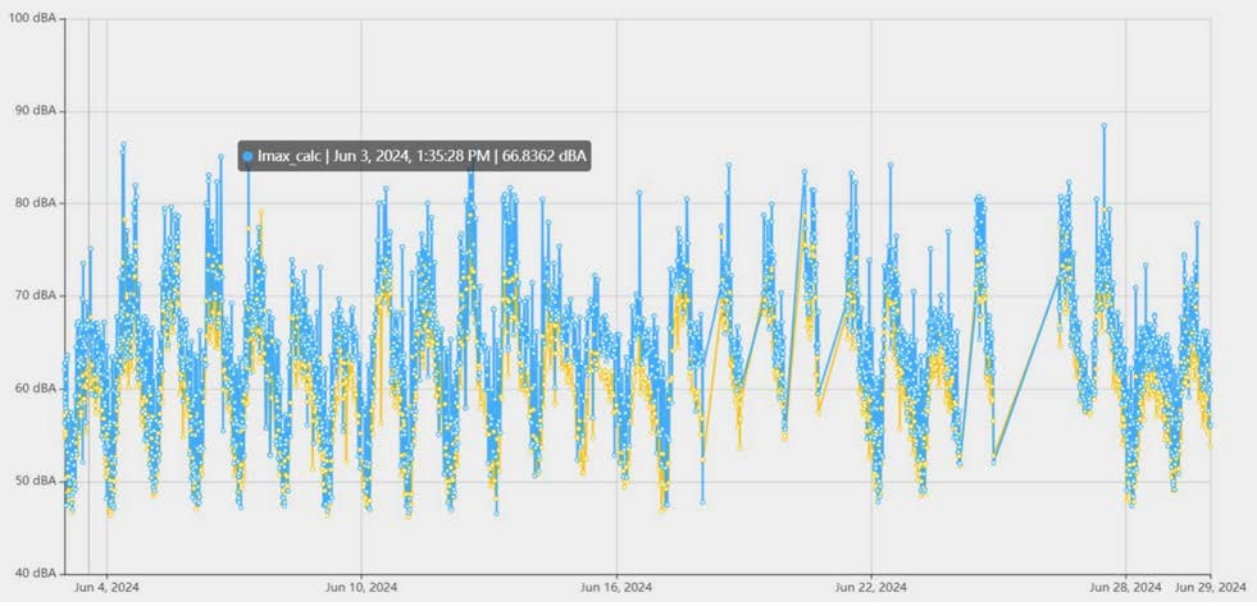
The monitoring of construction activities on site at the closest site boundary receptors generally sat below 75 dBA. There are instances where the results peak for short durations between 80 – 85dBA with some minor exceedance of 85dBA.

These results are within the recommended limits for construction noise received in residential areas (NZS 6803:1999).

We have relocated the Tuam Street noise logger to the north boundary to better understand the readings here due to some recent complaints from the north end of the project.

Night works is being restricted to essential works with work activities planned to minimise noise.

We are updating the Construction Management Plan to include measures associated with the requirement to work “outside normal working hours” to complete welding works associated with the roof construction, this will include an assessment by Marshall Day.



Noise monitoring results for the reporting period

3.1.2.2 Vibration

Vibration monitoring undertaken in the reporting period, complies with DIN 4150.

3.1.2.3 Dust

Continued vigilance is required during windy days.

3.2 Sustainability

3.2.1 BESIX Watpac & UpstreamNZ

With our partner UpstreamNZ we continue to promote sustainable outcomes for the Te Kaha project that go beyond those initial target metrics we undertook to achieve.

Through UpstreamNZ we have engaged the following works through social procurement which has generated 212 hours of community support for young people as a result.

- Painting contractor for the onsite workforce facilities.
- First Aid Training.
- Sourced cleaning and safety products.
- End of year Impact Boxes (All items made in Aotearoa & environmentally sustainable)
- BESIX Watpac branded umbrellas, Hard hat Labels and other merchandise.
- Fire Extinguishers for the office and site inclusive of regular servicing.
- Printing of A1 colour plans & laminated plans.
- Site BBQ – Food & Drink supply.
- BESIX Site Staff obtaining private WOF's with a local (Tuam St) mechanic.
- Christmas Ham Fundraising Initiative
- Purchase of further whiteware for the office/cafeteria space