REBUILDING CHRISTCHURCH'S INFRASTRUCTURE: PRACTICAL SOLUTIONS FOR MANAGING CONTAMINATED LAND AND COMPLYING WITH THE NES

Grant Anderson (SCIRT), Lucy Hine (Tonkin & Taylor), Davina McNickel (Environment Canterbury).

For enquires on this paper contact Grant Anderson, Grant.Anderson@scirt.co.nz, (03) 3360 815

ABSTRACT

The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) represents a unique opportunity to challenge the mindset around business as usual practices in environmental management. With a strong emphasis on teamwork, all SCIRT participants have committed to promote new innovations.

The Canterbury earthquakes have significantly changed the face of Christchurch. The infrastructure rebuild alone is a $2.2 billion programme of works, incorporating the replacement or repair of: 100km of water reticulation, 620km of sewers, 9 sewer pump stations, 1050km of roading, 45 foot bridges and 18 new road bridges.

These works will require a huge volume of earthworks and excavation dewatering. With over 30% of the length of the road corridor within potentially contaminated soil or groundwater, the impacts (both environmental and financial) of potentially contaminated land need to be considered. Over and above this, the timing of the repair works has coincided with the implementation of the NES (Soils) which has presented a challenging situation.

Through innovative change, those involved in the rebuild have pulled together to develop a global consenting framework, based on a city wide desk based assessment and risk based management methods.

High groundwater tables, constrained sites, constrained timeframes and the requirement for delivering resilient infrastructure, not to mention the enormous scale of the works has made this project particularly challenging.

Managing the expectations of the client, designers, five head contractors, approximately 200 subcontractors and regulators has been a challenging and rewarding experience. It's taken an earthquake, but the tangible results are unique and beneficial for all involved.

Much is now expected of SCIRT, by not only leading the infrastructure rebuild of Christchurch, but also leaving a best practice environmental legacy to the industry.

INTRODUCTION

During 2010 and 2011 Christchurch experienced a series of significant earthquakes. These earthquakes caused considerable damage and loss of life. They also severely damaged assets which aren't immediately obvious – but critical to the operation of any city. The infrastructure (water, stormwater, wastewater and roading) assets are unique in the sense that they can't be seen, and when the work is finished, to the outsider, nothing will have changed.

There are many sites where SCIRT works are occurring which are on or adjacent to land that has accommodated an activity on the Hazardous Activities and Industries List (HAIL). In order to comply with the recently introduced *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*, consents have been required for the earthworks undertaken, as they typically exceed the soil disturbance volumes for each site (i.e. where >25m^3 material is disturbed over a site of 500m^2). Resource consent has also been required for the many associated activities, including discharge of dewatering water, and consideration given to the disposal of the enormous volumes of surplus soil that will be generated across all sites.

Due to the necessity of this infrastructure and the fact that the scale is widespread in location and type, the standard process of assessing individual projects for intersection with HAIL sites was considered to be too costly, and too time prohibitive. As a result of collaborative

discussions between SCIRT, Environment Canterbury (ECan) and Christchurch City Council (CCC) it was determined that the best approach would be to cover all of the SCIRT works through global consents. In order to ensure SCIRT and the associated delivery teams, and subcontractors are operating legally, an overarching site management plan was chosen as the best mechanism to deliver this.

THE SCIRT ALLIANCE

In response to the significant damage to the infrastructure, a competitive alliance was set up to deliver the $2.2 billion dollar programme of works.

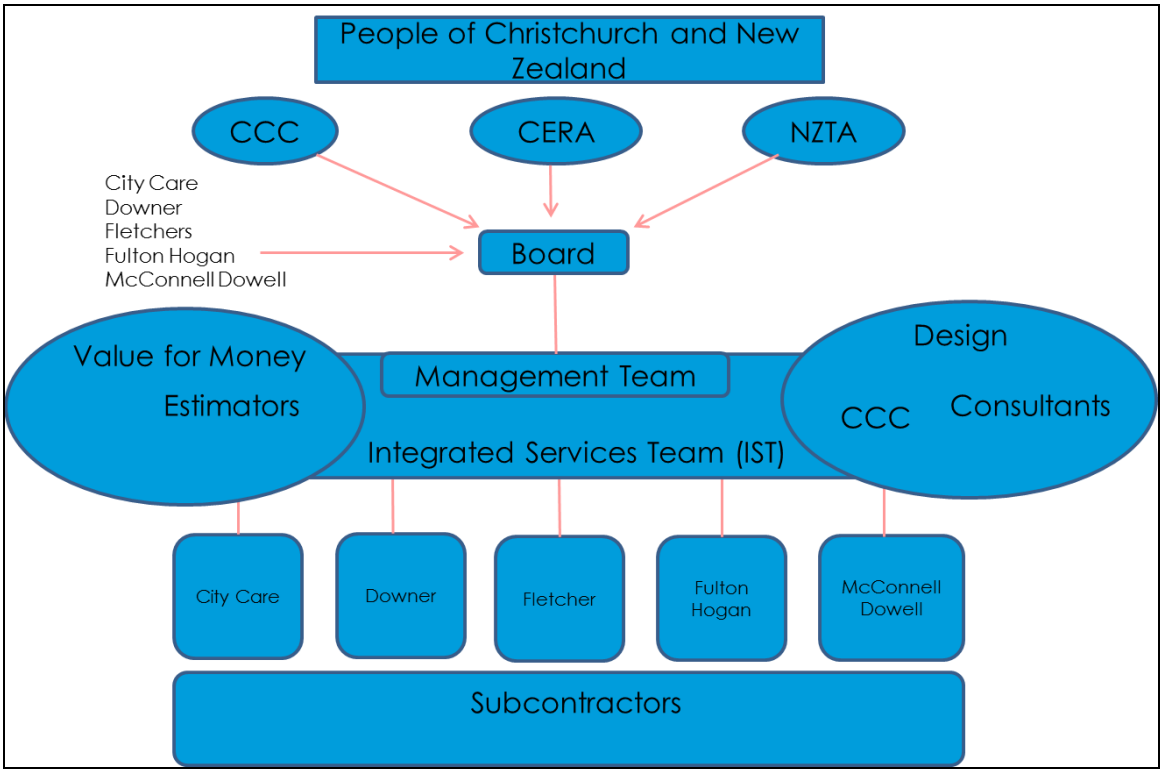

Figure 1: Structure of SCIRT Alliance

The infrastructure alliance is typically mandating how the rebuild occurs in the field. This has led to things such as; increased PPE requirements for all staff, sharing of non-price attributes, and a consolidated approach to the way in which we procure, and utilise consents. Due to the criticality of the infrastructure rebuild, it is necessary to ensure that the works are completed as

quickly as possible in a way that minimises risk to the environment, to our workers and which delivers resilient and robust infrastructure to the residents of Christchurch.

Typically, design and build are happening very close together, and sometimes in emergency situations, contemporaneously. This has meant that designers are with a project from needs identification right through to handover back to the client. The pace at which design is being outputted from the SCIRT design teams is both significant, and unprecedented. Almost all of the consulting engineering firms from Christchurch are involved within the design team mixture at SCIRT.

The construction delivery is $40 million/month, and this has to continue at steady state for approximately five years. Due to the large forward workload, and the criticality of the infrastructure, it is important that SCIRT has the ability to continue to work with as few restrictions as practical. For our infrastructure work, this means that we need to have the ability to make quick, and informed decisions to ensure that we deliver resilient infrastructure while having a minimal environmental impact.

To date, SCIRT has had a strong cooperative arrangement with the regulators, CCC and ECan. ECan have been particularly enabling, and recognised that the situation we are facing is not the same as 'Business as Usual', and that we require quick, concise judgements to continue with our works.

As demonstrated in Figure 1 above, there are many subcontractors working for the five head contractors. Some of these subcontractors are familiar with standards required to work in Christchurch and others are newer to town and coming to grips with some of these standards. Recognising that there is a varying level of confidence, expertise and standards within our own workforce, it was decided that having one site management plan to manage all of the earthworks would provide a united front to the works being undertaken by SCIRT.

THE REGULATORY PERSPECTIVE

The unique situation faced by SCIRT presented unique challenges to the regulators, to balance the need for environmental protection with the urgency and scale of the work programme. In a normal scenario, dewatering of excavation trenches on HAIL sites would require sampling and analysis of both soil and water at each site to ensure contaminants were not being discharged to the environment. ECan acknowledged that this was not going to be possible in this case, since the cost of large scale sampling and delays in awaiting laboratory analysis simply couldn't be imposed. Added to that the lack of an available alternative to discharging to the rivers, such as a functioning sewer network, combined with the already degraded state of Christchurch waterways, and the only solution was for a risk based approach to be applied.

An extra challenge came in the form of suitable disposal options for excavated soil. The volume of soil expected to be removed during these works has been estimated in the hundreds of thousands of cubic metres over the lifetime of the project. Much of it is unlikely to actually be contaminated, and it is expected that only a very small volume of the overall waste will require disposal at Kate Valley Landfill at a substantial cost. Burwood landfill was already nearing capacity, and so there needed to be some lateral thinking about the best way to dispose of this material.

The most suitable approach was to try and determine a method of separating out the worst of the worst, from everything else. The management plan had to include the methods by which visual observations and sampling and analysis of soils will be used where obvious contamination is encountered. Where no HAIL activities are known to have occurred on site and there are no indications of contamination being present, or where testing has confirmed that the soils are not contaminated, the soil can be disposed at an authorised cleanfill. This is discussed in the risk based solution below.

Whilst there are many cleanfills in and around the Christchurch area, many of them have consent conditions that prohibit the receiving of material that has been generated from a HAIL site. ECan has been looking into ways in which soil from earthquake related infrastructure repair works can be allowed, either by way of a variation to the consent, or by allowing it as a minor non-compliance on a monitoring report. ECan have indicated a willingness to accept clean

material from HAIL sites associated with the SCIRT works, provided that the material is proven to be free of contamination.

A RISK BASED APPROACH AS A PRACTICAL SOLUTION TO DEAL WITH A COMPLEX PROBLEM

The first step in developing plans and procedures to achieve the agreed onsite level of control of potential contamination was to identify HAIL activities. The associated risk to soil and groundwater along the mostly linear site is clearly different for each type of HAIL activity and an appreciation of this variation was needed in the assessment. As there are thousands of HAIL sites across the works area, of all manner of different types, the approach to identification of HAIL and associated risk had to be sufficiently detailed to support the works but also, importantly, completed to meet the tight timeframes.

The desk based assessment involved review of historical aerial photographs across the city, collation of information held on the CCC and ECan contaminated land databases and inclusion of current land uses from sources such as the telephone directory. A GIS data base of HAIL sites across the works area was produced.

To guide the onsite management and disposal assessment for the enormous volume of soils to be excavated during the works, a Soil Site Management Plan was developed. Within the Soil Site Management Plan, there are different requirements for the different categories where works are occurring. There are three basic HAIL categories:

- Category 1 – On a HAIL site
- Category 2 – Adjacent to a HAIL site
- Category 3 – Not on or adjacent to a HAIL site (business as usual)

Figure 2: HAIL sites in Christchurch on SCIRT GIS

The default disposal options and requirement site management works are different for each category. Where works are occurring on a Category 1 site, no excavated material may be sent to a cleanfill unless this has been approved by a Contaminated Land Specialist. Observations of the trench are made every 10m by the excavator operator, and daily (or every 100m of trenching, whichever is the most frequent) by a trained professional. For Category 2 sites, the default position is that soils can be sent to cleanfill unless anything untoward is identified by operators and trained staff. The same level of observation is required throughout Category 2. Disposal to cleanfill is the default position for Category 3 sites (unless evidence of potential contamination is noted) however there is a reduced requirement for observation for these areas.

SCIRT have had made available a triage area at Burwood Resource Recovery Park, where soils can be temporarily stockpiled which enables material with unknown levels of contamination to be stockpiled and tested, further avoiding delays.

With such a high groundwater table across Christchurch, dewatering is an integral aspect of works. Procedures to mitigate the possible impacts of potentially contaminated dewatering water were developed also based on the HAIL database. Each HAIL activity was ranked (High,

Medium and Low risk) based on the potential for contamination to impact shallow groundwater. This involved understanding the nature and likely pattern of potential contamination associated with each type of HAIL activity. When working in High Risk sites the contractors are required to incorporate, as default, the highest level of protection (including oil-water separators and high levels of notification and observation during works). Requirements on the contractor reduce for Medium Risk zones with 'business as usual' applying in Low Risk areas. In all areas, the procedures applied while dewatering are escalated where evidence of contamination is encountered by onsite and trained staff.

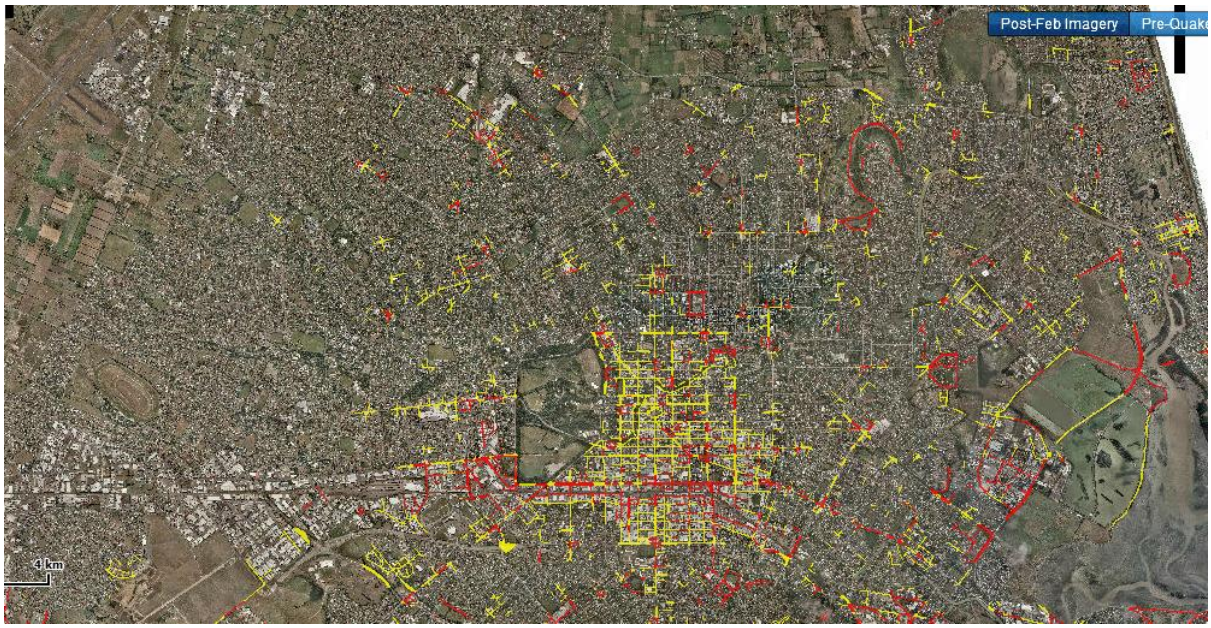

Figure 3: Groundwater Contamination Zones (High & Medium)

It has been recognised throughout that the information used to develop the HAIL database is not, and could never be, perfect. As such it was important that the management procedures take into account the potential for contamination to be present where unexpected, and vice versa. An integral aspect of the approach is that all parties understand the limitations of the data and are trained to appropriate levels to effectively implement the procedures.

SCIRT and the delivery teams have trained 60 internal Environmental Advisors, Site Engineers, Project Managers and site superintendents. This enables a broader range of people to undertake site observations, and record the material which is being excavated.

OUTCOMES

The partnership between SCIRT, ECan, CCC and the project delivery teams has enabled common sense to prevail, which has required some give and take from all parties. Whilst the regulators have had to respond to tight time frames, constrained budgets and high expectations, they have also had to ensure the best possible environmental outcomes. SCIRT have responded with a commitment to explore the best way in which to achieve those outcomes while still delivering on their promise to the people of Christchurch for a resilient and robust infrastructure. The collaborative way in which solutions have been realised and decisions have been made has been critical to the success of this programme.

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