

ENHANCING PROJECT OUTCOMES THROUGH FORMAL INNOVATION PROGRAMMES – SOME REAL CASE LEARNINGS

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ABSTRACT

“Innovation” is a term commonly used throughout our industry, particularly at present, in the quest for enhancing project outcomes. However, definitions on what genuine innovation actually is and where the line between good practice, value engineering and innovation are somewhat unclear. In addition, can and does innovation apply not only to technical aspects but also to the processes we follow throughout delivery of projects or is this actually just continuous process improvement?

The paper attempts to clarify some of these uncertainties by reviewing how formal innovation programmes have been set up and run through three major water industry projects currently underway across New Zealand – The Clear Harbour Alliance in Auckland, The Hunua 4 Trunk Watermain Project in Auckland and the Major Sewer Upgrade currently underway in Christchurch City. The structure of the programmes and development of an innovations culture within the project teams are discussed and some of the innovations that have arisen and the value and improvement in project outcomes they have brought to the project are detailed.

Delegates should not only obtain some clarification on the questions above but also find through these project examples how innovation culture, frameworks can be used to enhance project outcomes.

1. INTRODUCTION

Formal “innovation” programmes are now a common feature of most major projects in water industry in New Zealand. Rather than representing innovation for innovations sake, generally they strive to achieve performance outcomes on projects that would otherwise be considered not likely in the absence of such a programme.

Such programmes are a feature of three of the larger projects currently underway in the New Zealand water industry - The Clear Harbour Alliance in Auckland, the Major Sewer Upgrade currently underway in Christchurch City and the Hunua 4 Trunk Watermain Project in Auckland.

2. CLEAR HARBOUR ALLIANCE

2.1. PROJECT OUTLINE

The first water New Zealand water industry formal project alliance, the Clear Harbour Alliance is a partnership involving Metrowater and engineering companies GHD, Opus International Consultants and Downer EDI Works. The Alliance has been formed to carry out the sewer separation project for nearly 1000 properties that are currently served by a combined stormwater-wastewater drainage system in suburban Kingsland and Eden Terrace in Auckland.

The drainage upgrade will reduce the amount of wastewater pollution that overflows into the waterways leading to the Waitemata Harbour around Westmere and will enable the removal of 30 of the points where wastewater pollution overflows. It will also ensure that the drainage infrastructure can cope with forecast growth.

Figure 1 shows the changes in pipework during the separation process.

Diagram 1

Diagram 2

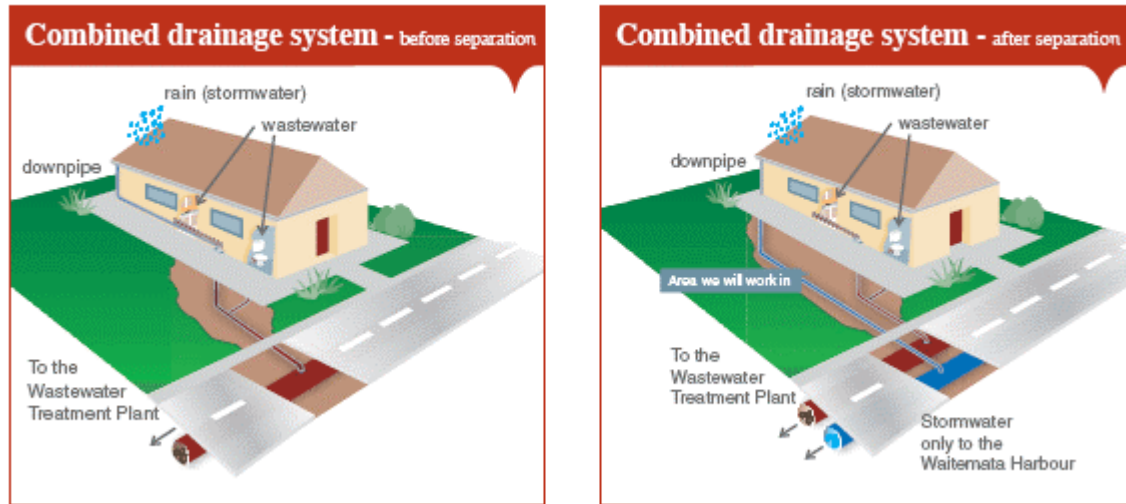


Figure 1 – Combined Drainage System – Before and After Separation.

The CHA team commenced work on the project in mid 2007 with the development of the Target Outturn Cost (TOC). TOC was agreed in late 2007 and on-site work commenced thereafter. The reward mechanism (a painshare-gainshare arrangement that is shared between all alliance participants) on CHA has components relating to both cost (how close to the TOC is the Actual Outturn Cost (AOC) and also the non-cost Key Result Areas (KRAs) of Programme, Safety, Environment, Community Relations, Traffic Management, Auckland City Council and Stakeholder Relationships, Functionality and Legacy.

Target completion date for the programme is June 2010.

2.2. INNOVATIONS PROGRAMME

The Innovations programme for CHA was initiated with a start-up innovations workshop during the TOC development phase. Regular innovations sessions were held throughout TOC development and project implementation phases. During this project, the team has remained conscious that the ‘accepted method’ of doing things may not always be the best method.

Co-location of the design and construction teams during the TOC development and project implementation phases was a key means by which this has led to a coordinated and all-encompassing approach by the Alliance towards design and construction. This co-location has allowed for early contractor involvement in the investigation and design of the separated reticulation system and has led to the most practical designs and methodologies, utilising the most recent technology. Over 90% of pipelines laid on CHA have been installed by trenchless means.

In the collaborative environment, issues are transformed into new, innovative approaches. It is a dynamic environment where the design team has the information they need to make quick and informed decisions. The collaboration between designers and constructors has meant that we have the ability to meet property owners on site to discuss construction methodologies prior to obtaining the property owner consents. This coordinated approach has assisted in obtaining consents and means that any conditions the property owner has stipulated are understood and can be complied with by the Clear Harbour Alliance team.

A total of 70 ideas exist on the Innovations Register for the project, These ideas traverse all KRAs and include technological and process improvements. The ideas represent a combination of incremental steps and also a small number of key “eureka “ideas.

2.3. EXAMPLE IDEAS

A range of ideas across technical and also process improvement issues were identified and developed within the programme.

2.3.1. Improved Access to Metrowater information

Having Metrowater as an Alliance member has allowed the design and construction engineers to have access to the Metrowater GIS mapping system which provides immediate access to existing Metrowater As Built information from the project office. The relationship with Metrowater has also been utilised to better share information between Clear Harbour Alliance and Metrowater which has led to improved customer relations. Metrowater’s customer records are available on request and regular updates on the project are provided by Clear Harbour Alliance to Metrowater’s customer facing contact points such as the contact centre and the faults call centre.

2.3.2. Materials

New materials have been introduced with Metrowater’s consent such as electrofusion PE private connection saddles and the PE terminal chambers for use in the back of properties where access for machinery is difficult. This is estimated to have saved approximately \$250,000 in capital cost.

2.3.3. Technology

Through the use of the latest directional drilling technology and bed boring machines, Clear Harbour Alliance has been able to eliminate the extra time, cost and disruption inherent in open cut methodologies. The difficult terrain in some parts of the catchments has meant that some new sewer lines have been designed with horizontal curves and others with vertical curves. This has eliminated the need for some manholes to be placed in the backyard of some properties, which is an excellent customer result. These initiatives are estimated to have saved over \$300,000 in capital costs.

2.3.4. Systems

Some major innovations have occurred in the form of systems implementation. These are also referred to in the ‘creating a high performance environment’ section but include the following things.

2.3.4.1. Property Database

CHA have implemented an innovative web-based property management database which supports the delivery of the consents required and the construction when undertaken. This was developed by and specifically for Clear Harbour Alliance. The database, which has viewing links to GIS information, helps to accurately track and manage information relating to the status of the consent and construction on specific properties. Significant time savings are being achieved from the up to date data that this provides access to. This has also allowed better communication of information and reporting across the project. Specific benefits of the property database include:

- Time and cost savings through efficient record keeping;
- Tracking of building and tree consent approval with Auckland City Council;
- Issuing building consents to the contractor;
- Faster and easier tracking of each property’s progress;
- Accurate records for benchmarking future projects;
- Enhanced cross-communication on the project resulting in a reduced likelihood of upsetting customers; and
- Information that is readily accessible by all parties, from anywhere, any time. This also provides a legacy of project Information for Metrowater in the future.

2.3.4.2. Customer database (Darzin)

A customer database (called Darzin) has also been established which complements this database. This is the first time this software has been used in New Zealand.

2.3.4.3. Document Management

Communication between the design and operations teams is further enhanced by Aconex, an online document management system. Aconex facilitates sharing of resources and fast turn-over of commercial documentation and procedures. This also provides an audit trail with date stamps of all actions.

2.3.4.4. Improved 'As-Builts'

Traditionally private drainage As-Builts have been hand drawn by drainlayers. Often these are inadequate and incomplete. The drawings produced were part of a jigsaw puzzle which were often difficult to fit in with the larger picture. Clear Harbour Alliance has dedicated team members working with many of the drainlayers to produce As Built drawings in AutoCAD on the original private drainage drawings. This provides a complete drainage layout drawing of the drainage on most of the sites for future reference by Auckland City Council and property owners.

2.4. OUTCOMES

With over 80% of the works now complete, the project is likely to finish 6 months early in December 2009, with AOC being approximately 7% less than TOC (17% less than Metrowater's project budget). In addition to this, the CHA team is projecting non-cost KRAs to score around 70 of a maximum of 100, thereby satisfying many of the non-cost reasons why Metrowater chose an alliance delivery model. The innovative culture generated by the alliance environment, supported by the formal innovations programme is considered to be a very significant contributor to this very successful outcome.

3. CHRISTCHURCH CITY COUNCIL MAIN SEWER UPGRADE

3.1. PROJECT OUTLINE

The Christchurch City Council (CCC) Major Sewer Upgrade (MSU) Project is a significant infrastructure project for CCC and the city of Christchurch. Designed to provide sufficient capacity to cater for future growth needs in the city that is occurring at the top end of the wastewater network, the project will provide 8 kms of further trunk sewer (up to 1600mm diameter) capacity serving the areas to the north west, west and south west of the City. The project is currently in an interactive tender phase, with construction scheduled 2010-2015.

The Project comprises three main trunk sewer packages as follows:

Table 1 CCC MSU Sewer Packages

Sewer Package	Approx. Capital Works Value	Proposed Construction Period
1. Western Interceptor	\$51.6M	2010-2013
2. Fendalton Duplication	\$14.6M	2012-14
3. Wairakei Diversion	\$10.3	2013-15

Sewers are design to be built within this programme along St Asaph St on the CBD fringe, through Hagley Park, across the Avon River and along streets in the leafy suburb of Riccarton.

The development of the design has proceeded into 2 stages – an initial preliminary design which ran from October 2008 to February 2009. The outputs of this phase were preliminary design drawings and a Preliminary Design Report. In February 2009 the detailed design commenced and this phase was completed in July 2009 to a level sufficient to take the developed design forward to an interactive tender process. The consultancy work is being carried out for CCC by consulting partners GHD Limited and CH2MBeca Limited.

3.2. INNOVATIONS PROGRAMME

Within this relatively tight timeframe of the design phase, the Innovations Programme for this project commenced in December 2008 and followed a process as shown in Figure 2. The initial brainstorming session was a free and open discussion and “braindump” of ideas facilitated by the project Innovations Champion. Participants attending were from both the consultant team and also from CCC.

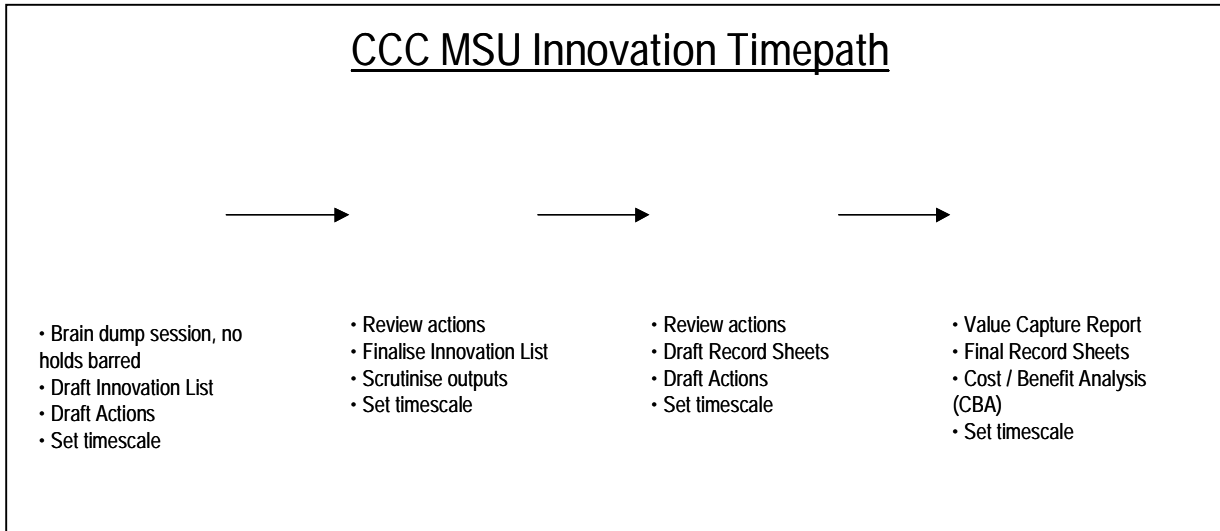


Figure 2 – CCC MSU Project Innovation Programme

The process broadly followed a funnel conceptual process, to ‘filter down’ ideas identified in the initial session into more meaningful concepts or solutions. Details of the ideas identified in the initial workshop were available to all project team members to build on and develop further through a collaborative process. The owner of the idea was formalised and this person was more likely to be the originator of the idea. Set outcomes for what progress on development of the idea that was expected of the innovation idea owner was set at the conclusion of the previous workshop. At each workshop, new ideas start-up were developed. Details of all ideas in progress or development were stored on the Innovations Register which was accessible to all project team members on the internal project communication website.

The Innovation Owner was challenged at each meeting to consider the following in detail to make sure the idea was focussed on achieving an improved project outcome:

- » Is it really innovative? Has this been done before?
- » Who are the main beneficiaries?
- » How risky is the innovation? Who will own the risk? (i.e. CCC or Contractor or other)
- » Is the innovation technical, commercial or other?
- » Does the innovation consume more energy or create more greenhouse gas emissions?
- » Will the innovation save CCC money? If so, how much?

The Innovation Ideas were then assessed to see which of the previously identified project Key Result Areas (KRAs) shown following that the idea would be likely to achieve an improved project outcome on:

- 1 Design Process and Construction monitoring
- 2 Delivery
- 3 Stakeholders
- 4 Environmental / Health and Safety

- 5 Finance
- 6 Team

These six KRAs were previously developed with the CCC’s stated four community well-beings in mind; Social, Cultural, Environmental and Economic. In this way, the project team was able to align the Innovations Programme with the objectives of CCC’s Long Term Council Community Plan (LTCCP).

3.2. INNOVATION IDEAS

A range of ideas across technical and also process improvement issues were identified and developed within the programme. Examples of these and which KRA they are likely to generate improvements in are shown in Table 1.

<i>No</i>	<i>Innovation</i>	<i>KRA</i>
1	<i>Interactive peer reviewing</i>	1, 2, 6
2	<i>Active and passive sewer ventilation</i>	3, 4
3	<i>Alternative hydraulic delivery system</i>	3, 4, 5
4	<i>Antigua St Overflow</i>	3, 5
5	<i>Slurry backfill method to speed up pipelaying rates</i>	1, 3, 5
6	<i>Alternative trench shields to speed up pipelaying and reduce H&S risks</i>	1, 3, 5
7	<i>Service co location (trench sharing), including other works for other utilities</i>	3, 5
8	<i>Sewer crossovers /isolation</i>	3
9	<i>Cover plates system to reduce traffic disruptions.</i>	1, 3, 5
10	<i>Recycled backfill / bedding</i>	3, 4, 5
11	<i>Sewer Flowmeter locations</i>	3
12	<i>Management of dry weather flow to reduce risk and odour and septicity risk.</i>	2
13	<i>Improved trenchless crossings @ critical intersections</i>	3, 4, 5
14	<i>Enhanced community engagement / PR</i>	1, 3
15	<i>Tailored Procurement strategy</i>	1,3,5
16	<i>Staged construction to achieve short terms operational benefits</i>	1,3,4

3.3. OUTCOMES

The project is currently in an interactive tender process. This process comprises discussions with 2 separate contracting parties to finalise the design and negotiate a contract sum. The viability of all of the above ideas has been confirmed to an extent sufficient to take these ideas forward to this interactive tender process. The team has identified that the alternative hydraulic concept developed as Idea 3 above has the potential to reduce the capital cost of the Western Interceptor by up to 10%. The other ideas have been confirmed to most likely significantly reduce impact of the works on the community. Further progress reporting of these outcomes is planned in industry journals and other forums.

4. WATERCARE HUNUA 4 PIPELINE PROJECT

4.1. PROJECT OUTLINE

Watercare is proposing to construct a new watermain to cater for population growth in the Auckland region over the next 50 years and to increase the security of the water supply for the city of Auckland. As shown in Figure 3, the proposed Hunua No. 4 Trunk Watermain (Hunua 4) is expected to run from Redoubt North Reservoir in Manukau to Market Road in Epsom. Along its route it will connect with the local water supply network in Manukau and Auckland cities. Estimated to cost \$225M, the proposed Hunua 4 will be 1.3 to 1.9 metres in diameter and approximately 30 kilometres long. It will mostly be laid under the road though at times it will cross coastal streams, private property and rural land. Construction is planned to be over the 2012-2016 period.

The project is currently in a Preliminary Design Phase, with this phase programmed for completion in November 2009. Consulting partners GHD Limited and CH2MBeca are carrying out all design and consenting work associated with the project for Watercare. The consenting phase which is being done in parallel with the Preliminary Design sees the project team consulting with a wide variety of stakeholders, including Auckland and Manukau City Councils, Auckland Regional Council, Auckland Airport, NZTA, OnTrack, Iwi, Community Boards, the public and a very limited number of affected landowners.



Figure 3 – Hunua 4 – Pipeline Route Options (as at May 2009)

4.2. INNOVATIONS PROGRAMME

The project team is implementing the Innovations Programme on this project as an evolution of the programmes carried out previously on the Clear Harbour Alliance and CCC MSU programme.

As shown in Figure 4, all ideas for innovation are posted in an Innovations Register called the I-Zone. I-Zone is hosted on the project Communications website, permitting all team members from Watercare, GHD and CH2MBeca to contribute their own innovative ideas and, more importantly, collaborate or comment on the ideas posted by other team members.

Ideas included thus far contain any idea or invention relating to the planning, design or construction of the project in any technical discipline of the project.

Postings to I-Zone will be viewed on a fortnightly basis by the Innovation Champion. The Innovations Champion assesses the posted ideas and any comments or collaborations from team members and reports these fortnightly. The ideas are reviewed formally approximately every month in the Project Leadership Team which are held fortnightly. Innovation is also a standard agenda item in every monthly Project Steering Group Meeting and also in each formal monthly progress report.

Ideas move through the following formal stages, and are tracked as such in the I-Zone:

- Raw Zone – Ideas have been posted and are in the initial collaboration or comment phase.
- Active Zone – Ideas have been reviewed and approved for the next stage of development by the Leadership Team. At this stage the individual idea champion will develop an implementation plan, taking into account collaboration ideas from the Raw stage.
- Action Zone – Idea has been identified as an approved innovation and its progress is tracked through its implementation phase and its success is measured against its stated objectives.

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- Action Zone – Idea has been identified as an approved innovation and its progress is tracked through its implementation phase and its success is measured against its stated objectives.

The KRAs against which idea is tracked follow Watercare’s stated policy objectives and include the following –

1. Environmental Care
2. Relationships
3. Stakeholder Relationships
4. Community
5. Economic Performance

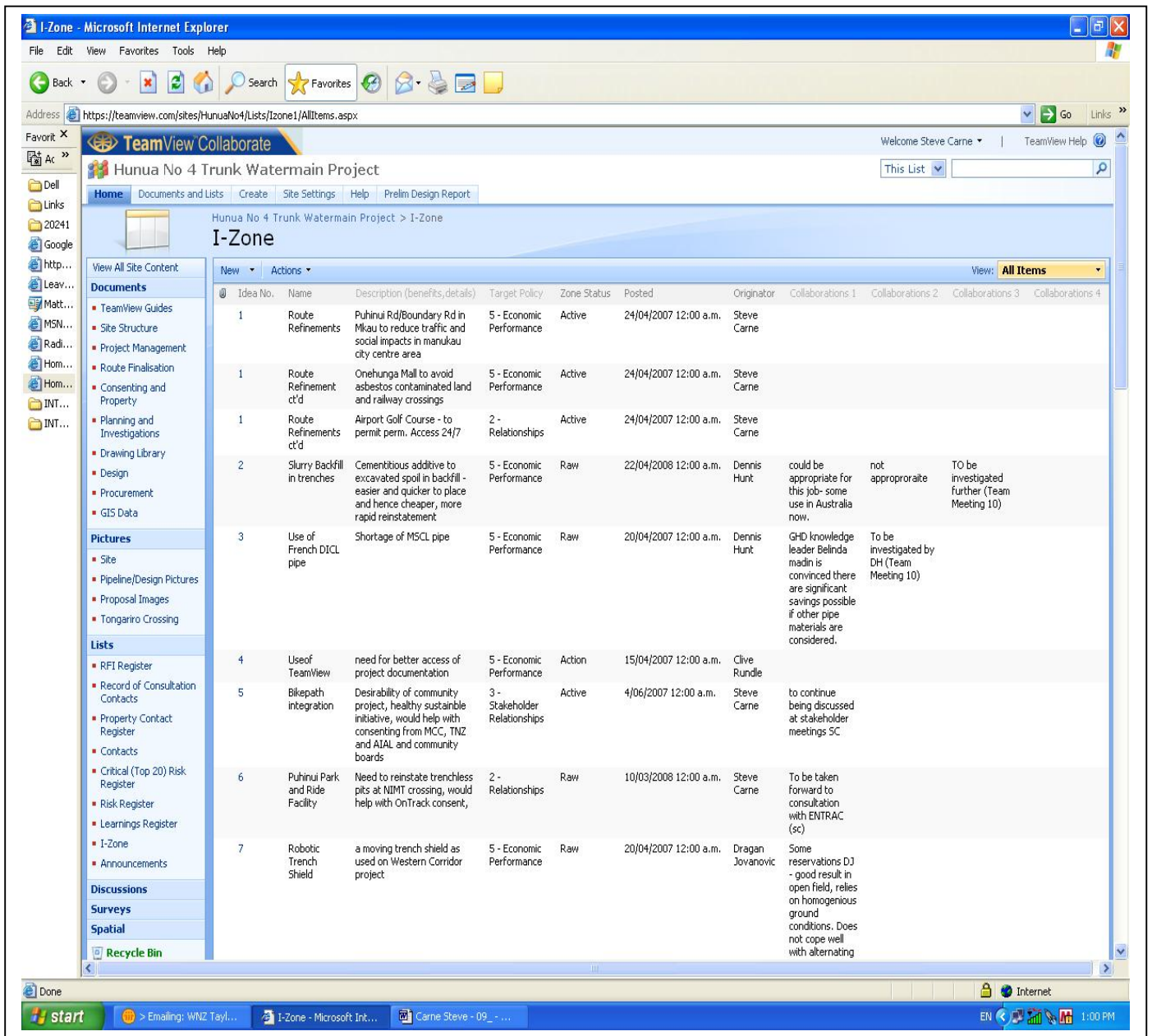


Figure 4 – Hunua 4 Project Innovations Register – “I-Zone”

4.3. INNOVATIONS IDEAS

Ideas included thus far contain any idea or invention relating to the planning, design or construction of the project in any technical discipline of the project. They range across technical and also procedural initiatives. Example ideas proposed thus far include –

- Flowable trench backfill to speed up construction
- Use of rock saws to speed up construction in areas of the basalt lave flows
- Use of ground penetrating radar surveys to map depths to rock and the existence of lava caves in the Auckland volcanic field.
- An enhanced community liaison and contact database
- Two competing, incentivised construction contracts

- Using pre-fabricated line valve chambers to speed up construction

4.4. OUTCOMES

These ideas are being progressed as the project proceeds and new ideas are regularly added to I-Zone. Further progress reporting of these outcomes is planned in industry journals and other forums as the preliminary design is finalised.

5. COMMON THEMES

The following are common features of each of these programmes –

5.1. INNOVATIONS CHAMPION

Appointment of an “Innovations Champion” - The function of this team member’s role is to lead and facilitate the programme within the team. Generally, such a person has a genuine interest in new technologies and processes and in challenging team members and current paradigms in the hope of finding new and improved ways of doing things.

5.2 AN INNOVATIONS REGISTER

This is a database which all team members can access and contribute to which contains all innovative ideas and initiatives, their status of development and comments or contributions on the innovative idea from team members who are challenged to discuss, debate and enhance the original innovative idea.

5.3 STAGED IDEA DEVELOPMENT

Assessed at Regular and on-going Workshops – with more and more investigation, innovative ideas can be progressed from a raw stage through to implementation. At each stage, sufficient further development must be undertaken to prove they are worthwhile and will result in improved project outcomes. By having increased rigour in such “gateway” assessment processes supported by each regular and on-going innovation workshops, more robust outcomes are obtained. Facilitated by the Innovations Champion, these workshops discuss the innovative ideas put forward by team members. These workshops are typically high energy discussions, where team members are challenged to not only discuss the merits of the ideas put forward, but to also contribute to and enhance the ideas under discussion.

5.4 ASSESSMENT CRITERIA

These are a well-defined set of criteria such as documented project or corporate objectives, values upon which the merits of the innovative ideas can be more objectively assessed in both isolation and also in comparison with other ideas. It is against these criteria that the focus on obtaining improved project outcomes is maintained. Furthermore, it is against these criteria that the “GO-NO GO” decision is made. The decision is then made as to whether further investment in time and resources to develop the innovation.

Many of the ideas developed in the Innovations Programmes discussed above could be viewed simply as good practice and more in the realm of value engineering and hence not necessarily what might be regarded as “innovative”. It has become apparent in these programmes that the boundary between good “value engineering” and innovation is somewhat blurred. Irrespective of what is defined as “innovative” and what is defined as good practice, the process undertaken in the name of “Innovations Programme” itself has obtained such outcomes and hence has justified its presence and value to the project outcomes.

Positive Team Culture is both a pre-requisite and a self-sustaining byproduct of such programmes. A positive culture has existed in each of these discussed project teams that encourages team members to strive for new ways of

achieving outcomes and contribute ideas. A key part of this culture is that every idea warrants investigation and that no idea is considered “a dumb idea.” Development and implementation of ideas then further fuels the desire within the team to generate more new ideas and improvements to further enhance project outcomes.

6. CONCLUSIONS

Based on the experiences of the three large water industry projects outlined above, successful project innovation programmes as outlined here;

1. Have the potential and also proven track record to save considerable amounts of the capital and whole of life costs and generate improved outcomes against non-cost criteria for major water industry projects
2. Need to be accessible by all project team members – including those in the team across clients, consultants and contractor backgrounds
3. Generally feature the following –
 - An Innovations Register
 - An Innovations Champion
 - Staged development of innovation ideas
 - Well defined assessment criteria
4. Target both technology-based and process-based improvements
5. May develop not only ideas and solutions regarded as being “innovative” in the pure sense but also contribute significantly to what would have been otherwise termed “value-engineered” or good practice outcomes.
6. Have a positive, supportive and challenging team culture as both a pre-requisite and also a self-sustaining by-product.