SMALL COMMUNITY WIN BY SMART PROCUREMENT THAT SAVES TIME AND PUTS MONEY BACK INTO THE LOCAL ECONOMY

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ABSTRACT

In 2019, after detecting e-coli in the reticulation system, South Wairarapa District Council (SWDC) decided to permanently disinfect the drinking water for the town of Martinborough. However, two of the three bores had high levels of dissolved manganese that resulted in water discoloration which quickly became a major issue for consumers. With only one bore providing acceptable drinking water, a solution to the problem was needed, and quickly.

SWDC turned to Wellington Water Limited (WWL) for help, and in turn they engaged an approved contractor (AC) to produce a concept design and pricing for a manganese reduction plant (MRP). Unfortunately, the cost estimated for the proposed design far exceeded the council's budget. Even after a value engineering workshop, there was still a vast gap leaving the council with a problem.

Discussions within SWDC identified a local contactor who was suitably qualified and experienced to design and build a manganese reduction plant. They were approached and invited to quote for the work to develop the concept design into a detailed design, and then construct the treatment plant using local sub-contractors.

The local contractor's price was well within the council's allocated budget and a NZ3916 design/build contract was able to be awarded. When Wellington Water took over 3 water operations from SWDC on 1st October 2019, they managed the contract through their consultant panel by engaging GHD.

Despite Covid lockdowns, the allocated land being contaminated and delays with international deliveries, the Martinborough Manganese Reduction Plant was completed on time and passed a stringent 30-day trial with flying colours, consistently removing manganese to less than the detectable level.

The fully automated and unmanned treatment plant is operated by Wellington Water on behalf of SWDC. It has been designed so that there is minimal operational involvement, only requiring weekly checks and instrument verifications.

The biggest concerns of the local project stakeholders were potential operational noise and aesthetic appearance. However, these issues were addressed during the detailed design phase with acoustic attenuation and landscaping, with incredible final outcomes.

By using local contractors with low overheads, and some lateral thinking, the SWDC were able to procure a high-quality treatment plant not only within budget, but also gaining some non-tangible benefits such as;

- Employing and managing local skilled labour for a water infrastructure project keeps local taxpayers' money within the community,
- The knowledge gained during construction is retained locally,
- Construction workers and/or members of their families were involved as community stakeholders and were more willing to assist through difficult phases of the project,
- The community has more pride and ownership of their new asset once completed.

In the next decade, our drinking water systems need a vast amount of improvement work and funding these projects is a major concern for many councils. SWDC has proved that with a wise procurement strategy and careful project management, small local companies can be an alternative/cost-effective option compared to the larger corporations.

KEYWORDS

Small Community, Value, Design/Build, Local, Value Engineering

PRESENTER PROFILE

Harry Wilson is the CEO of South Wairarapa District Council. Previously Harry was on the executive team of Waka Kotahi (NZTA) having roles as the Regional Director for the Waikato and BOP, and as national Director for Road Safety. Harry was also the CEO for the Waikato RC and over 40 years of public service.

Simon Cartwright is a Charted engineer with over 30 years of experience with water and wastewater treatment projects. His international career has alternated between working as a contractor and consulting engineer, with broad experience in various processes, associated equipment, procurement models, project and design management, through to implementation.

1. INTRODUCTION

The South Wairarapa District covers about 2500 sq km of rural hinterland east of Wellington and at the southern tip of the North Island. The South Wairarapa District Council (SWDC) owns the local infrastructure, including the water infrastructure and until October 2019 (when Wellington Water Limited took over operations) was also responsible for operating the water infrastructure. SWDC had an in-house 'water team', but the day-to-day operations were subcontracted to CityCare Water.

There are three main population centres with reticulated water and wastewater, being Martinborough, Greytown and Featherston.

This paper will look at the difficulties that faced SWDC when Martinborough received a positive E.coli result, the resulting water quality issues experienced from chlorination, and the battle to procure a treatment solution within budget.

2. BACKGROUND

2.1 HISTORY

Originally the town water supply was serviced from the small river (Huangarua) to the East of the town. River water was pumped to the reservoir (at the current reservoir site) and chlorinated before gravity feeding to town. The supply had issues with quantity and quality (turbidity) and was chlorinated. Anecdotally it has been said that it had a strong chlorine taste and smell, likely due to the high organic loading associated with surface water reacting with the chlorine.

In the early 1990s a bore source was found at the current site to the north of the town, from bores adjacent the Ruamahanga River to the northwest of the town. The drinking water standards at the time allowed for the supply to be unchlorinated. At around this time the growing viticulture industry connected to the town water supply, and the addition of chlorine to the water was discounted. The bores are shallow and recharged by the Ruamahanga River. A nearby fourth bore of similar depth provides water to Herricks farm but can be used as a source for the community supply if required, due to unforeseen issues with other bores.

Photograph 1: Martinborough Water Scheme Overview

The water is pumped by the bores through the UV disinfection plant and directly in the reticulation. Four supply reservoirs are located at the far (south-eastern) end of the network, with each reservoir providing for around 1,000m³ storage, a total of around 4,000 m³.

The UV plant was installed in 2011 with a Ministry of Health (MOH) subsidy to provide protozoa compliance, and originally only targeted a 12mJ/cm² dose to do so. This dose was increased in April 2018, with water then being treated to achieve a target dose of 40 mJ/cm² to provide a treatment barrier to contamination for both protozoa and microbiological contaminants.

Over the last 5 years the upgrades made have been modular, on an assumption that the plant may potentially move in the future to a more secure location, though a future location has not yet been identified. A Chlorine dosing plant was added in 2011/12 in preparation for the possibility of the move to chlorinated water supply, and to allow the supply to be chlorinated on an emergency basis. It has been a long-held officer assumption that at some point in the future chlorination would be required, and it is expected that three waters regulation reform will include this requirement as recommended in the Havelock North inquiry.

2.2 MARTINBOROUGH BOIL WATER NOTICE

2.2.1 FEBRUARY 2019

A positive E.coli test result was received on 30 January 2019 for water sampled from the Martinborough School on 29 January 2019. Further follow-up samples returned positive for E.coli, and a boil water notice was issued on the 1st February 2019.

Subsequent investigations using a source to tap approach identified a UV fault as the most probable cause of the contamination incident. A power cut and instrument fault and failure of the control system allowed untreated water to be pumped into the reticulation network for approximately 15 hours until the instrument was corrected by the operators.

Following consultation with Wellington Water, treatment advisors with experience managing supplies with manganese in the water, and Regional Public Health, the council prepared a remedial work and flushing program to discharge all potentially contaminated water from the network.

A decision was made not to chlorinate the water at that time due to the likelihood of significant water quality issues and complaints due to discoloured water because of the manganese content of the water and biofilm within the supply network.

2.2.2 APRIL-MAY 2019

A further boil water notice was issued on 9th April 2019 following positive E.coli test results that were received that day for water sampled from the Martinborough Reservoir and a location on Shooting Butts Road on 8th April 2019. Follow-up sampling at the reservoir confirmed presence of E.coli.

As the source of the contamination could not be definitively identified, temporary chlorination of the network was implemented to allow lifting of the boil water notice.

The chlorination system was upgraded to allow it to operate automatically and deliver a set dose based on flow rate. Manganese levels in the bores was checked using historic data and Bore 4 was determined to have the lowest concentration and potentially be capable of supplying Martinborough without significant risk of water discoloration.

Correspondence with the winemakers revealed a risk of chlorinated water used in the washing process impacting the wine quality with by-products being produced. A 2-week period was agreed prior to chlorination to allow preparation work to be completed and allow winemakers time to make alternative arrangements to mitigate this risk.

High levels of dissolved manganese levels had been identified as an issue and allowance of $1.064M had been made to address the problem in the previous year.

A further air scour and flushing programme was carried out to reduce the risk of residual manganese within the pipe network, prior to the chlorination starting.

Photograph 2: Manganese Oxide contaminated pipe flush

2.3 TIME FOR ACTION

On 19th June, in an Assets and Services Committee meeting, SWDC recommended that a temporary manganese removal plant be built and that a new non-manganese water source be investigated.

WWL were engaged to assist SWDC with the delivery of temporary manganese removal plant. The WWL Major Projects team were tasked with the project and employed one of their approved contractors (AC) under a 'Early Contractor Engagement' contract to develop a preliminary design, and through their board of the consultants engaged GHD to manage the project.

At this time, WWL had an estimated project cost to be $2.052M (+/-25%), including project management costs of $270k. SWDC were able to allocate a budget of $2.3M to include a reasonable level of contingency.

3. MANGANESE REDUCTION PLANT (MRP)

Through the early contractor engagement arrangement, the best method to remove manganese was determined to be with the use of Greensand filters.

Manganese Greensand is formulated from a glauconite greensand which can reduce iron, manganese, and hydrogen sulphide from water through oxidation and filtration. Soluble iron and manganese are oxidized and precipitated by contact with higher oxides of manganese on the greensand granules. Precipitates are then filtered and removed by backwashing.

The Greensand process is simple, robust, and reliable. The only specialist components required are the Greensand and the filters.

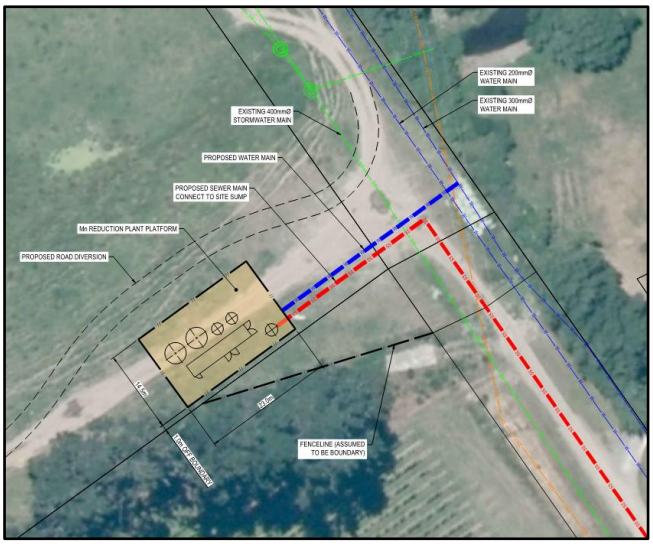
Given the pressure to complete the project before Christmas (typically the start of high demand season), in July 2019 SWDC committed to the Greensand process by ordering the critical and long delivery items, being the filters and Greensand.

3.1 PRELIMINARY DESIGN

Once the process had been committed to, the preliminary design could continue. This involved sizing/selection of equipment, completing a general arrangement concept , and a more comprehensive a cost estimate.

The general arrangement of that equipment was needed early to determine the land area required for the site. The site needed to be before any customers to avoid additional reticulation work and if possible, a reasonable distance away from the WTP to allow time for the dissolved manganese to react with the chlorine and oxidise fully.

SWDC identified an ideal location at the northern end of New York Street, which was about 750m from the WTP and 100m before the first reticulated customer.



Photograph 3: Original Proposed location of the MRP

SWDC engaged with the landowners and affected parties to gauge the acceptability of leasing an adjacent parcel of land to locate the MRP.

3.2 SWDC NEEDED HELP

The SWDC Water Team were already under pressure with the day-to-day management of the council's water infrastructure and were struggling to successfully manage a fast-track capital project. They needed help.

The cost estimates being provided by WWL were higher than council budget and specialist skills and time were needed to ensure SWDC were getting value for money.

SWDC decided to engage an independent consultant to assist the team, it was hoped that with their help the project costs could be reduced to within the allocated budget.

Through local enquiries and networking, a suitably qualified Charted engineer with experience in the water industry was identified an approached to assist the SWDC project manager.

The consultants brief included design review, risk analysis, constructability assessment with a focus on cost saving, while ensuring the stakeholders long-term goals were considered.

4. INDEPENDENT REVIEW (OR A FRESH PAIR OF EYES)

In early August 2019, Southern Cross Consulting (SCC) was engaged by SWDC to help their team with the project management of the manganese reduction project.

SCC is a small consultancy, based in Martinborough, owned, and operated by Simon Cartwright who has over 30 years of experience with water and wastewater treatment projects, working as both a contractor and consultant. Simon's track record with project management services and his experience with water projects, perfectly suited the scope of the temporary assistance SWDC were looking for.

4.1 DESIGN REVIEW

As the design had not been peer reviewed, SCC engaged an independent company to undertake a process review, while at the same time inhouse, reviewing the preliminary design against SWDC criteria for their new asset.

The feedback from the process review said that the design was robust and should achieve the manganese reduction and water quality SWDC had targeted.

The review of the preliminary design for the civil, mechanical and electrical systems however, highlighted some over-design issues. Because the project cost estimate from WWL/AC was significantly above the SWDC budget, SCC organised a 'Value Engineering Workshop'.

In addition to the MRP, SCC undertook a basic condition assessment of the WTP and town reservoir. This highlighted that there was a high operational risk with the existing electrical power and control systems, and that several problems should be addressed to improve the reliability and robustness of the overall Martinborough water scheme.

4.2 VALUE ENGINEERING WORKSHOP

In mid-August 2019, a Value Engineering Workshop was held in Martinborough and involved representation from SWDC, WWL and subcontractors. By this time, the MRP preliminary design had been completed, the approximate location/site agreed, and critical components ordered, which meant that the workshop could only 'tweak' the design with no radical changes. However, there were a few areas for potential savings identified during the workshop. Some of main opportunities are listed in Table 1.

Issue Identified	**Potential Solution**	**Risk**	**Benefit**
40' container for equipment	Use 20' container	Equipment accessibility	Reduced • Cost ($10k)
50m^3 storage tanks	Use 30m^3 storage tanks	Insufficient storage	Reduced • Cost ($50k)
Site area fully concreted	Concrete where structural are required	Additional maintenance (weeds etc)	Reduced • Cost ($25k) • Construct time Better access
Dedicated sewer for backwash	Use existing private sewer	Not owned by SWDC	Reduced • Cost ($400k) • Construct time
Vehicle parking on site	Park outside compound	None	Reduced • Cost ($10k)
Moving chlorine gas installation, WTP to MRP	Chlorine gas system remain at WTP, install small 'booster' at MRP	Reduced as Cl2 gas remains remote.	Reduced • Cost ($20k) • Risk

Table 1: Main Opportunities Identified During Value Engineering Workshop

Some of these ideas are discussed in more detail below.

4.2.1 A DEDICATED SEWER RISING MAIN

The largest potential cost saving identified, was the elimination of a new sewer rising main along New York Street, to connect the MRP to the town's wastewater system. The alternative to a dedicated MRP sewer rising main was to use the existing private sewer belonging to a small resort/retreat.

The Value Engineering Workshop identified that the private sewer was probably only used for an hour or two a day during peak occupancy, therefore would be available the rest of the time.

The theory of sharing a private sewer rising main was made possible because the preliminary design had already allowed for storage of filter backwash water, so that it could be released slowly into the town's wastewater system. By timing the release of backwash water to after midnight, when there was no wastewater being pumped from the resort, it might be possible to utilise the private sewer and realise a significant saving.

This option would require the agreement of the resort owner and arrangement for a lease to use their sewer rising main but reduced the MRP sewer rising main by 600m.

4.2.2 50,000 LITRE TANKS

The preliminary design used 50,000 litre storage tanks that were manufactured to order in Australia. Due to transportation and exchange rate, these seemed to be expensive items compared to New Zealand supplied tanks, and a potential long delivery problem.

New Zealand has many plastic tank manufacturers, but their maximum tank size is 30,000. Therefore, the design team were asked if two New Zealand manufactured 30,000 litre tanks could be used instead, and would it be a more economical option.

4.2.3 FULL CONCRETE COVER

Even though the original design had been pared down from a permanent building to a shipping container, the entire site remained fully concreted.

When questioned the design team had no good reason for this, other than for parking and to reduce maintenance from weed growth. Once again, the design team were asked to review the preliminary design and consider concrete pads to support equipment, with gravel cover for the rest of the site.

4.2.4 WORKSHOP OUTCOME

With over $500k of potential cost reduction, WWL/AC were instructed to consider altering the preliminary design and revising the project cost estimate. They were reminded of the SWDC original criteria that the MRP is to be considered a temporary facility, with a design life of less than 5 years and the project should be delivered within the allocated budget of $2.3M.

4.3 INDEPENDENT COST ESTIMATE

As SWDC (through WWL) had paid for AC to produce a preliminary design with a cost estimate, that intellectual property belonged to them, so while WWL/AC considered the outcomes from the workshop, SWDC expanded the brief for SCC to produce an independent cost estimate.

SWDC wanted the independent cost estimate to be based on the preliminary design, plus the workshop findings, but where possible, quotations for equipment and services to understand the risk and therefore an appropriate level of contingency. Where quotations for equipment and services could not be obtained the cost estimate was to use the indicative sums provided from the AC cost estimate.

As mentioned previously, SCC had highlighted the need to upgrade the power and control systems at both the water treatment plant and the town reservoir. So, a cost estimate for this work (although not clearly defined) was also included.

To ensure a like-for-like comparison with the revised WWL/AC cost estimate, the same percentages were used for 'Contractor Mark-up' and 'Contingency'. The independent cost estimate was completed in only two weeks and presented to SWDC.

4.4 REVIEW SUMMARY

Given the positive feedback from the independent process review and the independent cost estimate that indicted the project could be delivered easily within the SWDC budget, there was a high level of confidence that the project would be both successful and affordable.

5. PROCUREMENT ISSUE

WWL/AC submitted a revised cost estimate based on the preliminary design and the value engineering workshop. At the same time SWDC also received the independent cost estimate and were anticipating that the cost estimate through early contractor involvement would be similar.

5.1 A BUDGET PROBLEM (OR IS THERE)

Unfortunately, even though both estimates were based on the same preliminary design, the WWL/AC estimate was significantly higher (47%) than the independent estimate and was above the SWDC budget. Given that construction projects only ever increase in cost, starting with a price higher than the SWDC budget was not acceptable.

The independent cost estimate had also provided an estimate of cost to upgrade and improve the WTP and reservoir. With these costs included, the overall estimate was still under the SWDC budget. In other words, the independent cost estimate suggested that SWDC had the budget to not only build a new MRP, but also to improve two other key community assets.

5.2 COST ESTIMATE CHALLENGED

Clearly with such a large discrepancy between estimates there needed to be reason. SWDC challenged WWL/AC to check/review their cost estimates, reiterating the budget restraints, while at the same time challenging SCC to substantiate the much lower estimate.

5.2.1 CHALLENGING THE INDEPENDENT COST ESTIMATE

Given the time restraints of the project, SCC had not been able to obtain quotations for all the equipment and tasks. Instead, the itemised breakdown of the estimate was categorised into three types of risk (associated with the cost).

Risk Category	Cost Type	Source
High	Estimated	SCC Experience
Medium	Assumed	AC Estimate
Low	Quoted	Suppliers

Table 2: Risk Types Allocated to Cost Estimate

Categorising the independent estimate provides a level of confidence in each item and clear overall picture of cost risk. The more red items, the higher the cost risk. The more green items, the lower the cost risk.

When SWDC compared the two estimates, the lower cost items in the independent estimate were mostly green or orange, not red. This gave SWDC confidence that the savings were being achieved in lower risk categories and they were therefore able to have a higher confidence in these values.

Further investigation into some of the items showing significant cost savings revealed that these were from the 'Low Risk' category. In most cases, quotations had been obtained from local companies with lower labour rates, lower overheads, and less distance to travel.

5.2.2 COST ESTIMATE SUMMARY

After challenging the independent review, SWDC had confidence that the estimate was accurate to +/-15%, so a contingency allowance of 15% was added to the estimate.

After reviewing their cost estimate, WWL/AC resubmitted an estimate with very little change. A contingency allowance of 5% was added to their estimate.

Applying an overall project contingency of 5% to the WWL/AC estimate (perceived as a lower risk) and 15% to the independent estimate, the cost difference was still more than 34% more for the WWL/AC option.

5.3 SWDC DILEMMA

So far, SWDC (through WWL) had paid for AC to produce a preliminary design and produce a cost estimate, so therefore the council owned that intellectual property to use as they thought best. However, a contract was needed to develop the detailed design and deliver the project.

The dilemma facing SWDC was whether to use a well-known contractor used and trusted by WWL (that appeared to be extremely expensive) and try to find additional funds or try and find a contractor that could deliver the project within budget.

The use of the Early Contractor Engagement model for procurement had proven effective in quickly delivering a preliminary design, but without any competitive tension in the procurement process, was also an expensive option to use to complete the project.

One of the reasons for using an Early Contractor Engagement model for procurement was the short timeframe that had been placed on project delivery. The pressure to have a more robust water scheme before high demand. Without the project delivery pressure, there would be time for a competitive tender process and with that, sharper pricing (hopefully).

5.4 TESTING THE PRICE

When SCC had put together the independent cost estimate, conversations were had with multiple contractors, and so SWDC asked for recommendations of alternative contractors that would be capable and willing to undertake a design/build contract of this nature. SWDC also challenged SCC to consider tendering an offer.

5.5 SCC DECIDED TO TENDER

With a history of delivering design/build water projects in remote Australian towns, undertaking this type of contract while living locally appealed to SCC from both a technical aspect and a sense of community involvement.

SCC withdrew from the project management assignment to ensure there was no conflict of interest.

6. DESIGN/BUILD CONTRACT

SCC submitted a formal proposal for the design completion, construction, and commissioning of a manganese reduction plant, based on the agreed preliminary process design, but incorporating all the recommendation from the value engineering workshop.

On 30th August, SWDC called a special meeting to select a contractor where the project costs were summarised and presented, highlighting the scope and outcomes expected. The costs presented were:

Contractor - Element	**Total Estimated Price**
Wellington Water initial estimate (June)	*$2,052,000.00*
WWL Approved Contractor (AC)	$2,522,500.00
Southern Cross Consulting (SCC)	$2,229,494.00

Table 3: Summarised Contract Costs

Note - The SCC price included upgrading the WTP and reservoir electrical systems.

SWDC made the decision to award the design/build contract to SCC. The council recognised that neither proposal would meet the timeline hoped for.

6.1 CONTRACT AWARD

The form of contract proposed was NZS3916:2013 – Design Construct. The contract terms and conditions were agreed, and a draft contract prepared.

However, SWDC had previously decided to join the WWL collective and with the start date set for 1st October 2019, the decision was made to allow WWL to award and manage the contract through their Major Project Team.

When WWL took over the SWDC water infrastructure and operations, SWDC were advised that there was significant risk placing a critical contract with an unknown entity such as SCC. However, SWDC decided that the risk was acceptable provided suitable Performance guarantees were included in the contract.

GHD were appointed to project manage the MRP project, the original contract terms and conditions were scrapped, the scope revised to remove the WTP and reservoir upgrades, and WWL standards were added. Performance guarantees were added, including process guarantees (even though the process had been dictated).

Eventually a new contract to design, build and commission a manganese reduction plant was signed on 4th December 2019, with a contract value of $1,878,537.00. The programme duration was agreed with a completion date of 10th July 2020.

6.2 COMPLETING THE PRELIMINARY DESIGN

During the contract negotiations, SWDC and WWL were busy discussing potential sites with local affected parties. The location issues that needed to be addressed at this stage of design were:

- Small footprint - a small footprint plant would have less impact and be more acceptable,
- Noise level – locations previously considered were less than 50m from the nearest affected party (and we wanted to lease their sewer),
- Proximity to public road – access to WTP is via private land which can be problematic, so a site avoiding access issues would be preferable,
- Proximity to water main – for connection in and out of MRP,
- Mains electricity – the MRP would need power,

A suitable parcel of land (thought to belong to a local farmer) was identified at the end of New York St and close to the water main. This turned out to belong to a vineyard, but the fence line crossed the boundary. Still close to the resort, noise attenuation would have to be included in the design.

Given the tight project timeframe, long delivery items needed to be ordered as soon as possible, so the draft preliminary design had to be completed as a matter of urgency.

Under the guidance of GHD and WWL, risk and HAZOP workshops were quickly organised so that they could influence the final requirements of the preliminary design. These workshops used the P&I diagrams, general arrangement drawings and a draft Functional Description.

6.3 DETAILED DESIGN

As a design/build contract with performance guarantees, SCC was wholly responsible for the design, within the restrictions of the WWL standards and project specific restrictions, such as location.

So once the preliminary design had been finalised, long delivery equipment such as pumps, tanks and software could be ordered, and the detailed design phase could start.

6.4 SMART PROCUREMENT

In this case, procurement refers to the purchase of both goods and services. Being smart about your project procurement can provide significant savings.

Having a tight/restricted project timeframe will limit the ability to make smart procurement choices by limiting your choice of contractors. SWDC had recognised that an MRP could not be constructed for the high demand period, thus a fast-track project approach and allowing SCC a wider scope of contractors.

6.4.1 MAINTAINING LOW OVERHEADS

Southern Cross Consulting sub-contracts most of their design and construction, which allows the business to maintain extremely low overheads that drives the ability to offer very competitive pricing. To do this successfully, the subcontractor's scope of work must be clearly defined and very well managed.

Building strong relationships with these small subcontractors helps improve communication, reduce errors/rework, and assists with delivery deadlines.

6.4.2 LOCAL CONTENT

The SCC tender was based on using local companies where the skills and services were readily available. Using local businesses has many benefits, some tangible, some not. For instance:

- It puts money back into the local economy,
- As ratepayers, local contractors take pride in community projects,
- Effected parties often know or are related to local contractors,
- It is often easier to get hold of a local contractor at short notice,
- The construction knowledge stays in the community,
- Costs are usually less than out-of-town contractor because there's no travel, no accommodation costs etc.

Wellington is the closest metropolitan area to South Wairarapa and is the home to many businesses able to provide goods and services for water project.

With a travel time of over an hour each way, and the inherent higher costs of city-based businesses, cost was a significant incentive to use local contractors. The following table shows the local content for the MRP project.

Service	Company	Location
Environmental Scientist	Ecoagrilogic (Dr Esther Dijkstra)	Carterton
Structural Engineer	Hewison Engineering Ltd (Michael Hewison)	Masterton
Architect	Cad Services Ltd (Willem van der Laan)	Masterton
Electrical Engineer	Southern Cross Consulting Ltd (Simon Cartwright)	Martinborough
Earth works contractor	Taylor & Hawkins Ltd (Mark Taylor)	Martinborough
Concrete contractor	Mills Concreting Ltd (Richard Mills)	Martinborough
Electrical contractor	Cotter & Stevens	Martinborough
Mechanical contractor	Cotter & Stevens	Martinborough
Subsurface service	Construction Contracts Ltd (CCL)	Martinborough
Fencing service	Taylor Fencing Ltd	Martinborough

Table 4: Wairarapa Companies and Contractors

Of course, some non-local consultants and contractors were used, either because SCC already had a strong working relationship with them, or those services could not be found locally. These included software, mechanical design, and container fit-out.

As Covid struck the world and New Zealand went into lockdown, having local contractors proved to be a huge benefit. This is discussed later.

6.5 DIFFICULT SITE

The chosen site came with several challenges that had to be addressed during the preliminary design. These included:

- being classified by GWRC as contaminated,
- being adjacent to the vineyard chemical washdown area,
- being a small triangular site,
- close to popular resort being especially noise sensitive,
- the construction site had 33kV overhead lines above.

6.5.1 CONTAMINATED GROUND

The site was at the edge of a historic saw milling area, so GWRC had classified the site and surrounding area as contaminated, thus necessitating a detailed investigation of the sub-soils had to be made.

SCC used an expert based in South Wairarapa to provide a detailed site investigation report (DSIR). This investigation involved taking soil samples from various levels and getting them analysed.

A Martinborough contractor was utilised to excavate the trenches and while the ground was exposed the structural engineer (Masterton) that had been engaged for the project took the opportunity to visually inspect the ground condition.

The DSIR stated that after "considering all previous, current and proposed site activities, this investigation concludes that it is highly unlikely that there will be a long-term risk to human health" and that "The short-term risk to human health because of soil disturbance during installation of the plant is highly unlikely". The only recommendation was "It is recommended that any excess soil from excavations on site is disposed of on site.".

6.5.2 NOISE

The rural site had very little background noise and so an acoustic consultant was engaged to assess the impact the MRP would have on the affected parties. Their assessment was based on any equipment that could produce noise, and luckily, all pumps, blower, compressor and VSDs were located inside the container.

The assessment recommended that a 50mm layer of acoustic absorbing material be applied to container walls and ceiling, and the pumps mounted on a concrete inertia base. Concrete inertia bases are made to suit the application and are therefore expensive. As they had not been allowed for in the budget an alternative solution was employed.

The pumps were mounted on a concrete block cast into the ground and a clearance penetration made in the floor of the container. Once the container had been lowered over this pump base, the gap between the concrete and container base was filled with the same acoustic absorbing material used on the interior.

6.6 CONSTRUCTION

As each phase of the detailed design was completed a tender package was sent to suitable providers of goods or services. The tender packages were kept concise, and the scope clearly defined. This helped to keep all tenders returned within budget.

Selection of major components (such as pumps) were independently peer reviewed and ordered, then either delivered to sub-contractors to include in their off-site construction contract or stored until required on site.

The manganese reduction plant construction was broken down packages of work, that could be categorised as either off-site or on-site construction.

6.6.1 OFF-SITE CONSTRUCTION CONTRACTS

Complex off-site construction packages included software and the containerised process plant. These were awarded to a AFI (Wellington) and Grossart Water Solutions (Auckland).

Using a shipping container to house process plant has many advantages:

- Constructing the process plant does not affect other construction,
- Construction is not affected by weather,
- Construction is in a clean environment,
- Safety can be easier to manage.

There were also simpler off-site construction packages such as storage tanks, pumps, chemical systems, electrical panels etc.

6.6.2 ON-SITE CONSTRUCTION CONTRACTS

WWL insisted that an approved contractor was to be appointed for any network connections. This could have increased cost and been a potential variation, but CCL (who have a small presence in South Wairarapa) provided a quotation within budget and as they are an WWL approved contractor, were awarded the contract for subsurface services and groundworks.

CCL were able to provide a competitive price by utilising local contractors for excavation and concrete bases.

Another Martinborough company, Cotter & Stevens, submitted a competitive price to provide mechanical and electrical installation services. Not being an approved WWL contractor was a potential problem, but an argument was made that they were not working on WWL infrastructure (the MRP was considered SCC property during construction) and SWDC had expressed a preference for using local companies wherever feasible. They were awarded the contract which proved to be a wise decision (refer to section on Covid), working safely and to a high quality of workmanship.

6.7 COVID

By mid-March, temporary site fencing, site office and toilet had been installed ready for construction to start.

CCL had arranged to commence site work on Monday 23rd March, only 72 working days since contract award. The project was ahead of schedule.

However, as Covid struck the world, New Zealand went into a level 3 lockdown on 23rd March and the situation quickly changed as we all entered unknown times.

On the 25th of March, one day before the alert level was raised to Level 4 for one month, WWL categorised all their projects and classified the Martinborough MRP project as 'Critical'. This meant that on-site and off-site construction for the project could continue, albeit with strict Covid rules of separation etc.

CCL were able to start groundworks and having selected local contractors proved to be a huge benefit.

The lockdown also provided unexpected benefit for the construction phase. One of the identified construction risks was excessive noise from construction equipment disturbing guests staying at Peppers Resort.

Any noise complaint would be detrimental to the relationship with affected parties, could potentially reduce working hours and extend construction time. However, with no guests allowed to stay at the local resort construction noise was no longer an issue.

6.8 HEALTH & SAFETY

Health and Safety is of paramount importance, and this ethos is driven from the top down. SCC had a management presence on site every day. That helps, but some incidents are difficult to avoid. Three non-injury incidents were recorded, all off the main construction site:

- Damage to an unregistered/unmarked subsurface 63mm irrigation pipe.
- Damage to an unregistered/unmarked subsurface telecom wire.
- Dog off leash ran into trailer being towed by contractor. (Dog was OK!)

6.9 PROJECT CHANGES

The construction phase of the project went very smoothly with no delays, no technical changes, and no lost-time H&S incidents. The MRP construction was running to schedule but a delay obtaining approval to procure new bore pumps introduced an unexpected delay.

WWL introduced a large and complex variation to the contract early in June, when SCC were requested to upgrade the WTP and Reservoir.

A scope was agreed, and the contract varied accordingly. However, this introduced a significant five-month delay to the overall programme, bring final completion into the increased water demand time of year. This could have been avoided with better planning, particularly as they were part of the original SCC offer.

Other variations were awarded during the project, largely by client driven changes from undocumented or missing infrastructure.

6.10 COMMISSIONING

The MRP was successfully pre-commissioned in July and project focus was then directed to the upgrade of the WTP and Reservoirs. These were successfully tested and ready for operation by early October 2020, but due to various operational issues the MRP was not bought online.

By the time these issues had been resolved it was too close to Christmas to risk starting a 30-day performance trial.

6.11 PERFORMANCE TRIAL

Chlorine levels in the MRP, being offline, had be checked and maintained over Christmas and New Year, but eventually the performance trial started on 14th January.

SCC operated the MRP during the 30-day trial with water samples taken and analysed by an independent contractor. The trial was carefully monitored by GHD/WWL and passing all criteria with flying colours.

The main criteria had always been to reduce the level of dissolved manganese entering the reticulation system and to summarise the trial period results were:

Dissolved manganese entering MRP = 0.045 g/ml (ave) & 0.075 g/ml (max)

Dissolved manganese leaving MRP < 0.005 g/ml (the detection limit)

The MRP and WTP are now fully operational and six months through the contractual twelve months defects liability period.

Photograph 4: Official Opening of the MRP (SWDC Mayor and Simon)

CONCLUSIONS

Using a small suitably experienced local contractor instead of a larger corporation has its risks, but (as proved this this project) can offer an alternative with cost benefits and other non-tangible benefits associated with employing locally, such as retaining construction knowledge, stimulating the local economy through employment, increased engagement from effected parties and more.

The Martinborough manganese reduction project is a shining example of how a small contractor can outperform 'the big guys' by delivering a high-quality infrastructure project on schedule and within budget. The local community is proud of their new asset that will now enable the town's water supply to keep up with the high demands of Summer without restrictions.

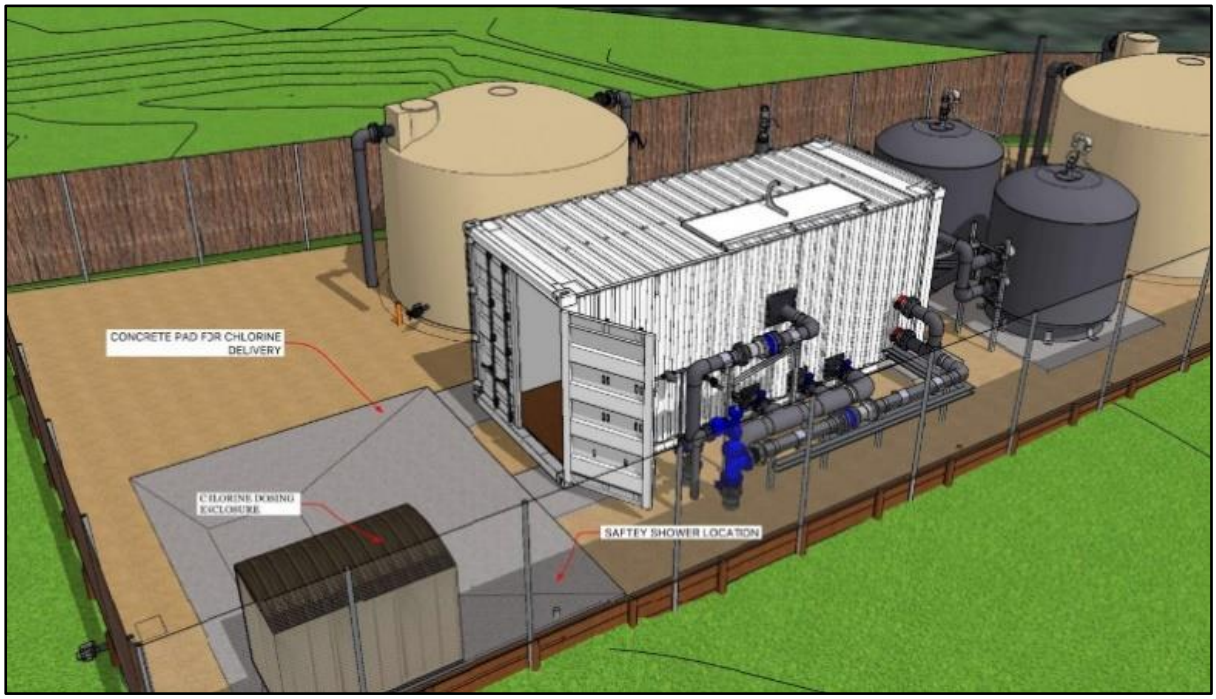
As with any projects, there were contract variations. However, keeping these to less than 3% (WTP variation excluded) is an unusual achievement.

The final MRP project cost was $1.932M (excluding WWL/GHD overhead costs).

Final overall project cost, including variations for contaminated ground issue, water main fire hydrants, missing NRVs, additional testing and covid related costs was $2.304M (excluding WWL/GHD overhead costs).

With significant changes to the way New Zealand's water infrastructure is to be managed on the horizon, is there going to be time and incentive for smart procurement?

Will it be too much effort to seek locally experienced professionals and contractors in favour of big corporations?



Photograph 5: 3D Model

Photograph 6: Aerial View

Photograph 7: From New York St