

MEMO

To: Ms. Lynda Floyd, Village of Belcarra

Copies to: Mr. Larry Scott, Mr. Walt Bayless

Our File No. 08.13

From: Ron Beesley

Date: May 9, 2012

Re: Final Construction Costs, Scope Creep (additional work) and Contingency Items, Potable Waterworks Project, Beesley Engineering Portion

As requested, we are writing regarding the costs for the above project. We have prepared a spreadsheet comparing the December 2006 estimate, the March 2008 estimate and the estimated final costs. All of the work is not yet complete or invoiced so some of the final costs are estimated. Costs which are final are highlighted in blue. Some of the costs in the spreadsheet are approximate due to the difference between the way the estimates were prepared and construction costs were incurred. This is a partial response to the residents' question regarding the overall estimate and actual costs incurred.

We have prepared our response in three parts. The first two parts deal with the 2006 and 2008 estimates and the third part deals with actual costs incurred and an estimate of the cost of inflation.

1. ORIGINAL (DECEMBER 2006) COST ESTIMATE

In December 2006, Dayton & Knight submitted a Potable Water Study to the Village. The Study is available on the Village's web site. This was a high level study which provided a road map for the Village showing how the project could proceed and was paid for by the Village under a Planning Grant. Among other things, the study addressed design considerations, alignment options for the submarine pipelines from North Vancouver, Pipeline Design, Regulatory Approvals, Village Water System Upgrades, Capital Costs and Scheduling.

It was noted in the Study that it was based on the best available mapping and that due to the Village's budget limitations a survey of the seabed and marine organisms was not carried out.

When the Study was carried out there was an existing fire protection system in the Village. The system consisted of two steel water storage tanks, eight inch diameter ductile iron watermain, valves and fire hydrants. The system was designed and constructed to meet the Fire Underwriters Criteria for a fire protection system together with the recommendations of the Turgy Report. There was a fire hydrant within 300 metres of every home and there was an available fire flow of 30 litres/second for a one hour duration. The system was constructed over a number of years and was funded from general revenue. The system not only improved property and life safety but also resulted in a significant reduction in home insurance costs for the residents.

Section 8 of the Dayton & Knight Study contained a preliminary estimate of the anticipated Capital Cost of the project in 2006 dollars. There was no allowance for any taxes or inflation costs. At that time, the Village paid GST but was refunded any GST paid. Effectively paying no GST.

In December 2006, with assistance from Dayton & Knight the Village made application for a MRIF Grant using the estimated capital cost for the project as shown in the Report. The cost was \$6,052,900 in 2006 dollars, including a 25% contingency allowance and excluding taxes. If approved, the Grant would pay two thirds of the estimated cost of the project.

It is important to understand that the Contingency Allowance in the estimate was only to cover the unknowns associated with the scope of work included in the cost estimate. Scope creep (additional items) were not covered by the Contingency Allowance.

An example of a contingency item would be an air release valve. All watermains require air release valves at their high point. They are a relatively low cost item. At the pre-design stage there is no survey and so it is impossible to determine the exact number of air release valves required. The Contingency Allowance is intended to cover these types of costs.

An example of scope creep is the fibre optic communication cable installed between Midden Road, the Village Hall and Tatlow Reservoir. Dayton & Knight did not anticipate in their cost estimate that a fibre optic cable would be required for a SCADA System.

The estimate also included an allowance of \$ 448,364 (10%) to cover the cost of engineering and survey fees. In hindsight, 10 percent may not have been a sufficient allowance for engineering and survey. As water service connections were required to be installed on all of the existing watermain fronting the properties to be served, this meant that even though new watermain was only being installed in a portion of the Village, it was still necessary to survey the entire Village and produce new engineering drawings of the entire Village. Not just where new watermain was being installed.

On January 18, 2008 the Village was awarded a MRIF Grant of \$ 4,035,266. One condition of the Grant was that all work was to be completed and invoiced no later than March 31, 2012.

2. MARCH 2008 COST ESTIMATE

Following award of the Grant, at the January 21, 2008 Council Meeting, Council appointed Dayton & Knight and Beesley Engineering as the Engineers for the project. Council also approved a budget of \$30,000 for Dayton & Knight to review their design and cost estimates and carry out some preliminary work on the marine pipelines and North Vancouver works.

In the time between December 2006 and March 2008 Dayton & Knight had carried out some additional work and had obtained from the Province a Cadastral Map of the Village. In March of 2008 Dayton & Knight submitted a revised Construction Cost Estimate for the project in 2008 dollars. At that time, Dayton & Knight recommended that the contingency allowance be reduced to 15 percent. The new estimate was \$6,863,975, an increase of about \$811,000. The 2008 estimate did not include for taxes or inflation.

The 2008 estimate included for additional scope. A building at Midden Road was added, flushing and “pigging” infrastructure on both sides of the crossing was added and additional flow monitoring capability on either side of the underwater portion of the works was added. A dedicated watermain from Midden Road to the Tatlow Reservoir was added.

The engineering and surveying allowance was still set at about 10 percent of the construction cost in the amount of \$620,548 an increase of \$172,184.

On February 1, 2008, the Village received a letter from Western Economic Diversification Canada (WED) stating that a number of pre-conditions had to be met before any project funds could be spent. This placed the Village in a “Catch 22” situation as it was necessary to spend money to meet the requirements. WED agreed to modify the conditions such that a portion of the funds spent on meeting the Grant pre-conditions would be reimbursed under the Grant. Until all of the pre-conditions were met, the Village was not allowed to spend any additional project funds.

It was made quite clear that any funds spent prior to final approval of the Grant would not qualify for cost sharing. This meant that no detailed engineering or survey work could commence. In order to assist the Village, Dayton & Knight and Papove Surveying carried out some work but did not submit invoices.

One of the pre-conditions was a Canadian Environmental Assessment (CEAA). Other pre-conditions included consultation with local First Nations. A submission to WED was made on April 4, 2008.

Between March 2008 and July 2009, design and engineering work relating to the project was effectively on hold while the Grant approval process was completed.

The final Agreement from WED (dated July 2009) was received and executed by the Village in September 2009. Following receipt of the Agreement, the Village undertook the elector assent process to adopt the requisite bylaws to authorize borrowing for the municipal portion of the capital costs. Bylaw 413, 2008 was adopted January 11, 2010, being the date the Village had legal authority to borrow monies for it's share of the project. Following adoption of the bylaw Dayton & Knight and Beesley Engineering were instructed to proceed with design, tendering and inspection of the project. In 2010, work was proceeding on design consultation with and obtaining District of North Vancouver permits, archeological permits, environmental permits and permission to carry out construction in the Fisheries window.

As the grant application, approval process and Village approval had taken 3 years and the completion date was still March 31, 2012 it was understood by all parties that time was of the essence. It was decided to tender and award the work as soon as the design was complete. Splitting the municipal watermain construction into three phases enabled portions of the work to be completed and tendered rather than waiting for all of the design to be complete. (This was not the only consideration in phasing the work.)

There was no time to carry out all the design work and then re-estimate the project costs prior to going to tender/construction.

In 2010, the marine portion of the work was advanced to construction. This component was able to be tendered first as the design was completed through a combination of funding from WED which permitted Dayton & Knight to complete a sufficient portion of the design to permit regulatory review. The balance of the design was completed by Dayton & Knight who held invoices so that the Village would not immediately incur the costs.

The Marine Pipeline work was awarded to Vancouver Pile Driving on August 12, 2010, the North Vancouver Vault and Dean Place work was awarded to Merletti Construction on May 9, 2011, the Midden Building and Tatlow Pump Station work was awarded to Merletti Construction on June 27, 2011. The tender prices for this work, with the exception of Tatlow Pump Station, were in line with the 2008 estimate.

The Municipal Watermains Phase I work was awarded to Mission Contractors on September 13, 2010, the Municipal Watermains Phases II and III work was awarded to Sandpiper Contracting on August 8, 2011 and November 16, 2011 respectively. Award of the Phase III Contract was delayed due to a shortage of funds.

In May of 2011, as the tendered construction costs were becoming known, the Village began a comparison of the actual and projected construction costs with the 2008 estimate. It was identified at that time that final construction costs would exceed the 2008 estimate. A complete estimate of the projected final costs and a budget was prepared in mid October 2011. There were insufficient funds available to award the final phase of the waterworks construction to Sandpiper.

As a result, the Village arranged for additional funds and the final phase of the work was awarded to Sandpiper Contracting.

3. ACTUAL AND ESTIMATED FINAL CONSTRUCTION COSTS

A. Dean Place PRV, Marine Watermains, DNV Vault, Midden Building and Environmental Planning.

These costs are listed on the spreadsheet as Items 1 to 5 inclusive. The estimated cost for these items was \$ 2,665,915. The final construction cost was \$2,643,230 or \$22,685 less than the estimate. If the cost of the BC Hydro Charges of \$17,704 is taken into account the final cost would have been \$4,981 less than the estimate with no allowance for inflation.(For complete accuracy, about \$4,000 of the BC Hydro Charges should be allocated to the Tatlow Pump Station)

B. Municipal Watermains, Service Connections and Meters and Reservoir Modifications

The actual and estimated final costs excluding taxes are as follows:

1.	Phase I - Mission Contractors. (Actual)	\$ 1,721,276.54
2.	Phase II - Sandpiper. (Actual)	\$ 1,436,501.32
3.	Phase III - Sandpiper (Estimated)	\$ 1,110,000.00
4.	Chlorination and reservoir cleaning costs. (Actual)	\$ 16,503.68
5.	Purchase of reservoir seismic and altitude valves.(Actual)	\$ 13,618.00
6.	Purchase of 284 water meters. (Projected cost)	\$ 85,200.00
7.	Credit fibre optic cable (Actual, added to SCADA cost)	\$ (42,000.00)
8.	Credit asphalt overlay and Coombe repair.(Actual)	\$ (186,726.00)
9.	Miscellaneous costs.(Actual)	\$ 9,388.13
TOTAL		\$ 4,163,761.67

It is anticipated that the water meters will be purchased and installed on an “as required” basis over a number of years as residents connect to the system. As the meters are battery powered and there is a very small number of meters required there is no incentive to bulk purchase and inventory the meters. Any discount for 284 meters would be small and the battery life would be used up sitting on the shelf.

The Contracts with Mission and Sandpiper included an allowance for rock blasting, an allowance for poor ground conditions and a contingency amount. The final cost of the Phase I Contract was \$7,587.20 more than the Contract Amount. The final cost of the Phase II Contract (excluding the \$186,726 extra cost of the road reconstruction) was \$225,417 less than the Contract Amount. It is estimated that the final cost of the Phase III Contract, presently under construction, will be \$178,000 less than the Contract Amount. All costs exclude taxes.

The estimated final cost of the municipal watermains is \$1,030,587 higher than the March 2008 estimated cost of \$3,133,175.

The ENR Index on March 2008 was 8109 and in June 2011 9053 for a difference of 11.6 percent. 11.6 percent of the March 2008 estimated cost is \$354,777.

In addition, there was scope creep (additional work not anticipated in the 2008 estimate) of \$ 271,836 as shown on the attached spreadsheet. Inflation and scope creep total \$ 626,613 leaving a difference of \$ 403,974 unaccounted for. It would be necessary to carry out a detailed analysis and comparison of the estimate and construction costs to identify the areas of difference. This work is beyond the scope of this memo.

One area of difference was the intent that water services for adjacent lots be installed in a common trench wherever possible. At the detailed design stage it was realised that in many cases this could not be achieved due to either topographic constraints, the presence of rock or greatly increasing the cost of connecting the home to the water service connection.

The scope creep consisted of four categories. The first category consisted of the provision of blowdowns. Blowdowns, installed at the low points of a watermain, allow the system to be completely flushed and drained as opposed to flushing through a fire hydrant. With the Village System being constructed for a minimum 75 year useful life it was decided that it would be prudent to incorporate blowdowns into the system as a more positive way of flushing and cleaning the system. Blow downs also make operation and maintenance simpler. There were to be no fire hydrants installed on the feeder main from North Vancouver, blow downs were required on this main in order to flush and clean the main. These blow downs were combined with the distribution main blow downs, reducing costs.

Water quality standards are continually being raised (turbidity control has been in the local news recently) and it will be very important in the future to maintain clean watermains. The Village of Anmore has required blow downs on all their watermains for a number of years.

The second category consists of the installation of water sampling stations. Historically, water samples have been taken from homes on an occasional basis and tested for the presence of bacteria and free chlorine. This confirms that the water is safe to drink. A more rigorous approach to water sampling has now been adopted by Fraser Health and Metro Vancouver. Samples are taken from random locations on a weekly basis. The preferred location for sampling are dead ends of watermains where the water may have become stagnant with low free chlorine levels. Fraser Health is now mandating that all new water systems have sampling stations incorporated into them at locations approved by them.

The third category is the installation of a seismic valve on the outlet pipe of the Tatlow Reservoir. The purpose of the valve is that in the event of an earthquake it will close to save the contents of the reservoir for fire fighting and drinking water use. If an earthquake ruptures any watermains it may drain the reservoir or cut off supply from North Vancouver to the Village. The valve may be controlled using the SCADA System. None of these items were included for in the 2008 estimate.

The fourth category was the need to expand the high pressure water zone following receipt of final topographic survey.

C. Tatlow Pump Station, Fire Pump

As mentioned previously, in 2006 the Village had a fire protection system with fire hydrants within 300 metres of all of the homes in the proposed potable water service area. To fight a fire 300 metres from a hydrant the Fire Department would typically set up their pumper truck about 150 metres from the hydrant using 150 metres of hose and then pump the water to the fire using another 150 metres of hose.

In 2006, the fire hydrant on Main Avenue at Tatlow Road had insufficient pressure to deliver water to a fire truck located 150 metres uphill to the east. In order to fight a fire at the end of Main Avenue it was necessary to respond with two fire trucks. The trucks would then work in tandem with one truck pumping water up to the other truck. This was not an ideal situation for the Sasamat Volunteer Fire Department as there were not always enough volunteers to man two trucks when called out to fight a fire.

In 2006, it was planned to improve the Village fire protection system by adding a number of fire hydrants to the new watermains. The locations of the new hydrants were shown in the Dayton & Knight Report. At that time there was limited topographic survey available. Page 3-11 of the Dayton & Knight Report discussed the requirement for a high pressure zone and recommended a residential booster pump station to serve the zone. Dayton & Knight also indicated that the exact details of the zone would have to be finalised at the detailed design stage when topographic survey was available.

The 2006 estimate included an allowance of \$125,000 (\$100,000 + 25% contingency) for a residential booster pump station. At the detailed design stage when topographic information became available it was realised that the proposed new fire hydrant on Main Avenue, east of Tatlow Road, would not have sufficient pressure to meet the Fire Underwriters specifications. It was decided that a fire pump was required.

The fire pump not only improved the fire protection system by increasing the water pressure at the hydrants on Main Avenue, it also eliminated the requirement for two fire trucks to fight a fire at the east end of Main Avenue.

The additional cost of expanding the pump station building and adding the fire pump was \$342,000. The cost of the fire pump was not included in the 2008 cost estimate.

D. Asphalt Overlay

The 2008 estimate included an amount of \$329,337 for overlaying some of the Village roads following trench repair. At the time, it was known that many of the roads were in poor condition and would be badly damaged during installation of the watermain. It was deemed prudent to allow for an overlay of some of the roads. The roads were not identified, it was simply an allowance.

In the Phase II contract, in lieu of asphalt overlay, road reconstruction was carried out on Coombe Lane, Whisky Cove Lane, Robson Road and Turtlehead Road. The cost of this work was \$188,115, \$141,222 less than the estimate.

E. SCADA System Construction and Programming Fees

Electronic technology continues to develop rapidly with prices continually falling as the technology becomes widely adopted. In the 2008 estimate there was no allowance for a SCADA System. By the time the project reached the detailed design stage it was deemed that a SCADA System should be incorporated into the system.

The cost justification was that there would be a significant savings in staff time and costs, for operation of the system and responding to alarms.

The SCADA System allows the key functions and alarms of the water system to be monitored in the Village Hall and also remotely on smart phones. Apart from providing operational flexibility, it is anticipated that there will be significant staff time saved in driving to the reservoir, pump station and the Midden Building to confirm that the system is operating correctly and that there is chlorine in the system.

When alarms are triggered (say a low reservoir alarm), staff will be able to identify the problem and decide if they need to respond immediately, especially outside normal working hours. This will save costs over the lifetime of the system.

The system may be custom programmed to display information deemed necessary to confirm the system is operating correctly.

The cost of the SCADA System is estimated at \$73,485 for the hardware, underground wiring and software. Programming is part of the Opus DaytonKnight engineering fees. Of the \$73,485, \$54,265 was the cost of installing a fibre optic communication cable between the Midden Building, the Village Hall and the Tatlow Pump Station. The remaining \$ 19,222 is the estimated cost of the supply and installation of electronic equipment. There was no allowance for these costs in the 2008 estimate.

F. Water Meters

A technology situation similar to that of the SCADA arose during selection of the water meters. In 2010, Sensus Meters developed and had approved by the regulatory authorities a new water meter for use in North America.(IPERL)

The meter is a sealed unit, contains no moving parts or obstructions to flow and can be read in a couple of hours by radio from a mobile base station in a truck while driving through the Village. The water meter also contains a leak detection alarm. The unit contains a replaceable battery which is guaranteed for 20 years.

Software purchased with the system allows for computerised billing and monitoring of leaks or unusually high consumption. The staff time savings over a number of years are obvious as are the operational advantages. Leaks typically constitute a significant portion of the consumption in a water system.

The IPERL enabled the Village to standardize on meter setters and a 25 mm diameter water meter for sprinklered homes, large homes and non sprinklered homes. It should be noted that the Village of Anmore is using their third model of water meter. The current cost of an IPERL meter is about \$300.00 excluding tax. A 19 mm diameter meter is about \$40 less but will not easily fit into the meter setter.

G. BC Hydro Charges

These costs of \$17,704 are for supplying an electrical service to the Dean Place PRV, the North Vancouver Vault, the Midden Road Building and the Tatlow Pump Station. These costs should be apportioned between the various facilities and have been discussed in Item A above.

H. Engineering Fees

The 2008 estimate included an allowance of 10% for engineering fees. Ten to twelve percent is an industry rule of thumb for engineering fees. The fees will vary dependant upon the complexity of the work and the scope of work required. This amount will typically cover topographic survey, preparation of detailed design drawings, tendering of work, preparation of contract documents, recommendation on progress draws and inspection and field services.

The final construction cost for the project is estimated as \$7,546,866. Ten percent of this amount would be about \$755,000. The estimated fees to complete the project are \$ 384,000 for Beesley Engineering and Papove Surveying and \$ 507,000 for Opus Dayton & Knight for a total of \$891,000.

The Beesley and Papove fees represent about 8.8 percent of the \$4,351,877 construction cost of the work that they were responsible for. As mentioned previously, their work included for surveying of the entire Village and preparing drawings of the entire Village even though there were only service connections added to the existing watermains.

The Opus Dayton & Knight fees include labour related to the permitting process and the SCADA programming. The costs to advance the project through the permitting process were in the order of \$96,000 and the programming fees are estimated at \$44,000. This leaves a balance of \$367,000 (\$507,000 - \$96,000 - \$44,000), or about 11% , for engineering fees directly related to the \$3,191,732 construction cost of the work that they were responsible for. In this instance, a direct comparison between fees and construction cost is not appropriate. At all times, Dayton & Knight provided the Village with fee estimates for review and approval prior to carrying out their work.

I. Miscellaneous Costs

There were a number of miscellaneous costs incurred on the project. These are shown on the enclosed spreadsheet. The costs have been added into the applicable project costs where possible. There remains \$9,338 that is unallocated. The unallocated costs are general overhead and environmental permits.

J. Village Portion of HST

Under the HST regulations the Village is required to pay approximately 14.5833 % of the HST. The Village's portion of the HST on the final construction cost is about \$150,000. In 2008 there was no HST so this amount was not included in the 2008 estimate.

K. Environmental Monitoring

The Village is required by Fisheries to monitor the marine environmental compensation planting of eel grass through to 2015 to ensure that it grows. There is an allowance for monitoring and reporting to Fisheries.

L. Inflation Allowance

The December 2006 estimate did not include an allowance for inflationary costs. When the estimate was updated in March 2008, the costs were increased to reflect inflation between 2006 and 2008. There was no inflation allowance added in 2008 as it was assumed that the project would proceed quickly, the grant having been awarded. As mentioned previously, no one was aware that meeting the final grant conditions would take so long or be so complicated.

The government produces various price indices which track inflation in the cost of items such as food, homes etc. The government does not track inflation in the cost of construction.

It is impossible to accurately estimate the inflationary portion of the cost of the Village's water system between March 2008 and the time of construction of the various components. A common measure of inflation in construction is the Engineering News Record (ENR) index. This may be used a guide to inflation in construction costs. It tracks material and labour costs.

Some areas of work are more sensitive to inflation than others. For instance, watermain construction is relatively low risk and highly competitive. The number of bids and small spread in the tendered prices for the watermain work reflect this. Watermains are constructed all the time. Specialist work such as construction of the marine pipeline is infrequent, less competitive but with a much higher risk.(Only 2 bids were received for the marine pipeline.)

Small increases in the cost of materials, wages and fuel are passed on more quickly on competitive work than on less competitive high risk work.

As mentioned in Item B above, an argument could be made that inflation between March 2008 and July 2010 was 9.1 % (ENR Index 8109 to 8844) on the entire project construction cost of \$7,543,609 for an amount of \$686,000. The exact figure is unknown. The \$686,000 number is shown in the spreadsheet.

We trust this answers in part the residents' question.

“QUESTIONNAIRE” Re: Village of Belcarra Domestic Water System Project
“MUNICIPAL RESPONSES” May 9, 2012 are shown in red

To: Village Council, Village Staff and Consultants for the Project

From: Property Owners who have not received responses to their October 2011 letters with questions regarding the new Village water system project.

GENERAL

In accordance with the alternative plan proposed by Councillor Drake to have our concerns and questions addressed at a meeting scheduled to be held on the evening of May 10th, we submit in advance the following as the principal issues for which we desire explanations. Our concerns are shared by other taxpayers in the community.

In January of 2010 the taxpayers agreed that the domestic water initiative should proceed. That decision was based upon the taxpayers being responsible for about \$3,000,000. of the estimated total capital cost of \$7,000,000. In October of 2011, when the project was nearing the final stages of construction, we suddenly found that the capital costs were going to be in excess of \$9,000,000. and that we were now responsible for \$5,000,000. of the costs. This is a \$2,000,000. hit and a 67 percent increase in our share of the costs. It seems apparent that the 2008 cost estimate, upon which the 2010 decision was made, did not include allowances for all cost items and that the contingent allowance of 15% in that budget was not nearly sufficient to cover all of the costs of: uncertainties in the estimates, unaccounted for incidental & significant items and for any inflation that might occur. What is also concerning is that it appears that it was not just the taxpayers who so belatedly learned the extent of the overrun.

Some of the letter writers wish to be able to review the agreements with the consultants and the various construction contract documents. Such a review might provide clarification regarding some of the issues, and may also lead to the asking of some further questions. They request that the Village provide PDF copies of these documents by or before April 27. These letter writers are prepared to sign non-disclosure agreements.

Municipal Clarification - Contingency:

Contingency is an additional funds allocation to address uncertainties in the estimates. It is not there to provide for any inflationary increases or to pay for work which was not envisaged at the time the estimate was prepared. The contingency is there to cover unanticipated costs of the envisioned work. It's not there to cover costs of work that was not envisioned. It is for the "known unknowns".

Municipal Clarification – 2011 Cost Estimate Breakdown provided in October 2011

Component of Budget	Notes	Oct12/2011	Mar/18/2008
Original OPUS DaytonKnight Project Estimate *	(1)	\$6,864,000	\$6,864,000
Inflation *		973,300	
Items added to Project during construction *		1,306,206	
Original estimate components adjustments *		(423,531)	
*As estimated by OPUS DaytonKnight, Oct/12/2011		8,719,975	
HST, non-rebateable	(2)	152,600	0
External interim financing costs	(3)	33,400	192,192
Internal interim financing costs	(3)	16,851	↓
MFA, debenture financing fees	(4)	29,802	0
MFA, debenture cash reserve contribution	(4)	49,670	0
		\$9,002,298	7,056,192

MAIN ISSUES and QUESTIONS:

1. OPUS DAYTON KNIGHT'S (ODK) JUNE, 2011 COST UPDATE LETTER

Background:

- The text in this letter indicates that it is providing an update of the "overall project budget", yet the cost totals that are stated do not appear to include all of the costs that were either known, or, that could reasonably have been anticipated at that time. The result is that the overall total cost estimate seems to be understated and misleading.

Questions:

- If the letter was not intended to provide an update of the estimated overall project cost, what was the intent of the letter?

Answer - The June 2011 letter was the next update as pricing came in and was a work in progress as construction work was unfolding.

- Please explain why the estimates of engineering costs in the June, 2011 column are lower than those in the 2006 estimate.

Answer - The approved budget had not reached the estimate accepted by the Village at the time of writing the June 2011 letter.

- Is the \$80,700. of additional engineering costs identified in ODK's June estimate included in the \$309,950 figure?. If not, please explain why not.

Answer - No because it had not yet been approved by the Village.

- Even though the tendered price for the Stage 1 watermain work seems to have come in higher than budgeted, the total allowance for the watermain work (\$1,719,300. plus \$416,000.) is \$89,700. below the amount allowed for in the 2006 estimate. How was the figure of \$416,000. derived?

Answer - Stage 1 costs represent tendered costs, the balance represents works which had not yet been attributed to a specific phase of other works. A forensic analysis of the cost estimate was not done. The 2006 estimated cost of the work including contingency was \$3,067,219 minus \$1,719,300 leaves an allowance of \$1,247,919 to complete the work. (\$3,067,219 = total of tables 8-2 and 8-3 2006 estimate plus 25% contingency)

2. INFLATION FIGURES

Background:

- We believe that specific consideration of and allowances for future inflation should be made in preparing budgets for project costs.

Answer -

- Clarification needs to be noted – the information represented project estimates, it was not budget. This is a difference. At the time of preparing the 2006 estimate it was not anticipated a multiple year delay for commencement.
- There may have been an unforeseen extended delay due to approval issues but the 2008 budget should have included allowances for inflation costs over the estimated times for permitting & approvals, for design and for construction periods.
- We have difficulty accepting the \$973,300 inflation figure. As there was less than 1% overrun of the cost estimate for the marine contract, this would mean that there was about 20% inflation for the other items in the 2008 budget. It is hard to believe that inflation costs increased from \$31,620 in June of 2011 to \$973,300 in October, 2011. This would mean that over 96 per cent of the inflation costs were incurred within the last few months of the project activities.

Questions:

- What are the actual allowances that were made in the March 2008 budget for inflation?
Answer - It did not carry an allowance to adjust for inflation to when the project would be built, that is why it states cost estimate. The estimate from 2006 was revised to reflect 2008 prices.
- Why was no adjustment made to the 2008 cost estimate after the approvals delay and before the January 2010 vote on the water initiative?
Answer - Because the project was primarily on hold pending CEEA completion and permitting. In hindsight perhaps another estimate may have been warranted and incurring the additional engineering costs for an updated estimate.
- Could you please show how the \$973,300 inflation cost was calculated?
Answer - It was projected out pending 2012 project completion. It was an inflation allowance to the anticipated end of the construction phase of the project at 10.97% of \$8,872,575.
- Are the ENR price indexes the most appropriate to use for this region and this type of work?
Answer - It is the index that Dayton & Knight has used for the past 40 years and considers it to be appropriate.
- What was the reason for spacing out the tender calls over a period of fourteen months which extended the times of construction and of exposure to inflation?
Answer -
 - It was decided to construct the work initially in 3 phases in order to minimize disruption to Village residents;
 - Open the bids to smaller contractors who have more competitive pricing due to their lower overheads;
 - A large consideration in this decision was maintaining the existing fire protection system in operation during construction;
 - By opening it up to smaller contractors it had to be spread out to avoid interference with each other;
 - There was insufficient time and would have delayed the entire project to have completed the design for all phases prior to tendering the work. This meant some construction could occur more quickly thus reducing the cost of inflation;
 - There were fisheries window that needed to be met and a Disposal at Sea Permit with definitive time parameters specified in it; Dayton & Knight completed the design for the marine portion of the work, on the understanding that a portion of their fees would not be paid by the Village until such time as the CEEA process was approved and the agreement issued to the Village enabling the tender calls and work to proceed. Those constraints did not exist for the terrestrial portion of the work, design on those portions of the work started later;
 - Where tenders could be let simultaneously, they were ie, marine works (VPD) and phase 1 of the terrestrial works (Mission Contractors); DNV terrestrial works and Belcarra Valve buildings;

3. ENGINEERING COSTS**Background:**

- ODK's March 2008 update seems to recognize that the Village wanted a radio network system for meter reading and notes that this type of meter infrastructure has been assumed in the budget.
- The estimated costs in October of 2011 for both engineering consultants were both in the order of fifty (50) per cent higher than those estimated in 2008. This increase seems high.

Questions:

- What type of contracts does the Village have with the consultants?
Answer - Beesley Engineering is the Village's municipal engineer appointed by Council since 1990. Beesley services have been required on an as needed basis. Consulting engineering services are provided as an alternative to having a staff engineer. Given Beesley's extensive knowledge of the Village it was appropriate to retain and continue receiving their services for the water project. In order to

ascertain estimate of costs to completion of project, Beesley Engineering submitted an estimate reflected in the October 2011 report (June 2011 letter reflected known costs to that date). Dayton & Knight have been working with the Village on a study by study basis since 2004, all costs covered by infrastructure planning studies up to 2006 upon submission of the pre-design report. OPUSDaytonKnight submitted a standard engineering proposal for the water project in 2008 forming the basis of their budget with the Village. Proposal updates were provided October 2009, June 2011 and October 2011 as the project proceeded and the scope of work changed.

- Why was the decision made to change the number of contracts that were administered by ODK from two to three with the resulting additional engineering charge of \$28,000.?
Answer - The DNV and Belcarra terrestrial works were split into separate contracts with the thought that local contractors may be more competitive. It also recognized that some contractors limit their services to geographical locations.
- Why was it necessary to spend nearly 100 **additional** hours at a cost of \$11,000. to specify the water meters?
Answer - It is industry standard to prepare a tender package for water meter supply, install and pricing security for future years, given the potential purchase of 286 meters. The scope of work included technology availability and arranging vendor presentations. As a result of Council's decision to not require properties to connect, the Village may not end up tendering the meters due to unknown quantities required.
- What is the basis of the \$98,000. in additional fees charged by Beesley Engineering Ltd over their 2008 estimate?
Answer - As mentioned previously Beesley is working on an hourly basis as the Village's contracted engineer, there was no 2008 estimate prepared.
- What is the basis of the \$81,950. in additional fees charged by ODK over their 2008 and June, 2011 estimates?
Answer - Opus DaytonKnight fees are summarized in letters to the Village dated June 2, 2008; October 8, 2009; June 14, 2011 and September 2011. Each letters summarizes the scope and estimated level of engineering required to complete the tasks.
- Why did the engineering costs related to SCADA increase so significantly after the March2008 budget?
Answer - The SCADA system involves two separate components, the purchase of the hardware (i.e.: computers, radios and software) and the programming. The programming involves the control logic, communication between devices, operator interface screens, alarming routines, commissioning, testing and training. Opus DaytonKnight provided the programming component which is additional scope.

4. INCREASED COSTS for SURVEYING

Background:

- We do not understand the cost of surveying increasing from \$7,500. In June of 2011 to \$74,655. In October of 2011.
- The Mayor's Report in the February, 2007 Barnacle noted that an up to date survey "...is a prerequisite to engineering design work for a water distribution system,..." and indicated that this survey work would be completed in 2007 "...to minimize delays." ,and, The Mayor's Report in the October 2008 Barnacle noted that "Detailed surveys of...plus the road allowances where meters and valves will be located, have been completed."
- We have to think, that as it is the same consultant for the new water system mains as carried out the engineering work for the previously completed fire protection mains (which will now constitute a significant portion of the domestic water system mains), that there should be drawings available of the existing infrastructure.

Questions:

- How is it that there was "...no legal survey related to existing infrastructure..."?
Answer - The previous survey work was the minimum required to complete the fire protection main project. As the terrestrial work encompassed the entire Village it was deemed necessary that a complete survey of the Village roads and property lines was required. This necessitated updating the existing survey of the fire protection system as these areas had previously been surveyed using different datum and some property lines were not accurately located on the older survey information.
- Were the detailed surveys carried out in 2007? And if not, when were they completed?
Answer - Survey work was started in 2007 and carried out slowly until 2010 as the Village did not have the funds to compensate the surveyor. The 2009 Agreement funding agreement authorized the fees to be captured as part of the grant reimbursable costs. The surveyor agreed to withhold invoices for all works, submitting them to the Village at the end of 2011.
- How is it that these additional survey costs of over \$67,000. only became apparent after June of 2011?
Answer - June 2011 was when the surveyor, as requested, submitted the estimate for works to end of construction period March 31/12.
- On what basis were detailed tender issue drawings prepared without this survey information prior to June 2011?
Answer - They were prepared with the required survey information.
- Does the Village now own A Cadastral Base Map? And, if so, what was the cost?
Answer - Yes, it's included in the overall survey costs and not separated out.

5. UNFORESEEN CONSTRUCTION COSTS for ROAD REPAIRS & ACCESS DIFFICULTIES**Background:**

- There appears to be an additional cost of \$308,000. (\$48,800. + \$60,000. + \$200,000.) for these items.
- The difficulty of access to some locations is, and was, pretty obvious. Based upon previous experience (with fire main installation and road reconstruction projects) and other observations, it seems that some problems with subgrade conditions should have been anticipated.
- Although a definitive estimate of costs these kinds of items might be difficult at the budgeting stage, it would seem only prudent to consider them at that time and to make specific allowances.

Questions:

- Were there any specific allowances made in the 2008 budget for these kinds of costs?
Answer - There was no allowance for difficult access made in the 2008 estimate as this would be covered as an unknown in the contingency amount. There was an allowance in the 2008 cost estimate to overlay roads, however this amount did not include for partial reconstruction of roads such as Turtlehead Road, Coombe, Whiskey Cove and Robson Road.
- Does \$308,000. represent the entire cost related to these issues, or, does it represent just the additional cost over any allowed contingencies?
Answer - The additional roads were reconstructed under the Phase II contract for the amount of \$152,901, excluding HST. It is impossible to determine the additional amount charged by the contractor for low production due to the difficult access conditions, suffice to say that it was drawn to their attention at the on-site tender meeting.

6. SERVICE TRENCH COSTS**Background:**

- Although the final cost of the service connections and meters is no longer shown as a separate item in the OKD's Oct/12 budget, their letter indicates that there has been an increase of \$225,000 as a result of there being fewer than anticipated pairs of service connections that can be placed in a common trench.

- It appears, from the March 2008 budget, that there was an assumption that only one trench would be required for every two properties. and that there would be few or no single service trenches.
- We understand that at the time of the Oct19/11 open meeting that it then appeared that it would be possible to have about only 45 twinned service trenches.

Questions

- Why was such an optimist assumption made at the budget stage as to the number of twinned service trenches?

Answer - At the time of the estimate and design there were known areas of required blasting and the concept was in those cases, a single trench would be laid and two services provided. When the installation occurred that principle was abandoned in respect to the significant challenges private properties would have in connecting to the service box. Had the Village proceeded with the initial concept, the logistics and costs to property to connect would have been a lot more significant and in some cases, connection could not have been facilitated.

- How many services are actually going to be in twin service trenches?

Answer -22 twinned service trenches have been identified from as-built drawings received. The total number will be known once the as-builts are provided to the Village following construction completion. Shared trenches was intended to minimize costs where blasting was required. As construction progressed it became evident shared trenches in some circumstances would create financial hardship and servicing challenges for property owners, which led to consultation with property owners to determine best locations for service box locations. Shared trenches are used where it is mutually beneficial for the property owners.

7. MISSED AND/OR ADDITIONAL COST ITEMS

Background:

- The following items are identified as additional costs in OKD’s letter of October 2011 and are attributed generally “...to changes associated with the CEAA requirements” and “Ministry of Health Requirements...”:

○ Fire Pump Station -----	\$292,000.
○ Blow downs-----	170,000.
○ SCADA System	109,000.
○ Flushing and Disinfection---	80,000.
○ Sampling Stations-----	84,000.
○ Security Provisions-----	10,000.
Total	\$745,000.

The extent of these items is significant and it appears that a number of the items were overlooked or, not fully considered in earlier estimates.

- The March 2008 estimate appears to have been based on 19mm meters (and setters?), but, based upon the installed meter setters, the size of these will now be considerably larger.
- It appears that the cost of meters and PRVs have been transferred from project budget to the property owners’ connection fee.

Questions:

- Which of the above additional cost items are actually related to changes in regulatory requirements?

Answer - Sampling Stations.

- Is the \$80,000. amount for costs of flushing and disinfection extra to any previous allowance?

Answer - Pressure testing, flushing and disinfecting was included in the 2006 estimate in the amounts of \$,4,710 for the new works and \$8,750 for the existing fire protection system, excluding contingency. Costs to March 23, 2012 were \$36,656 for the terrestrial portion of the works, with some final disinfection required for Phase III.

- Why has the size of the meters (and setters) been increased? And, what is the impact on cost of this upsizing?

Answer - The 2008 cost estimate allowed for a 50 mm diameter water service and 19 mm diameter meter. The estimated cost of supplying and installing the meter was \$1,188 including contingency.

The larger water service was to provide sufficient capacity for larger or sprinklered homes and to avoid digging up the road every time a new home was constructed. The system has been designed for the long term.

At the detailed design stage it was decided that a 40 mm water service would be sufficient and that a 40 mm water meter setter would be adequate. It was decided to standardise on this configuration throughout the village to simplify installation. At the time the decision was made a water meter was not chosen so it was decided to leave options open.

A 25 mm diameter IPERL water meter will be installed on all services. The cost difference between a 25 mm diameter meter and a 19 mm diameter is about \$40 (\$300 - \$260). There would be additional costs to install a 19 mm diameter meter in the meter setter so standardisation on the larger meter makes sense.

The estimate assumed purchasing and installing meters at one time. As not all homes will connect at once it was decided to purchase and install meters on an as required basis. Idlers will be installed where meters are not required. (This is discussed in the project overview) To ensure a like with like comparison between the estimate and the actual costs the project overview has included for the supply of meters. It will take a couple of minutes to drop the meters into the setter when the home is connected.

Doesn't the transfer of the meter and PRVs from the project budget to the property owners tend to reduce the apparent extent of the overrun?

Answer - The May 10 cost update retains the water meter costs for the purposes of a true comparison.

8. HABITAT COMPENSATION

Background:

- There was no surprise that habitat compensation would be required, and the need was identified in an earlier report. It would seem that a reasonably close estimate of cost for this item could have been made when the detailed design of the marine crossing was completed in 2010.
- There is also a requirement for some continued monitoring of the compensation areas and an obligation to remedy any regrowth problems.

Questions:

- Where does the allowance for the cost of this work appear in the March 2008 budget?

Answer –

In March 2008 the requirements for nor the costs were known; therefore not included.

- Feb 1/08 Western Economic Diversification (WED) requested Environmental Assessment Document (EAD) for project, a component of which required terrestrial, fish and fish habitat, marine environment analysis and proposed mitigation during and following construction;
- Apr 4/08 Belcarra submitted EAD to WED;
- Aug 8/08 Belcarra submitted EAD Addendum per WED request;
- July 20/09 Belcarra received Province Contribution Agreement setting out Environmental Mitigation Measure requirements for project. Until receiving this agreement, any monies the Village spent on project works would not qualify for reimbursement under the MRIF grant, unless the expenditure had express Provincial approval.

- What was the reason for Balanced Environmental's charges (or, estimated charges) nearly doubling from June 2011 to October 2011?

Answer -

1. As noted in Question 1, the June 14, 2011 letter was a work in progress. October 2011 reflected Balanced Environmental's June 30, 2011 cost estimate for works and monitoring required under DFO Authorization.
2. On February 5, 2011, as the marine work neared the Belcarra shoreline, the owner of the property adjacent to Midden Road advised the Village that their dock, fairway and use thereof, and waterlot would be impeded by the underwater berm and marine pipeline location; that both needed to be relocated south. In investigating the owner's concern, survey and underwater survey found that the fairway was not impeded and the dock anchor was outside of the owner's water lot. To avoid a possible injunction from the owner, penalties from the marine contractor due to work stoppage and not completing the works within the Fisheries window ending March 31, the pipeline was moved south. Extra costs incurred moving pipeline: Balanced Environmental \$3,367.92; Opus Dayton & Knight \$5,915.69 and Vancouver Pile Driving \$21,339.01 (total \$30,622.62); Additional environmental impacts: original route impacted 5.3 square metres of eelgrass, requiring 10.6 sq metres of compensation @ estimated \$1,185 for 0.3 days to plant eelgrass; shifting pipeline south impacted 24.8 sq metres of eelgrass requiring 49.6 sq metres of compensation – increasing planting time to 1.5 days at estimated cost of \$5,925 (increase of \$4,740). Increased compensation area reflected in 2011 monitoring and reporting estimate.

- Are the costs of monitoring and possible future remedial work related to Habitat Compensation covered in current contracts?

Answer - Yes to March 31/12, the completion date for any reimbursable works under the MRRIF grant.

And if not, has a provisional allowance been made to cover these items?

Answer - April 1/12 onwards, provision will be included in the annual budgets for 2012, 2013 and 2014; the years required as outlined in the Fisheries Act Authorization 08-HPA2-00151 issued for the project.

- Is \$52,406. The entire cost for habitat compensation or, does that figure represent only the additional costs over those provided for in the 2008 budget?

Answer - Represents the total estimate of works for the project that, if completed by March 31/12 would be reimbursable under the MRRIF grant.

9. FIRST NATION and ENVIRONMENTAL ASSESSMENT ISSUES

Background:

- Projects receiving Federal funding are generally subject to assessment in accordance with the Canadian Environmental Assessment Act.
- Requirements for not only consultation with First Nations but also the possible need for some archeological work might be expected for a project such as this.

Questions:

- What consideration was given to these items in the scheduling of the project?

Answer –

- Pre-design proposed that the terrestrial pipeline would be located on top of the Belcarra midden and covered with a berm to avoid disturbing the known archeological midden. Requirements for a CEAA were a known possibility. To what extent the screening process would be required was unknown and could not be determined at the time of estimate or project scheduling. . The

Environmental Act allows the Regulatory Body to define the scope of work at the time of the CEAA application. The regulatory body was determined to be WED following the Village's application. WED then issued a scope of work which the Village must complete as part of the screening application. As such, the extent of the scope and requirements for the CEAA can only be assumed prior to the application. Preliminary decisions were made to avoid impacting known environmental areas, such as the midden in Belcarra, the eelgrass in North Vancouver and the midden sites in North Vancouver.

- Where do the allowances for the cost of these items appear in the March 2008 budget?

Answer -

- In March 2008 the requirements for the costs were known; therefore not included.
 - Feb 1/08 Western Economic Diversification (WED) requested Environmental Assessment Document (EAD) for project, excerpt "2. First Nations Identify potential impacts of the project on any heritage resources or current use of lands and resources the traditional purposes by First Nations. Please include details on how this determination was made and provide details on any First Nations process undertaken or efforts made in engaging First Nations. If First Nations identified any concerns with the proposed project, those concerns need to be included in the EAD, along with details on how the First Nations concerns will be mitigated."
 - Apr 4/08 Belcarra submitted EAD to WED;
 - Aug 8/08 Belcarra submitted EAD Addendum per WED request;
 - July 20/09 Belcarra received Province Contribution Agreement setting out requirements for involving or consulting with Tsleil-Waututh Nation and other first nations.

10. MITIGATION of the IMPACT OF COST OVERRUNS on TAXPAYERS

Background:

- Not all taxpayers agree with the suggestion that an overrun which results in a 67 per cent increase to their direct costs over those estimated at the time of the 2010 initiative vote (and a 150 per cent increase since the 2006 budget) is "nominal".
- It was asked the October 2011 meeting and in some of the letters, that the Village consider ways in which this direct cost to the taxpayers could be mitigated, and it was suggested that sale of unused road allowances might be a possibility.
- Questions have been asked regarding the GVRD's sharing of costs for the project.

Questions:

- What has the Village done, or plan to do, in respect to the request to investigate sale of unused road allowances?

Answer –

Council has committed to investigating the matter having:

- resolved October 24 " That the proposal raised in the October 20, 2011 letter from Ian MacDonald, 4975 Robson Road regarding the possibility of selling municipal road ends as residential land be referred to staff for a report back to Council";
- included 2012 actions in the 2012 – 2014 Corporate Plan "Assess the current utility and future economic benefits of public lands" investigating the use of open space; and
- verbally reiterated Council's commitment to investigate the matter at numerous Council meetings since Oct. 24, 2011.
- What portion of the project costs will the GVRD be paying?

Answer -

- An agreement has not yet been drafted nor have any discussions been held with Metro Vancouver regarding conditions required of Metro Vancouver under which the Belcarra Regional Park would be permitted to connect to Belcarra's municipal water system.

- Three connections were estimated for Metro Vancouver as part of the water grant application process. The number of connections provided to Metro Vancouver will be determined by the Village of Belcarra's capacity requirements necessary to serve its residential properties, and considered as part of the agreement discussions when they occur

11. UPDATE of OVERALL PROJECT COSTS

Background:

- Our concerns and questions have been based upon project cost estimates that were provided in October of 2011.

Questions:

- What are the current cost estimates?
Answer - Refer to attached memorandum from Ron Beesley dated May 9, 2012.
- Could you provide these figures in a chart form that provides a comparison between the budgeted cost estimates, tender contract prices and final contract prices?
Answer - Refer to attached memorandum from Ron Beesley dated May 9, 2012.

OTHER ISSUES/QUESTIONS

Following is a list of other issues for which we have questions. Hopefully, there will be time at the meeting for these issues to be addressed. But if due to time limits, any of these issues cannot be addressed, we would hope that they could be addressed by either a response to a written submission, or, at a subsequent meeting.

1. What was the actual impact of the change from PST and GST to HST on the project cost?
Answer - HST paid on project invoices to Apr 20/12 = \$145,558.88. (2010 - \$16,979.61; 2011 - \$114,177; 2012 - \$14,402.27). The impact is identified on attached memorandum from Ron Beesley dated May 9, 2012
2. What is the \$45,995.00 "Additional Costs" under Item 18 in the table on Page 2 of the Oct. 12/11 OKD letter? Have budget allowances been made for the costs of decommissioning the Dutchman Ck. storage tank and out of service hydrants of the existing fire protection system?
Answer - It has been decided to retain the Dutchman Creek Tank and one fire hydrant for emergency backup rather than spend the money on demolition and removal. There was no allowance in the 2008 estimate to carry out this work, simply an allowance of \$65,000 (excluding contingency) for tank modifications. All other hydrants in the existing fire protection system have become part of the new system.
3. Does the ring from the Dutchman Creek storage tank still have to be removed and added on to the Tatlow Road tank? And if so, where is the cost of this work covered?
Answer - Detailed design has determined that the system can operate without increasing the size of the Tatlow Tank.
4. Review method of dealing with contingent allowances.
Answer -The contingency allocation is there to cover unanticipated costs of the envisioned tendered work. Unused contingency allocations are returned to funds available for other components of the project.
5. Is a 1.2 meter depth of pipe burial necessary for the pipe mains? (Especially as we have areas that require blasting a trench in rock)
Answer -See separate memo from Beesley Engineering to Sandpiper Contracting dated September 8, 2011 titled "Village of Belcarra, Watermain Cover" which addresses this question.
6. Confirm that the Village is getting "as built" drawings for the works done for this project.
Answer - "As Built" drawings are prepared and submitted to the Village following the completion of each phase of the work.

7. Questions not previously raised:

- Number of Properties that have had, or have requested, that service connection installed?

Answer - There have been 284 service connections installed. Expressions of interest in obtaining connection to the water system are still coming in.

- What was the reason for relocation of the marine pipe(s) off the Belcarra shore and, who was responsible for covering any resulting extra costs?

Answer –

On February 5, 2011, as the marine work neared the Belcarra shoreline, the owner of the property adjacent to Midden Road advised the Village that their dock, fairway and use thereof, and water lot would be impeded by the underwater berm and marine pipeline location; that both needed to be relocated south. In investigating the owner's concern, survey and underwater survey found that the fairway was not impeded and the dock anchor was outside of the owner's water lot. To avoid a possible injunction from the owner, penalties from the marine contractor due to work stoppage and not completing the works within the Fisheries window ending March 31, the pipeline was moved south. Extra environmental, engineering and contractor costs incurred by the project: Balanced Environmental \$3,367.92; Opus Dayton & Knight \$5,915.69 and Vancouver Pile Driving \$21,339.01 = \$30,622.62 plus the habitat compensation costs noted in 8. Habitat Compensation.

We apologize if, through lack of or misinterpretation of information, we have made incorrect assumptions and/or made suggestions that might not be appropriate.

Submitted by:

- Dan Brain,
- Jim Chisholm,
- Jack Daley,
- Don Reid,
- Carl Shaw
- John Willms

April 13, 2012

Attachments: (5)

- May 9, 2012 Memorandum from Beesley Engineering "Final Construction Costs, Scope Creep (additional work) and Contingency Items, Potable Waterworks Project, Beesley Engineering Portion
- Belcarra Potable Water System Estimate & Cost Summary 2006 & 2008
- Municipal Watermains Scope Creep Items from March 2008 Estimate
- Potable Water System Miscellaneous Items
- September 8, 2011 Memorandum from Beesley Engineering to Sandpiper Contracting titled "Village of Belcarra, Watermain Cover

**VILLAGE OF BELCARRA
POTABLE WATER SYSTEM PROJECT**

Belcarra Potable Water System Estimate & Cost Summary 2006 & 2008		December 2006 Estimate			March 2008 Estimate			2006 & 2008 Difference	2012 Actual & Estimated	2008 & Actual Difference
ITEM NO.	DESCRIPTION	2006 Cost	25% Contingency	Total	2008 Costs	15% Contingency	Total	Difference	Actual Costs	Difference
1	Dean Place PRV	\$133,333	\$33,333	\$166,666	\$168,200	\$25,230	\$193,430	\$26,764	\$87,000	(\$106,430)
2	Marine Watermains	\$1,841,500	\$460,375	\$2,301,875	\$1,633,087	\$244,963	\$1,878,050	\$107,360	\$1,935,730	\$57,680
3	DNV Vault	Included in #2			\$202,200	\$30,330	\$232,530		\$250,000	\$17,470
4	Midden Building	Included in #2			\$259,700	\$38,955	\$298,655		\$282,000	(\$16,655)
5	Environmental Permitting	\$55,000	\$13,750	\$68,750	\$55,000	\$8,250	\$63,250	(\$5,500)	\$88,500	\$25,250
6	Municipal Watermains	\$1,281,310	\$320,328	\$1,601,638	\$1,633,000	\$244,950	\$1,877,950	\$276,313	\$4,163,762	\$1,030,587
7	Service Connections & Meters	\$797,500	\$199,375	\$996,875	\$1,026,500	\$153,975	\$1,180,475	\$183,600	Included in #6	
8	Main Ave / Tatlow Pump Station	\$100,000	\$25,000	\$125,000	\$100,000	\$15,000	\$115,000	(\$10,000)	\$457,313	\$342,313
9	Reservoir Modifications	\$65,000	\$16,250	\$81,250	\$65,000	\$9,750	\$74,750	(\$6,500)	Included in #6	
10	Midden PRV Chamber	\$60,000	\$15,000	\$75,000	Deleted			(\$75,000)		
11	Asphalt Overlay	\$150,000	\$37,500	\$187,500	\$286,380	\$42,957	\$329,337	\$141,837	\$188,115	(\$141,222)
12	SCADA System			Not Included			Not Included		\$73,485	\$73,485
13	BC Hydro Charges			Not Included			Not Included		\$17,704	\$17,704
	Sub Total	\$4,483,643	\$1,120,911	\$5,604,554		\$814,360	\$6,243,427	\$638,873	\$7,543,609	\$1,300,182
14	Opus Dayton & Knight			\$240,364			\$370,800	\$130,436	\$507,000	\$136,200
15	Beesley Engineering Ltd & Papove			\$208,000			\$249,748	\$41,748	\$384,006	\$134,258
16	Misc Costs			Not Included			Not Included		\$9,388	\$9,388
17	Village Portion of HST			Not Included			Not Included		\$150,500	\$150,500
18	Environmental Monitoring - 2012-2015			Not Included			Not Included		\$16,000	\$16,000
	TOTAL			\$6,052,918			\$6,863,975	\$811,057	\$8,610,502	\$1,746,527
19	9.1% inflation on 2008 costs			Not Included			Not Included			(\$686,000)
20	Difference including inflation allowance									\$1,060,527

Denotes an actual cost. Costs not highlighted are estimates only as of May 07, 2012.

Note: There may be approximately \$28,000 due to the Tsleil-Waututh which is not allowed for in the above spreadsheet.

**MUNICIPAL WATERMAINS
SCOPE CREEP ITEMS FROM
MARCH 2008 ESTIMATE**

ITEM NO.	DESCRIPTION	COST
1	Phase I - Blowdown Assemblies	\$50,400.00
2	Phase I - Perforated Pipe Drain from Blowdown	\$22,053.00
3	Phase II - Blowdown Assemblies	\$27,216.00
4	Phase III - Blowdown Assemblies	\$29,447.00
	Sub Total	\$129,116.00
5	Phase I - Sampling Chambers	\$25,000.00
6	Phase II - Sampling Chambers	\$24,994.00
7	Phase III - Sampling Chambers	\$29,026.00
	Sub Total	\$79,020.00
8	Phase I - Seismic Valve - Tatlow	\$15,000.00
	Sub Total	\$15,000.00
9	High Pressure Watermain on Bedwell Bay Road (410mm*\$100.00)	\$41,000.00
10	High Pressure Watermain on Tatlow Road (77mm*\$100.00)	\$7,700.00
	Sub Total	\$48,700.00
	Total of Items 1 - 10	\$271,836.00

**POTABLE WATER SYSTEM
MISCELLANEOUS ITEMS**

ITEM NO.	DESCRIPTION	COST
	General Overhead	
1	Kubota Lease	\$7,712.73
2	Emprior Signworks	\$430.40
3	Bill Fraser	\$80.64
4	SCM Risk Management	\$549.45
	Sub Total	\$8,773.22
	Watermains	
5	Braun Geotechnical	\$1,440.00
6	Gibson Waterworks	\$1,197.40
7	Northriver Testing	\$5,870.00
8	SNC Lavalin	\$3,903.80
9	Emco Corporation	\$234.26
	Sub Total	\$12,645.46
	Tatlow Reservoir	
10	Norpac Controls (Siesmic Valve & Alitude Valve)	\$13,617.51
11	Coix Utilites - Reservoir Cleaning	\$4,649.00
	Sub Total	\$18,266.51
	Tatlow Pump Station	
11	Mission Contractors - Excavation	\$2,187.50
12	Davey Tree Expert - Site Clearing	\$925.00
	Sub Total	\$3,112.50
	SCDA	
13	Marletti- Fiber Optic to Municipal Hall	\$ 12,265.00
14	Sea to Sky Network Solutions	\$ 8,042.52
	Sub Total	\$20,307.52
	Environmental Permits	
15	Port Metro Vancouver	\$ 305.25
16	Opus Dayton Knight	\$ 11,177.20
17	District of North Vancovuer	\$ 309.66
18	Balanced Enviromental	
19	Tsleil-Waututh	
20	AMEC Earth Environmental	
	Sub Total	\$11,792.11
	Paving	
21	EXP - Asphalt Testing	\$ 1,388.60
	Sub Total	\$1,388.60
	Total of Items 1 - 21	\$76,285.92

MEMO

To: Sandpiper - Mr. Rino DiNicolo

Copies to: Mr. Larry Scott, Mr. Walt Bayless

Our File No. 08.13 Ph. III

From: Ron Beesley

Date: September 8, 2011

Re: Village of Belcarra, Watermain Cover

We have reviewed your request to reduce the minimum cover of the water main to 0.9 metres.

The Village of Belcarra is quite small so we are not in a position to carry out a large study to address your question.

We have looked at the minimum cover requirements in some nearby municipalities and discussed the matter with Mr. Larry Scott. Some typical cover requirements are as follows:

1. Anmore 1.0 metre.
2. Burnaby 0.9 metres.
3. Coquitlam 1.0 metre.
4. Port Coquitlam 1.0 metre.
5. Surrey 1.0 metre.
6. Port Moody 1.2 metres.
7. City of North Vancouver 1.2 metres.

In choosing a minimum water main cover there are three considerations. Adequate cover for protection from traffic loads in roads, adequate cover for frost protection and adequate clearance from utilities.

In Belcarra, 0.9 of a metre is adequate for protection from traffic loads and frost.

If you review our drawings in detail, you will see that we show a number of crossings of existing utilities (particularly gas) where they are about 1 metre deep. It is our preference to have the pipe pass under these utilities rather than cut through them and have to relocate them. With 1.2 metres of cover any future small size gas or electrical crossings may be installed over the pipe with 1 metre of cover and some separation from the pipe. When we prepared our design we chose a minimum cover of 1.2 metres to accommodate clearance from utilities.

Recognising that we are working on existing roads, we have no objection to the pipe cover being reduced to 0.9 m over short sections where it makes sense to raise the pipe to avoid either blasting or a conflict with existing utilities such as culverts. Mr. Scott, and our inspector Mr. Witt, are both available to approved a reduced cover where you may feel it is appropriate.

We trust this explains the rational behind our requirement.