

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

ACENZ Innovate NZ Awards of Excellence 2016 submission

Story: Design Teams Work Together for Common Goal

Theme: Design

A submission produced by the consultancies for the ACENZ Innovate NZ Awards of Excellence 2016, providing details into how the design team supporting SCIRT was formed, and how successful design delivery was achieved.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



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ACENZ INNOVATE NZ AWARDS OF EXCELLENCE 2016



**SCIRT (STRONGER CHRISTCHURCH INFRASTRUCTURE
REBUILD TEAM)**

CATEGORY: Collaborative Working Agreement

Submitted by Beca, AECOM, Aurecon, Opus, GHD,
Jacobs, MWH, Woods

April 2016



Contact

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Project name	SCIRT
Project location (address and city; no PO Boxes)	Christchurch, NZ
Project Completion Date	Operating since September 2011
Client Organisation	SCIRT Alliance
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Project Details

Date	3/23/2016
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Has the project been approved to be entered by the CEO or other suitable senior person?	Yes
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If this project is similar to another you have entered for an ACENZ award, or to an entry by some other firm, describe what refinements to this project have been added.	N/A
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Innovative Feature	The consultants quickly organised themselves in a professional and innovative way to meet the needs of the city within a delivery mechanism prescribed by the SCIRT alliance partners
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Please provide CWA Partner (s) or Alliance (s) contact details	The entry is being submitted jointly by Beca, Aecom, Aurecon, Opus, GHD, Jacobs, MWH and Woods - All ACENZ members. Beca is co-ordinating, and contact details above. The final submission will be jointly prepared. Approx. 85% of effort from these consultants on the project.. Four other consultants were involved with very minor roles (around 5% total), notably Pattle Delamore Partners (PDP), E2 Environmental, Davie Lovell Smith and WM Group. CCC were the other service provider, with about 10% contribution - contact Ron.clarke@ccc.govt.nz
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Position	Business Director - South Island Infrastructure
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Principal Disciplines	Civil Engineering
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Project Description	In response to the Christchurch earthquakes an Alliance was established between five contractors, Christchurch City Council, NZTA and CERA to deliver the infrastructure rebuild. Design services were not included in the Alliance, but were engaged separately in a collaborative working environment (as if part of the Alliance). Four Design teams were built on the basis of local resources, team leaders, knowledge of damaged infrastructure, capability, ability to deliver the required volume of work, commitment to work collaboratively and rates. In addition a Professional Services Advisory Group (PSAG) was established to work with SCIRT on- strategic management- agreeing rules of engagement- optimising local resources- ensuring sustainability of resources- establishing and monitoring behaviours. The consultants put aside differences to work collaboratively, quickly establishing a strong delivery team to respond to the needs of the City, with up to 176 designers from 12 different firms and CCC. This is great consulting and added significant value to the Christchurch rebuild.
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Signed	Richard Holyoake
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ENTRY FORM

INNOVATE AWARDS 2016

To your knowledge, is this project unique in New Zealand? ☐ Yes

To your knowledge, is this project unique in the World? ☐ Yes

Category Collaborative Working Agreement (CWA)

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Submission details	
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Principal contractor: Not applicable	Company: Name: Landline: Mobile: Email: Physical address:
Principal advisor: Not applicable.	Company: Name: Landline: Mobile: Email: Physical address:
Specialist advisors: Not applicable	Company: Name: Landline: Mobile: Email: Physical address:
Other consultants or contractors	Christchurch City Council Design Resources were employed on the project, approximately 10% of the staff – contact Ron Clarke, ron.clarke@ccc.govt.nz , 03 941 8712, 0276 377 959. Other consultants included Pattle Delamore Partners (PDP), E2 Environmental, Davie Lovell Smith and WM Group (<5%)
List of suppliers	Company: Name: Landline: Mobile: Email: Physical address:

1. Executive Summary

The 2010/2011 Christchurch earthquakes created a unique situation where approximately \$2 billion of horizontal infrastructure required repair or replacement.

Immediately after the September 2010 earthquakes, Christchurch City Council (CCC) established IRMO, (Infrastructure Recovery Management Office), co-ordinated “pods” of contractor-led repairs across the city. Various consultants worked in support of the IRMO pods.

The scale and complexity of damage and requirements became apparent. As a result, CCC, CERA and NZTA elected to establish an alliance (SCIRT) with non-owner contractor participants to deliver an integrated and co-ordinated programme of recovery work. The non-owner participants were Fulton Hogan, Downer NZ, McConnell Dowell, City Care and Fletcher Construction.

The alliance sought thoughts from the consultancy industry on how professional services should be procured after a decision was made that consultancy services would not be represented in the management or governance of the alliance.

Many different models of interaction between designers and construction were discussed in forums during the first half of 2011. Discipline-based versus geography-based or design organisation-based Design Teams were also debated, examined and critiqued by both the consulting community and SCIRT.

Significant time and effort was invested by consultants in this development stage with no real certainty or idea about what the final outcome might be. Trust and collaboration with a focus on the overall positive outcome for Christchurch were strong.

In June 2011, SCIRT released an RFP for Professional Services, looking to procure Lead Design Organisations (LDOs), immediately creating

tension in the consultancy community as there would clearly be “winners” and “losers”, with respect to the volume of work. Not surprisingly, consultant behaviours changed to be more competitive.

During this process SCIRT were still grappling with how work might be allocated and how efficiencies might be gained through design excellence if design leads were design company led.

In July 2011, four LDOs were selected and as expected, some companies were happy and others disappointed. Through a series of meetings and briefings over a period of about two weeks, significant effort was expended to rebuild trust, and build a successful team to deliver the “Best for Christchurch”. Successful LDOs, unsuccessful companies involved, representatives of small firms and ACENZ (Andrew Read) worked together to establish a positive way forward. A Professional Services Advisory Group (PSAG) was established on 8 September 2011 to “provide advice and support to SCIRT as representatives of the professional services industry to deliver the best for Christchurch”.

Rules of engagement were agreed as follows:

- Best for Christchurch
- First preference to Christchurch domiciled people
- Transparency of selection – best for project
- A collaborative, enjoyable culture
- Grow our people
- Look after everybody (including safety)
- Self-management
- No poaching.

The documented goal of the designers was: “Pride in the legacy we are creating in our people, our profession and our city.”

This submission outlines why the consultant input into the development of SCIRT is an example of great consulting which added significant value to the Christchurch rebuild.

2. Descriptive Technical Report

2.1 Complexity

The Christchurch earthquakes of 2010 and 2011 created a need for response, repair and rebuild of infrastructure. Initial activities of consultants were a direct response to the needs of the community and clients. After the September 2010 earthquakes, Christchurch City Council (CCC) established IRMO (Infrastructure Response Management Office) “pods” that were contractor-led to repair infrastructure in different areas of Christchurch. Consultants aligned themselves with contractors and the rebuild of horizontal infrastructure commenced.

However, as the scale and complexity of damage across the city became apparent after the February 2011 earthquakes, CCC, CERA and NZTA started considering options for a co-ordinated delivery station and eventually elected to adopt an alliance model. Consultants continued to deliver strongly under IRMO with some nervousness about what the new model would bring.

With the formation of the SCIRT alliance comprising CCC, CERA, NZTA, Fletcher Construction, Fulton Hogan, Downer NZ, McConnell Dowell and City Care, the industry was asked to contribute to how design resource might be structured from a delivery perspective, albeit being very clear that there was no intention of designers being “part” of the alliance – they would instead be engaged by the alliance.

Advice was sought from the consultancy community on how delivery might both provide the volume of design required, allow for sharing of technical knowledge and consistency, and provide value to SCIRT. A significant amount of effort was expended by consultants in proposing, discussing and critiquing different arrangements ranging from geographic pods (like IRMO) to discipline-led terms or design organisation-led teams.

The consultancy community focussed on how design services could be available to the alliance both from CCC and the wider consultancy community on a “Best for Christchurch” basis. All of these options had implications for the consultants and would affect how and who might be engaged, as well as having implications for how value for money would be demonstrated, design risk would be anchored and consistency of the technical solution.

Ultimately SCIRT elected to issue an RFP for Lead Design Organisations (LDOs) with the prospect of “winners and losers” leading to an immediate change in behaviour from collaborative to competitive. This also created the prospect for some that staff on the IRMO programme of work may not continue under SCIRT, and for others that already stretched (with recovery work) staff may be required for SCIRT. The SCIRT criteria for LDO submissions were:

- Local presence
- Rates
- Capability of team leader
- Previous experience with CCC and business systems.

The decision on four teams would allow for competition and collaboration within the overall design team.

The initial expectation was that the whole design team could deliver \$30million to \$40million of physical works per month, but it was difficult for SCIRT to estimate just how many people would be required for permanent works design.

The RFP process resulted in four LDOs being selected in July 2011 and SCIRT establishing ground rules for team composition (as discussed in section 2.3 below) particularly around the requirements for fully multi-disciplinary teams. A proportion of every team required to be non-LDO staff and CCC staff, and for the use of non-fly in – fly out (FIFO) staff. Each team was expected to operate under their ISO accredited quality system of the LDO. SCIRT’s aim was to provide a fully-integrated group of professional engineers from within Christchurch and across as many consulting organisations as possible. The scale of the programme (\$2.2billion over five years) required effective and motivated teams.

Another key complexity was establishing appropriate commercial arrangements. The owner participants in particular wanted competitive tension between the teams, as well as knowledge sharing and composite teams. A small team negotiated appropriate conditions and worked through project insurance and “no sue” arrangements with SCIRT to enable free and willing information sharing and innovation for the good of Christchurch and ultimately the engineering profession.

2.2 Innovation

The consultants involved responded willingly and collaboratively to address the complex challenges posed by the scale of the rebuild and the framework established by SCIRT.

From as early as June 2011, the consultants worked with SCIRT to develop a professional services model based on philosophies of:

- Maximising advantages of current technical knowledge and contractor relationships
- Pooling the best talent and removing institutional barriers
- Involving CCC staff and the wider consultancy community
- Inputting our knowledge on delivery
- Supporting the alliance objectives of safety
- Value for money and service
- Embracing a model to motivate best performance, decrease delivery time and maximise value.

In particular, consultants worked together in a working group until the LDO RFP was issued (during which time, the working group was suspended) and then after the LDO outcome, established a Professional Services Advisory Group (PSAG) to support SCIRT. The PSAG was established through a “Guideline Group Meeting” on 25 August 2011, followed by a more formal PSAG on 8 September.

At this meeting, the goal of the PSAG and Principles were agreed, along with the composition of the group.

The goal was agreed as: *“Pride in the legacy we are creating in our people, our profession and our city.”*

The principles established by the PSAG were:

- Best for Christchurch
- First preference to Christchurch domiciled people
- Transparency of selection – best for project
- A collaborative, enjoyable culture
- Grow our people
- Look after everybody
- Self management (of professional services).

Membership of the group was confirmed as ACENZ (Andrew Read) representing industry and smaller consultants, AECOM, Aurecon, Beca, CCC, GHD, MWH, Opus, SCIRT, SKM and URS.

A mandate for the Advisory Group was also discussed as being important and was agreed later as:

“To provide advice and support to SCIRT, to help build the horizontal infrastructure of Christchurch.”

Subsequent PSAG meetings focussed on health and safety, resourcing updates, commercial issues, and agreeing mechanisms for transparent staff selections and for administering “no poaching” provisions. A key challenge for the group soon after establishment was the requirement to build the design resource from 132 to 176 designers (44 per team) as the design target was lifted to \$50million per month.

A regular schedule of PSAG meetings has been held since this time, focussing on progress, health and safety, innovation, road blocks and staff development, and more latterly, transition of staff back into home organisations.



2.3 Depth & Extent of Technical Expertise

Upon appointment of the four Lead Design Organisations (LDOs), attention quickly turned towards forming the design teams. The breadth of technical skill expected in each team was confirmed as was the need to accommodate City Council Staff within the teams. From this point, through a series of weekly meetings, we set about establishing the depth and extent of technical expertise required and in parallel, team leaders set about the task of recruiting for these roles.

Initial team sizes were established using a simple top-down approach. A core of around 120 designers (30 per team) was required to achieve the monthly design output of \$20million to \$30million of physical work.

Given the requirement for the teams to start on the same competitive footing, each team required roughly the same number of each discipline and no one team could be established with any particular speciality. For example, each team needed a structural group able to design both bridges and retaining walls, rather than having some teams that focused on only one, or the other.

As the resource requirements were established, the challenge associated with actually finding these skills became more apparent. The scale of this challenge was different for each of the teams. Two of the LDOs already had co-located IRMO teams in Christchurch that could mostly be moved across to SCIRT. The other two LDOs resourced IRMO differently and needed to recruit more than half of their team. Rather than directly compete from the same resource pool, the two LDOs teamed up and held joint interviews with staff from other consultants. They then agreed who was best suited for each team.

The assignment of the City Council staff to each of the teams was also undertaken via a collaborative basis. CVs were circulated and, in a workshop, the four LDOs agreed on which team each individual was best suited to.

A key challenge for the team was the need to establish what to design and how to design it. For example, where we need to design for liquefaction buoyancy and how is it best achieved. We needed to establish how to approach resiliency in design? How robust should the designs be and / or how repairable should they be? How many design earthquake events should a design withstand? What is a design earthquake event?



The solution was to quickly develop world-leading expertise in resilient design and risk management. Design output could not wait, so we established technical teams to lead and align the designers and

groups to investigate and develop understanding. By involving Council, Consultant and Contractor expertise in this process, new approaches could be quickly developed and implemented. They could also then be quickly changed again multiple times, as learnings developed. The overall approach was very fluid and inclusive.

Another challenge related to getting all of the designers working with the same tools and customising those tools to an industry leading standard. Particular training and development went into the GIS and 12d design tools – both receiving numerous awards within their industry sectors.

Although each team was intended to be equivalent in technical capability, there were naturally senior engineers with particular areas of expertise others with a flair for innovation. The sharing of knowledge, innovations and tools across teams, rather than just within teams, took off as the benefits of creative feedback could easily be seen. Many of the best ideas were developed over lunchtime discussions, with whoever happened to be at the lunch table at that time.



The legacy of SCIRT extends well beyond all the standard design approaches, tools, systems and technical knowledge gained. As an industry we learnt how to be more open in our interactions, more ready to consider alternatives and more willing to partner. As an outcome, the rate of advancement of industry-wide technical expertise stepped up a notch.

2.4 Elegance of the Solution

The very first meeting of the newly appointed LDOs was the Design Team Alignment Workshop (23 September 2011). This set the scene for what SCIRT expected from its designers. It was made clear that, while collaboration was encouraged, the teams were expected to compete with each other, with the best performing teams ultimately receiving

a greater share of the overall scope of work. While the mechanisms for measuring success had yet to be developed, the scope for competition was outlined as being in the following areas:

- Leadership
- People
- Game Plan
- Execution.

There was therefore both opportunity and motive for any one of the LDOs to begin influencing the outcomes to their favour.

The collective response however, was to put aside any notion of competition between the teams until after things were up and running. We agreed to focus our combined attention solely on establishing the best solution for the people of Christchurch. This set the groundwork for trust between the LDOs, which encouraged the free exchange of ideas and ultimately led to a solution that was far better than any individual team could have envisioned.

The established trust also allowed us to quickly work through decisions that significantly affected some teams more than others. For example the agreed need for a single common design platform (12d) outweighed the fact that some teams had virtually no prior experience with this software.

One of the early challenges was that the architects of SCIRT envisioned a very linear process, which started with an Asset Assessment team collecting data on the type and nature of the damage. Based upon these findings, a Project Definition Team would then effectively prepare a design brief, which the Design Teams would then deliver upon. Construction would then be assigned to one of the Delivery Teams.

Through the course of the weekly workshops, which preceded the teams forming at SCIRT, the LDOs were able to amend this approach towards one that was far more interactive. The resulting approach started with the Project Definition Team, who identified project areas and assigned priority based upon the effects the damage was having on the network / community. These project areas were then assigned to a Design Team, who investigated the available data and identified the additional field data that would be needed for the likely design. The Asset Assessment Team would then collect this data and provide it back to the Design Teams. It was typical for the Design Teams to go back to the Asset Assessment Team on more than one occasion with additional data requests, as the design proceeded.

This interaction with the designers minimised unnecessary data collection which saved significant time and cost.

The true elegance of the final approach was that, through the life of SCIRT, the Asset Assessment and Design Teams continually learnt from each other. They got better at anticipating data requirements. This enabled smoothing of field crew workloads, minimising establishment costs, and meant that the implications associated with any change to the design guidelines could be readily foreseen or enacted.

Another key early achievement was the LDOs' ability to influence the structure of the team's interactions. The initial proposal was that it would be best to adopt what was termed a 'sausage factory' approach, with each discipline sitting next to each other churning out their component of the overall design with ruthless efficiency. The LDOs considered that while this approach would be efficient, it would also significantly increase the potential for them to design the wrong solution and such under such a rigid structure we would struggle to develop and retain our talent.

The accepted solution saw the four design teams seated separately from each other and given the liberty to structure themselves according to each LDO's preference. These differences strengthened the overall organisation and it enabled scope for competition between the teams in the areas outlined during our very first workshop. Because there was utter transparency, the teams could benchmark their performance against each other to see what worked and what didn't work so well.

The lessons learnt from those early days of collaboration ensured that the competition stayed constructive. For example, if one team liked the way another team tracked projects, they simply adopted and developed upon their approach. Everyone soon learnt that any attempt to retain intellectual property just meant missing out on the potential benefits resulting from others improving upon your original idea.

While the different teams gave everyone a sense of place, considerable work went to ensuring the whole organisation was aligned towards the same common good. Aside from project delivery, everything else was organisational-wide. Aside from SCIRT, there was no corporate branding. There was representation from all teams in everything, ranging from technical forums to social sports teams.



This level of interaction meant that designers did not hesitate to seek guidance from experts residing in other teams. To help balance workloads, it was routine for individuals from one team to be part of a project led by another team. Almost without intention, this contributed significantly to the development of the younger engineers. Their exposure to ideas, expertise and experiences far exceeded what was available in any of their home organisations and, as a result, their development accelerated. Many have been able to use the experience to gain their CPEng registration.

Within a year the projects were largely being delivered by intermediate-level engineers, enabling the senior engineers time to continually adapt the design guidelines to capture innovations, new learnings and the ever developing expectations of the client organisations.

2.5 Environmental Considerations & Sustainability

The enormity and complexity of the challenge posed in the delivery of consultancy services required a carefully considered and sustainable response.

A big focus of the alliance approach was to create efficiency and reduce wastage, sharing of ideas, innovation through technical challenge and involvement of constitutions in the design process.

Efficiency was also achieved through the selection process of staff – selecting the best people for the role rather than being bound by who they were employed by, and the incorporation of CCC staff with a great knowledge of the infrastructure into the design teams.

Specific attention was paid to limiting FIFO staff – reducing the cost and footprint of SCIRT, reducing time away from home for out of town staff and also to avoid the ratcheting up of consultancy service

costs through “poaching” and “rebranding” of staff within SCIRT.

Along with CCC, consultants also brought aesthetics to the infrastructure table through the SCIRT programme, with specific architectural treatments provided for pump stations, bridges and other structures to help with integration with the new Christchurch environment.

Achieving value was a key driver for SCIRT and particularly for the owner participants. Multiplier rates were sought through the LDO selection process and then audited regularly by an independent auditor for SCIRT.

2.6 Safety and Wellbeing

The safety and wellbeing of all SCIRT staff, contractors and the public were of critical importance during the SCIRT programme. The established principles of the PSAG from the outset included “looking after everybody” and a “collaborative enjoyable culture”.



There was a deliberate focus on collaboration and trust, sharing of lessons and learning from others. In addition, a strong emphasis was placed on appropriate mind set, values and behaviours from the outset of the project and posters were put up around the office for this purpose. The SCIRT working environment could largely be characterised as energised and fun, particularly when the design team was at 176 staff. This environment was created through trust, collaboration and leadership and contributed to by the consultant participants as well as SCIRT and CCC.

Perhaps the biggest test of wellbeing was the feedback from designers working in the team who overwhelmingly enjoyed the environment and challenge. Most took some adjustment to return to

their home organisations. This transition was primarily the responsibility of the home organisations but was assisted by SCIRT.



Safety in Design and the involvement of delivery teams in the design process was a feature of the design effort, and the SCIRT Safety in Design procedures were later adopted by other industry clients.

The design consultants also willingly adopted a requirement for random drug testing even for the design office to come into alignment with the delivery organisations.

2.7 Client Satisfaction

From the outset of the Alliance, establishment SCIRT requested input from the industry on how consultancy services could be provided to deliver \$30million to \$40million worth of physical work per month, with commercial tension between the designers and demonstrated value for money.

A consultancy industry working group worked to provide numerous options for team structures, identifying advantages and disadvantages of each. The interaction through 2011 was productive and

resulted in a close working relationship with key SCIRT staff – relationships that have been enduring through the programme due to the establishment of trust and open communication between the parties.

The consultants did not always get “their way”, but have worked tirelessly to make the model succeed and to deliver \$1.4billion of design work since September 2011.

The below quote gives an indication of the satisfaction of SCIRT:

“As we expected, the consultants were very keen to be involved and were keen to provide a solution to meet the needs of the asset owners, SCIRT and the people of Christchurch. They were also keen to incorporate CCC staff, giving the asset owner more confidence and comfort in the outcomes.

In joining SCIRT, they left their branding at the door and embraced the SCIRT culture, one of breaking down barriers, working collaboratively and sharing ideas and lessons. Through the establishment and performance of the design teams it became clear that performance was not driven solely by competition but also through working collaboratively. We developed a high performing team, delivering to an average of \$60million of concept design and \$40million of detailed design per month. The input and performance of the designers has been extremely valuable and a significant contribution to the rebuild of horizontal infrastructure in Christchurch, and I have valued their enthusiasm and professionalism in delivering.”

Steve Hart
Professional Services Manager

April 2016

Appendix A: Supporting Letters

20 April 2016

Convenor of Judges
ACENZ Awards 2016
ACENZ
Level 8: Hallenstein House
276 Lambton Quay
PO Box 10 247 - Wellington.

Dear Sir,

ACENZ INNOVATE Awards of Excellence 2016

This letter is to confirm that the content of the submission by the SCIRT Design Teams for the ACENZ INNOVATE Awards of Excellence 2016 reflects the innovation in how the SCIRT Design teams were set up and how they operated in providing design excellence to the SCIRT delivery teams.

If you require any further information please feel free to contact me.

Yours faithfully,

Ron Clarke



Technical Services and Design Manager
Christchurch City Council

20/04/2016

To whom it may concern

ACENZ Awards – Professional services for SCIRT

SCIRT is delighted to support this application by design consultants in respect of their significant contribution to SCIRT and the rebuild of horizontal infrastructure in Christchurch.

We consider that significant value has been added through the depth and breadth of skills provided, and the collaboration between the consultants and with the wider team.

Yours faithfully



Tim Mason
Delivery Manager, on behalf of

Ian Campbell
General Executive Manager

