NANOOSE PENINSULA WATER SERVICE AREA
SUMMARY OF WATER SUPPLY NEEDS TO BUILD-OUT

Further to our discussion this morning and the recent understanding between Rob Warren of KWL, Russell Tibbles of Fairwinds, and Mike Donnelly of the RDN that it is O.K. for Koers & Associates to release population and water use data and assumptions used in recent assignments for the RDN on Nanoose water supply and distribution, I provide the following summary:

There are three assignments that apply (in chronological order):

1. Arrowsmith Water Service (AWS). Englishman River Intake, Treatment Facilities and Supply Mains. Phase 1 – Conceptual Planning, Budgeting and Scheduling. Associated Engineering, April 2011. Koers & Associates, as well as KWL, were sub-consultants to AE on this project. A copy of this report and appendices is available on line.


Existing and Build-out Populations
There are some inconsistencies between the basic assumptions in these reports (reviews), for example, reports 1 and 2 each quote Nanoose Peninsula Water Service Area (NPWSA) build-out population and growth rate estimates from RDN staff. Report 1 projects 11,969 and a range of annual growth rates for Nanoose from 1.5 – 2.3%, and Report 2 projects 9,971 and a 2.0% annual growth rate. The report 1 assumptions do not achieve build-out until 2050 or later, whereas the report 2 assumptions achieve build-out by 2045. The existing NPWSA population was estimated by RDN staff at 4,803 for 2009 in report 1 and 5,085 for 2011 in report 2. Review 3 used the information contained in public report 1.

We suggest that the most realistic and likely conservative scenario is a total NPWSA build-out population of 11,969 (most recent public report), to be reached after 2050. The existing NPWSA population would be 5,190 for 2013, using the 4,803 estimate for 2009 and a 2% growth rate. The difference, or 6,779 people, would be contributed by new development over the next 40+ years.

Per Capita Water Consumption
Report 1 suggests a conservative overall per capita conservation water consumption target of 1.375 m³/day per capita for the entire AWS service area, which also includes the City of Parksville, the Town of Qualicum Beach, and the French Creek Regional Service Area. Recent design demand determinations for Fairwinds by KWL suggest a figure of 1.168 m³/day per capita for the Nanoose service area. We understand this has been adopted by the RDN. Review 3 therefore used for its “most probable” Nanoose bulk water use scenario a target value for Nanoose of 1.168 m³/day per capita. We believe this is still a conservative number, and have used that number for the present summary review.

The maximum day water demands for the NPWSA are summarized as follows:

| Present population (2013) | 6,062 m³/day |
| Build-out population (2050+) | 13,980 m³/day |
Overall AWS Bulk Water Requirements

Report 1 projected that, with overall estimated groundwater resources at 19,000 m³/day, the maximum day AWS surface water source requirement at full build-out (2050) would be between 46,329 and 21,218 m³/day, without Town of Qualicum Beach participation, depending on growth and per capita consumption scenarios. The AWS Englishman River water licence was issued for a maximum 24-hour withdrawal of 47,888 m³/day. There was no attempt made in Report 1 to project individual service area groundwater resources or individual service area bulk water requirements.

NPWSA Groundwater Availability

Review 3 considered four scenarios of available groundwater capacity for the NPWSA:

a. With the old NWSA (Beachcomber, Dolphin Beach) wells in service. These wells, #2, 3, 4, and 7, totaling 2,454 m³/day have been recently taken out of service due to water quality complaints.

b. With the old NWSA wells out of service.

c. With only Wallbrook Well #1 in service.

d. With Wallbrook Wells #1, 2, 3 and 4 in service.

For long term sustained capacity estimates, the RDN Operations Department 2013 maximum sustained 24-hour NPWSA well capacity values (May 17, 2013) were multiplied by a factor 0.7 to estimate the maximum capacity over a period of continuous pumping for several weeks. It should be noted that the Wallbrook # 1 well, which is currently hooked up, was included for its rated “summer capacity” of 367 m³/day, but that the remaining Wallbrook wells, which have not yet been completed or connected to the system, are now assumed to be available due to the change in sanitary setback requirements, and have been rated at 70% of the preliminary rating by Dennis Lowen. We understand the final ratings are still to be confirmed based on pump testing by Fairwinds under the influence of interference from the irrigation wells on the Springford farm.

We believe the most realistic build-out scenario is for the old NWSA wells to remain off-line (unless treatment is provided for these wells), and for the other wells to be available at 70% (subject to confirmation of the Wallbrook well capacities noted above).

The current (2013) available total well capacity would be 2,534 m³/day or 387 gpm, of which 1,352 m³/day or 206 gpm is being provided from wells developed and paid for by Fairwinds (Fairwinds Wells # 1, 2, and 3 and Wallbrook Well # 1).

The NPWSA groundwater availability at build-out (2050) would be 3,636 m³/day or 556 gpm. All of the additional well capacity (1,102 m³/day or 168 gpm) would be provided by wells developed and paid for by Fairwinds (Wallbrook Wells # 2, 3, and 4).

NPWSA Requirement for ERWS Surface Water

Current 2013 Conditions – Maximum Day:

| Design Water Demand | 6,062 m³/day |
| Available Well Supply | 2,534 m³/day |
| ERWS Surface Water Required | 3,528 m³/day (7.4% of ERWS water licence) |
**Build-out Conditions – Maximum Day:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Water Demand</td>
<td>13,980 m³/day</td>
</tr>
<tr>
<td>Available Well Supply</td>
<td>3,636 m³/day</td>
</tr>
<tr>
<td>ERWS Surface Water Required</td>
<td>10,344 m³/day  (21.6 % of ERWS water licence)</td>
</tr>
</tbody>
</table>

**ERWS Contribution from New Nanoose Development and Fairwinds:**

Based on the assumptions provided in this summary, the amount of surface water required from ERWS by new development in Nanoose is $10,344 - 3,528 = 6,816$ m³/day (66%).

The Fairwinds development has an ultimate population of 2,500 units x 2.2 people/unit = 5,500 people with a design water demand of $5,500 \times 1.168$ m³/day/capita = 6,424 m³/day. Of that total, it will have provided 2,454 m³/day in well capacity, leaving 3,970 m³/day to be provided for Fairwinds from ERWS, again, subject to confirmation of the Wallbrook well ratings.

* marks changes from June 25 copy.

Prepared by: Tony Koers
Tibbles, Russell

From: Tony Koers <dakoers@koers-eng.com>
Sent: Thursday, July 04, 2013 9:55 AM
To: Tibbles, Russell
Cc: David Scott; Rob Hoffman
Subject: FW: Fairwinds Meeting
Attachments: Scan0031.pdf; Scan0035.pdf

Good morning Russell,
Attached for your information.

Regards, Tony

Tony Koers
3309 Blueback Drive
NanOOSE Bay, B.C. V9P 9J1
Ph: 250-468-5302
i-Ph: 250-954-9690

From: Tony Koers
Sent: July-04-13 9:37 AM
To: GGarbutt@rdn.bc.ca
Subject: Fairwinds Meeting

Good morning Geoff:
Attached is a scan of my review notes of the spreadsheets produced by Fairwinds, which can serve as an unofficial record of our discussion. I did not take any other notes.
Let me know if you have any questions or comments. Rob Hoffman will call you regarding invoicing instructions for my work.

Regards, Tony

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### Nanoose - Water Demand & Supply Projections

**AWS Licence** 47,888 m³/day

**Population**
- Current: 5,190
- Projected (2050): 11,969
- New Population: 6,779

**Per Capita Consumption**
- Original: 1.375 m³/day
- Revised: 1.168 m³/day

### NPWSA Maximum Day Water Demands

<table>
<thead>
<tr>
<th></th>
<th>m³/day</th>
<th>IGPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Population (2013)</td>
<td>6,062</td>
<td>926</td>
</tr>
<tr>
<td>Build Out Population (2050)</td>
<td>13,980</td>
<td>2,136</td>
</tr>
</tbody>
</table>

### NWPSA Well Capacity (70% Maximum Capacity)

<table>
<thead>
<tr>
<th></th>
<th>m³/day</th>
<th>IGPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>2,534</td>
<td>387</td>
</tr>
<tr>
<td>Wall Brook</td>
<td>1,102</td>
<td>166</td>
</tr>
<tr>
<td>Build Out (2045)</td>
<td>3,636</td>
<td>555</td>
</tr>
</tbody>
</table>

### NPWSA Requirement for ERWS Water (Max Day)

<table>
<thead>
<tr>
<th></th>
<th>Current 2013</th>
<th>Build Out</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m³/day</td>
<td>IGPM</td>
</tr>
<tr>
<td>Design Water Demand</td>
<td>6,062</td>
<td>926</td>
</tr>
<tr>
<td>Available Well Supply</td>
<td>2,534</td>
<td>387</td>
</tr>
<tr>
<td>ERWS Water Required</td>
<td>3,528</td>
<td>539</td>
</tr>
</tbody>
</table>

**ERWS Water for New Development**
- 6,816 m³/day
- 1,041 IGPM

66% of ERWS water for new development

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It was confirmed that these values used by Fairwinds conform with the "summary of water supply needs to build-out" presented by Tony Kness, dated June 25, 2013 revised July 3, 2013.
Nanose - Simplified Analysis of Projected Water DCCs
Note: Non-residential uses are ignored in this analysis for simplicity. $unit amount relates to average of all residential unit types.

### Residential Dwelling Units:
- to buildout
- 20yr time horizon

<table>
<thead>
<tr>
<th>Existing Users</th>
<th>Future Additions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,253</td>
<td>2,443</td>
<td>4,752</td>
</tr>
<tr>
<td>65%</td>
<td>35%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**NBPWS Capital Costs**

<table>
<thead>
<tr>
<th>Total</th>
<th>Existing User Allocation</th>
<th>New Development Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,346</td>
<td>$2,346</td>
<td>$2,346</td>
</tr>
</tbody>
</table>

**NBPWS Water Capacity Additions (gpm)**

<table>
<thead>
<tr>
<th>Existing User</th>
<th>To Service New Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>225,168</td>
<td>225,168</td>
</tr>
<tr>
<td>225,159</td>
<td>225,159</td>
</tr>
<tr>
<td>225,144</td>
<td>225,144</td>
</tr>
</tbody>
</table>

**Existing "Bulk Water" DCC (1998)**

**First Amendment (~2014):**

| Wall Brook Wells (3 wells, excl. WB#1) | $2,798,858 |
| Clairet Rd Well (treatment)           | $2,008,000 |
| Other (NBPWS)                         | $7,172,897 |

Subtotal: $11,971,855

**Less: Applicable reserves from previous DCC**

Total: $9,412,000

**Second Amendment - ERWS Phase 1 (~2016):**

- ERWS Cost Allocation ($37.5m x 26%)
- Less: Senior Government Funding (currently in place)
- New/Incremental Capital
- Add: Applicable DCC from previous (First) Amendment

**Proforma Adjustments (to be deleted LD/SC Economic Analysis)**

Incl in SC/LD EA (to be removed):
- Capital Projects (reservoir etc)
- Wall Brook Land at AV
- Wall Brook Cost to date for Next 3 Wells
- Wall Brook Cost to date Compl for next 3 wells

Total: $2,798,689

**Supply Projections per T Koers Analysis (Jun/13)**

<table>
<thead>
<tr>
<th>m^3/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total New Supply (per above) 100%</td>
</tr>
<tr>
<td>Required for Existing Development 34%</td>
</tr>
<tr>
<td>Required for New Development 65%</td>
</tr>
<tr>
<td>Contingency</td>
</tr>
</tbody>
</table>

**Unknowns:**

1. Costs < inflation 2011 → 2013
2. Allocation to EXISTING depending on NUSA wells in or out.
3. Politics?