Regional District of Nanaimo Phase 1 Water Budget Project

Vancouver Island

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Waterline Resources Inc.
Nanaimo BC

Regional District of Nanaimo

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Presentation Outline

- RDN and Project Objectives;
- Scope of Work;
- Project Team;
- Approach and Deliverables;
- Schedule;
- Closing Comments; and
- Questions?

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RDN "Big Picture" Objectives

- Growth of healthy communities and ecosystems is contingent on availability of fresh water.
- Need to understand fresh water availability in each watershed; and
- Sustainable planning and development.

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Water Budget Project - Objectives

- Develop conceptual hydrogeological and hydrological models for 6 watersheds;
- Develop water budget;
- Assess existing conditions and stresses;
- Assess availability of water.

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Scope of Work

- Data Compilation:
  - ✓ RDN Water Map;
  - ✓ Government and consultant maps and reports and on-going projects (GSC, ASW);
  - ✓ Water data from MOE Wells DB, Obs wells, private wells and stream flow monitoring;
  - ✓ RDN Outreach with local stewardship groups, small systems operators and community groups.
- Synthesized and Integrate :
  - ✓ Geology and hydrogeology - Conceptual Model;
  - ✓ Assess groundwater and surface water linkages.

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Scope of Work

- Water budget development;
- Water demand & stress analysis; and
- Progress meetings; and
- Report.

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Project Team

- Waterline Resources Inc., Nanaimo
  - ✓Project Mgmt., Lead Hydrogeology
  - ✓D. David, S. Bayne, D. van Everdingen
- Kerr Wood Leidal, Victoria
  - ✓Lead - Surface Water Engineering
  - ✓Craig Sutherland
- Alberta Innovates/U of Waterloo
  - ✓Numerical Modeling structure and GSC
  - ✓Dr. JP Jones
- AquaResources Inc.
  - ✓MNR Water Quantity Geodatabase, Ontario
  - ✓Paul Martin

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kwl KERR WOOD LEIDAL consulting engineers

Alberta Innovates Technology Futures

AquaResource Inc. Integrity • Technology • Solutions

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Approach and Deliverables

- Data Compilation Phase
  - ✓ Need consistent data structure for lithology, water level, pumping volumes/rates, climate, surface water, tidal, barometric, etc;
  - ✓ Use Waterline's Groundwater Management Geodatabase and Arc-GIS system; and
  - ✓ Tailored to RDN Water Map, Vulnerability Mapping (VIU), Ontario MNR Geodatabase.

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Approach and Deliverables

- Conceptual Model Development
  - ✓ Surface Water (KWL): Monthly water balance model per watershed & sub-watershed.
  - ✓ Groundwater (WL): Focus on the Physical Model using ARCHydro Groundwater;
  - ✓ Expand RDN's Water Map to include a hydrology and hydrogeology layer.

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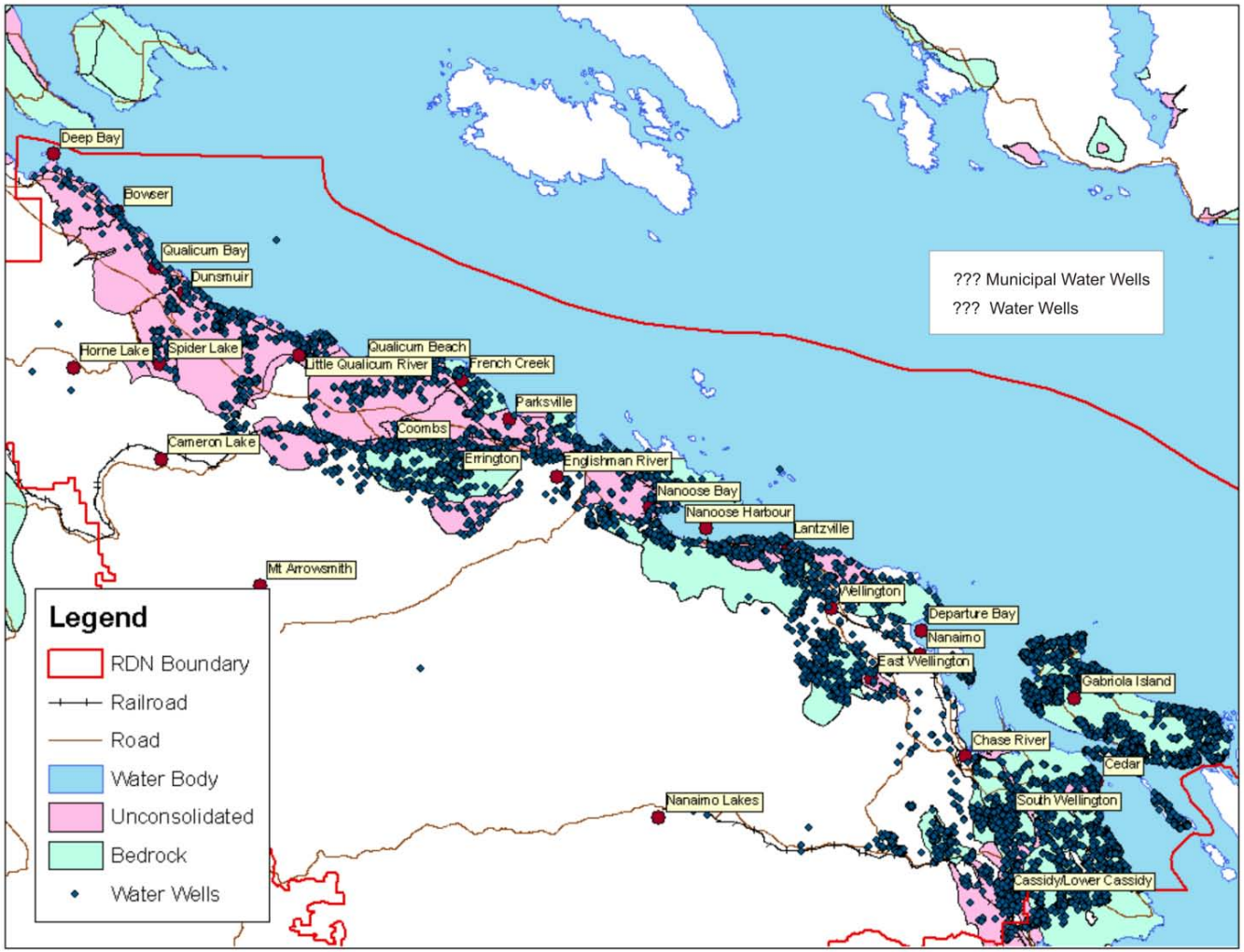
Approach and Deliverables



> 7000 Wells in MOE Wells DB

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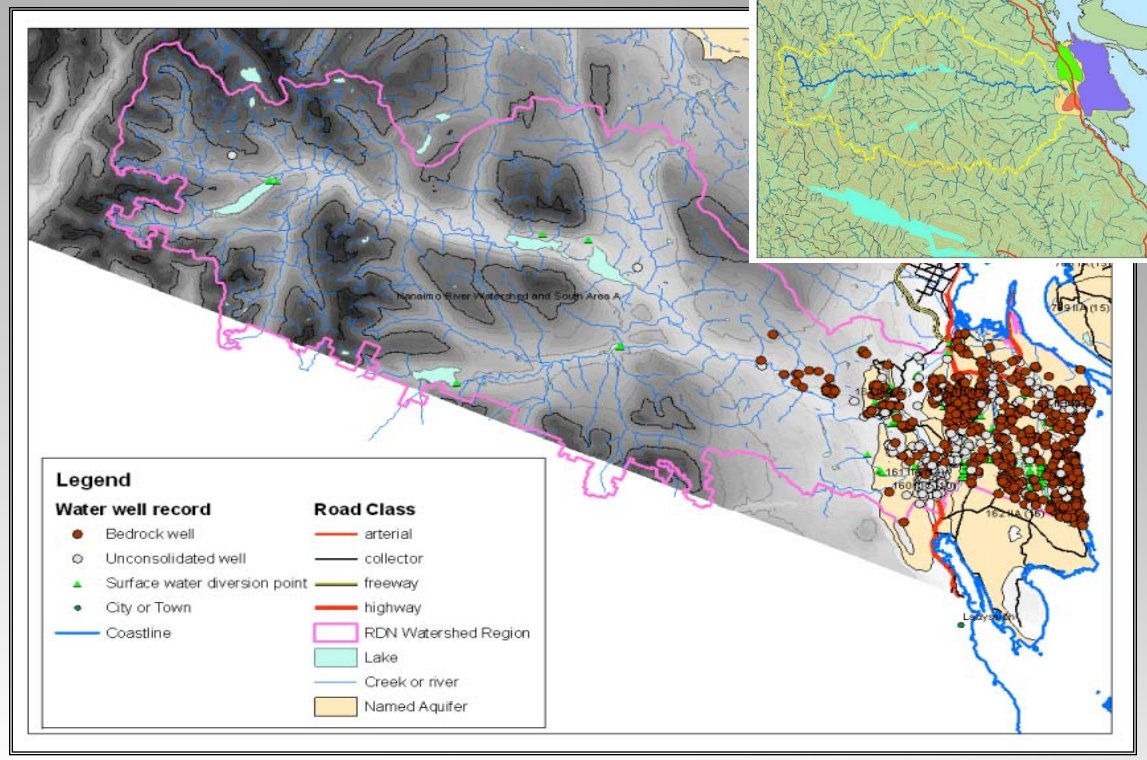
Approach and Deliverables

Water Region #6 Area= >800 km^2	Watershed and South Area A (1790 Wells)
Surface water diversion pts	266
Watershed name	**Total by Watershed**
Cedar Yellowpoint	669
Beck Creek	138
Berkley Creek	66
Boulder Creek	3
Haslam Creek	284
Nanaimo R	562
Stark Creek	68



- 4 aquifers in WATER REGION have been named
- 2 active, and 4 inactive WSC Hydrometric monitoring stations
- City of Nanaimo (Jump Creek and South Fork) and Harmac (Fourth Lake) largest users.
- City of Nanaimo pumps water outside of the Nanaimo River watershed for use in Water Region #5.
- Harmac also pumps water outside the watershed at Duke Point

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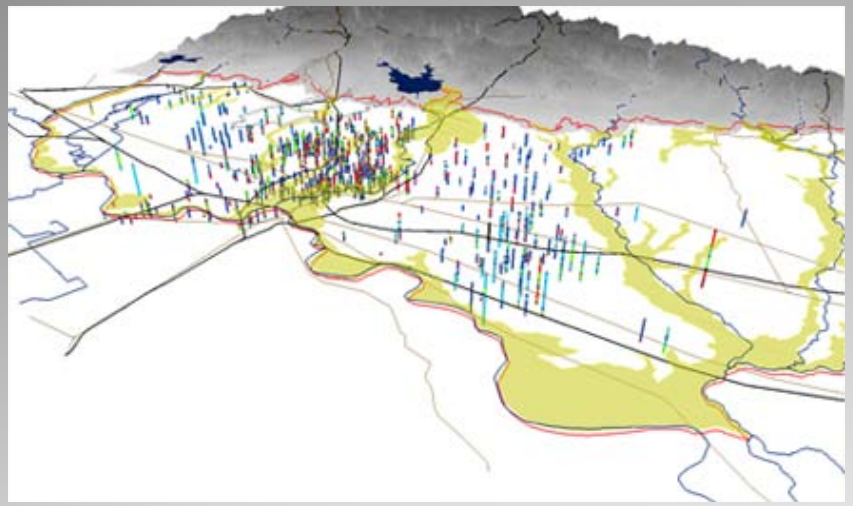
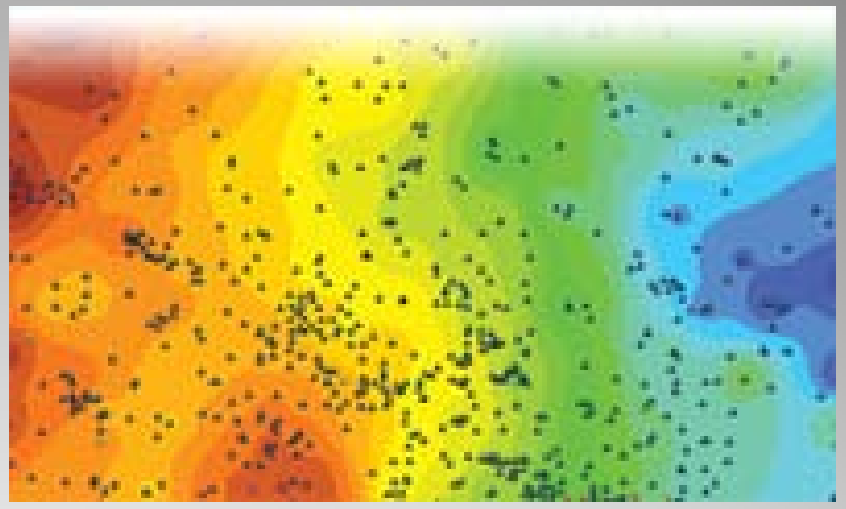
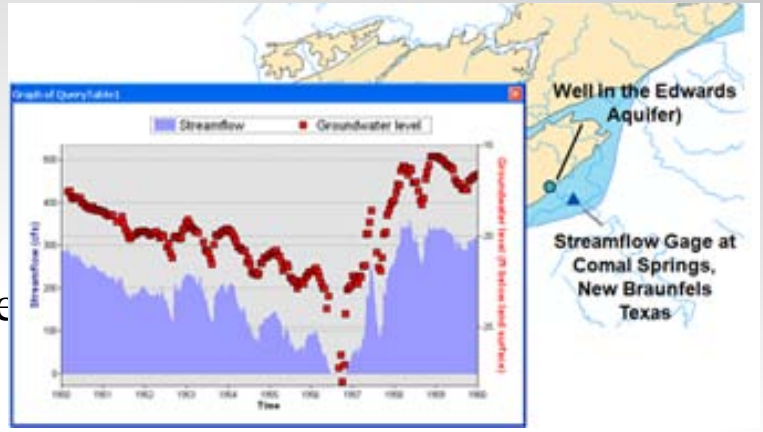
ARCHYDRO GROUNDWATER – SUBSURFACE MODEL DEVELOPMENT





- Import a variety of datasets including well data, lithology, water level, pumping rates, T, chemistry;
- Classify and edit borehole data including stratigraphy, casing and screen intervals;
- Create surfaces, thickness maps, water level, aquife transmissivity, water quality, and flow direction maps;
- 2D and 3D visualization,
- Time series plots (surface water & groundwater)



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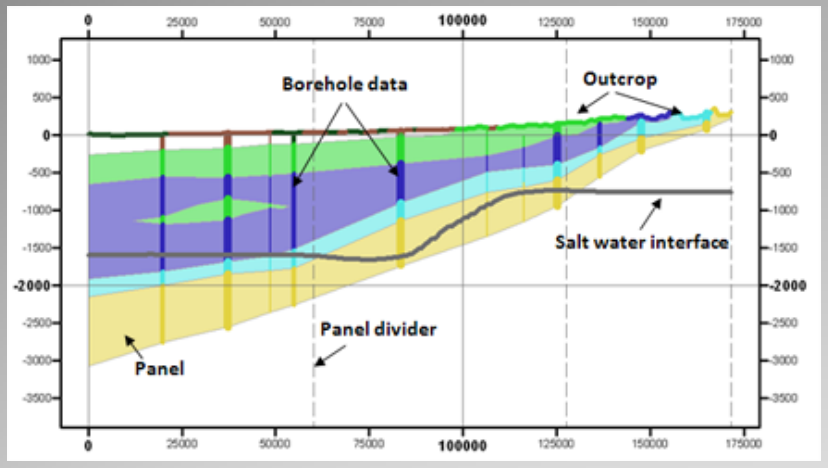
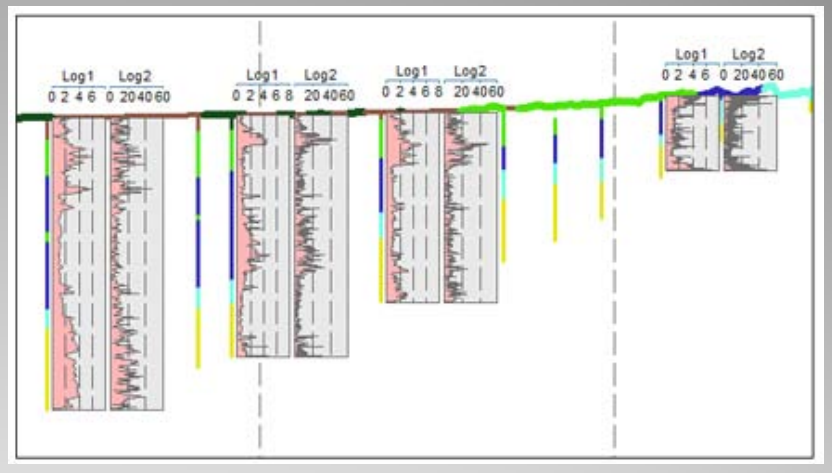
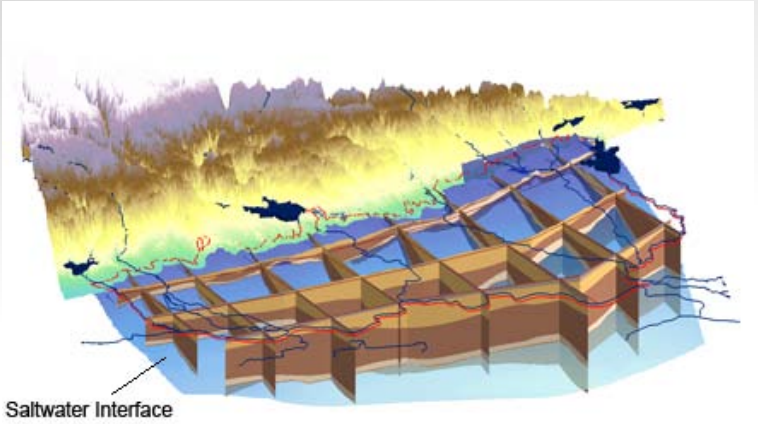
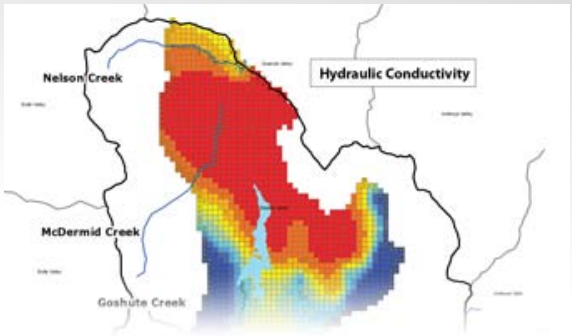
ARCHYDRO GROUNDWATER – SUBSURFACE MODEL DEVELOPMENT





- Create and edit 2D and 3D cross sections;
- Output to numerical groundwater model Modflow;
- GIGO rule….does not replace interpretation by a qualified hydrogeologist.





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Approach and Deliverables

- Water Budget and Stress Analysis
  - ✓ Monthly and annual water balance;
  - ✓ Groundwater input/output based on subsurface conceptual model;
  - ✓ Some aquifers may be need to be assessed separately; and
  - ✓ Focus on critical areas identified in RDN's Drinking Water and Watershed Protection Action Plan.
- Data/Knowledge Gaps Assessment

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Schedule

Task	Description	Estimated Start Date	Estimated Completion date
1	Project Award Date	-	January 2, 2012
	Kick-off meeting	Feb 6, 2012	Feb 6, 2012
2	Numerical Model Selection for Future	Feb 12, 2012	Feb 19, 2012
3	Literature Review; data compilation	Feb 20, 2012	Apr 15, 2012
4	Conceptual model development	Apr 16, 2012	July 15, 2012
	Peer Review – Conceptual Model	July 15, 2012	To be decided
5	Water Budget Assessment	July 16, 2012	Sept 15, 2012
6	Water Region Stress Analysis	Sept 16, 2012	Sept 30, 2012
7	Data Gaps Analysis	Oct 1, 2012	Oct 7, 2012
8	Draft Report Preparation	Oct 7, 2012	Oct 21, 2012
9	Follow-up Meeting and Presentation		Nov 7, 2012
10	Final Report Preparation and Transfer of ARC-GIS Files to RDN	Nov 7, 2012	Nov 15, 2012
11	Final Meeting and Presentation		Dec 1, 2012

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Closing Comments

- Very challenging project:
  - ✓ Good work done in the past;
  - ✓ Some electronic data.. lots of paper records;
  - ✓ Consistent data format needed;
  - ✓ Many interested stakeholders.
- Phase 1 water budget project will hopefully set the template for future GW work in RDN (BC?).

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Closing Comments

- Develop a tool for use moving forward:
  - ✓ System can be updated as new data comes available (historical data?);
  - ✓ Better manage groundwater and surface water data.
- Close the knowledge/data gaps.
- Welcome/solicit/require help from technical working group members.

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Questions?

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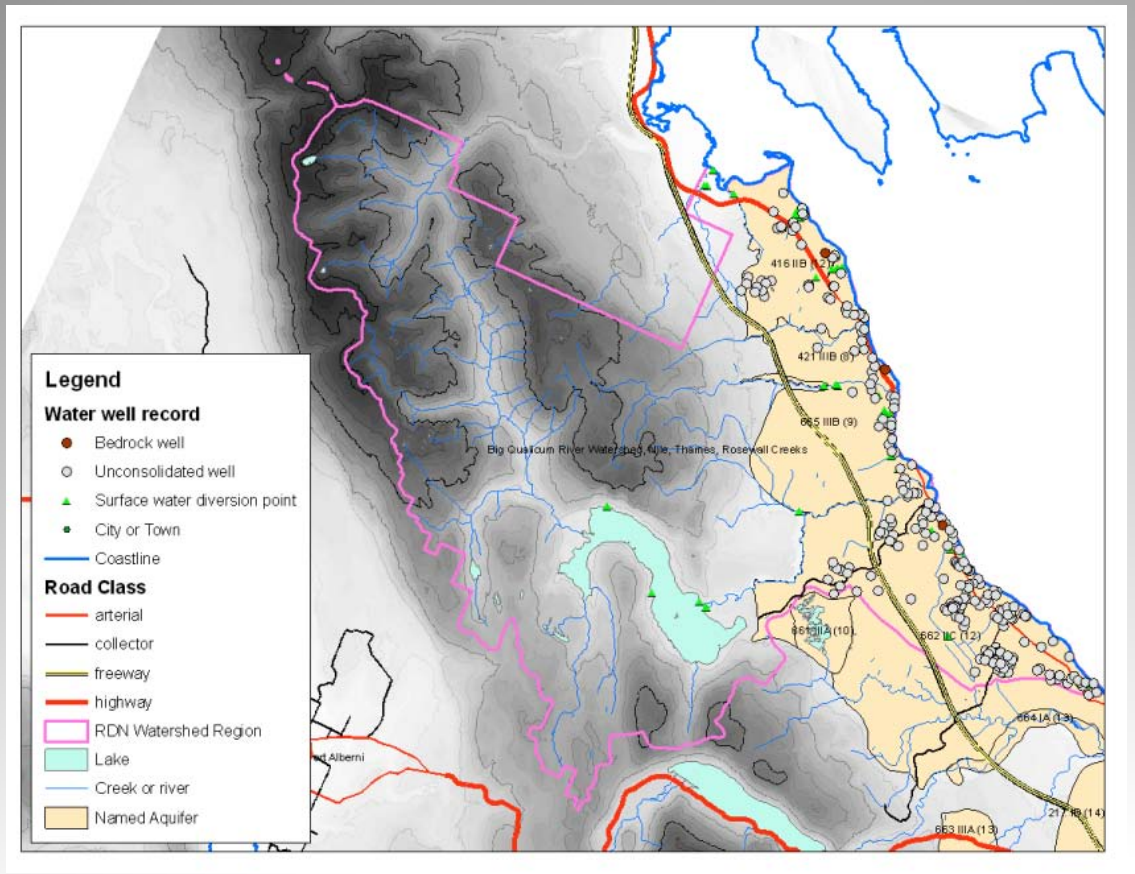
WATER REGION #1: BIG QUALICUM RIVER /HORNE LAKE



Water Region #1 Area= 254 km^2	Big Qualicum River (316 wells)
Active surface water diversion	80
Watershed name	**Wells by Watershed**
<no name>	189
	41
Chef Creek	1
Hunts Creek	1
Little	36
Nile Creek	5
	27
	5
Thames Creek	11

- 4 named aquifers,
- Deep Bay Waterworks District (Deep Bay) – 3 community wells per WaterMap
- Observation well 310 (Deep Bay)
- Land and Water BC (near Bowser) – 1 community well
- Bowser WWD (Bowser) How many wells, is this the LWBC community well?)
- Qualicum Bay/Horne Lake WWD – 2 community wells
- Unknown Community Well (Qualicum Bay) – 1 well

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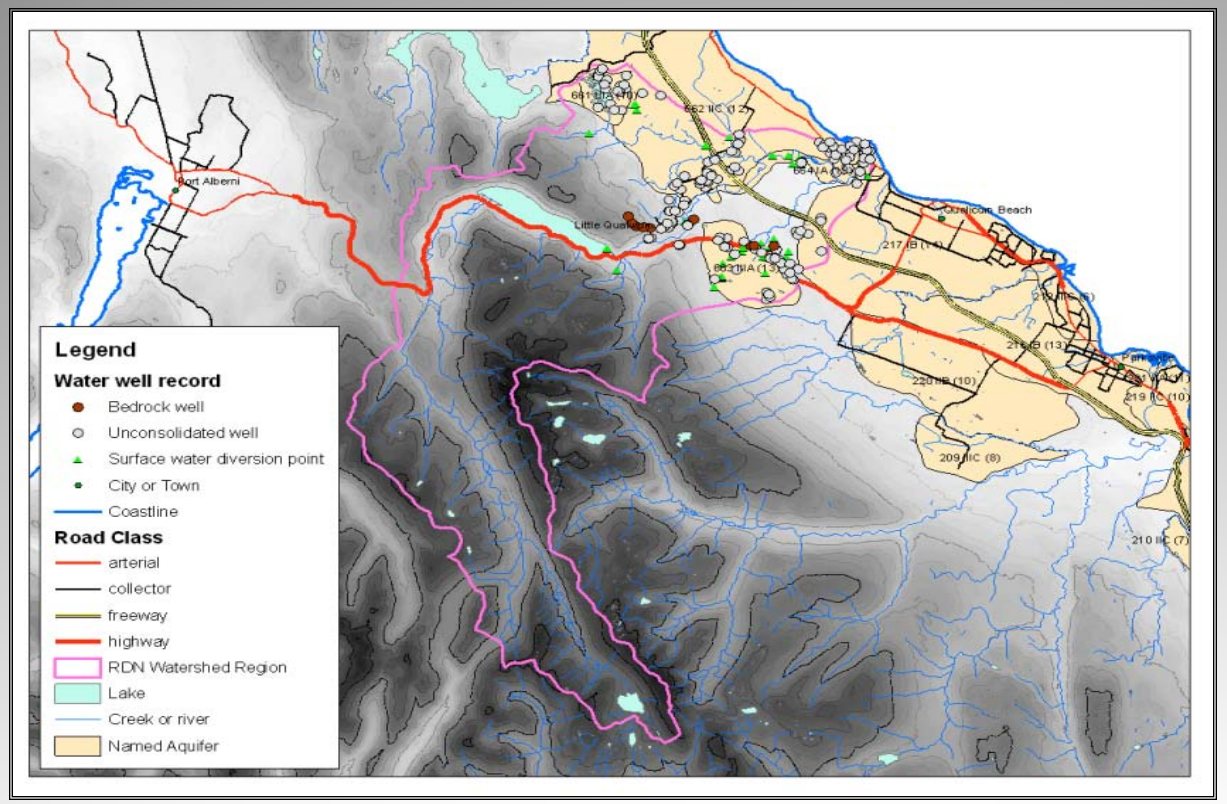
WATER REGION #2: LITTLE QUALICUM/CAMERON LAKE



Water Region #2 Area= 247 km^2	Little Qualicum (234 Wells)
Active surface water diversion	53
Watershed name	**Wells by Watershed**
<no name>	11
	3
Little	178
Whisky Creek	42

- 4 named aquifers,
- Spyder Lake Resort (Spider Lake) – 1 community well
- BC Parks (Spider Lake) 1 community well
- Spider Lake Springs Campground – 1 community well
- Little Qualicum Village (Qualicum River Estates) – 5 community wells?
- BC Parks (Little Qualicum Falls) – 2 community wells
- RDN Melrose Terrace Community System – 1 community well
- SHB – Melrose Properties Ltd. – 1 community well
- RDN Surfside (Little Qualicum River) – 2 community wells
- Cedar Grove RV and Campsite (Little Qualicum River) – 1 well

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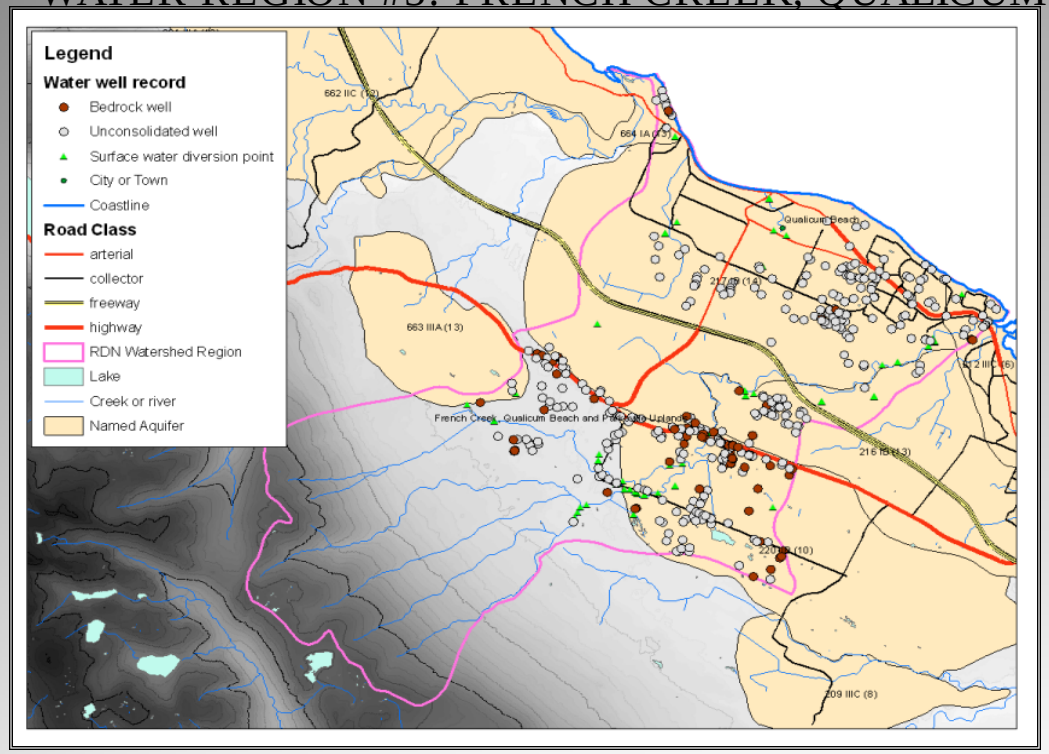
WATER REGION #3: FRENCH CREEK, QUALICUM BEACH & PARKSVILLE UPLAND



Water Region #3 Area= 94 km^2	French Creek (550 Wells)
Active surface water diversion	54
Watershed name	**Wells by Watershed**
<no name>	161
Beach Creek	10
French Creek	302
Grandon Creek	41
Morison Creek	2
Morningstar Creek	5
Whisky Creek	29

- 6 Provincial observation wells (295, 287, 303, 304, 314, 321)
- Krause (Parker Rd West) 1 community well
- QB – 1 well near Rupert Rd.
- QB – wells along Little Qualicum River – not id'd as community, Other QB wells???
- RDN French Creek – FC#2, FC#4 and FC#7
- EPCOR community wells???? New wells?, Norwood Holdings (French Creek north of Hwy) – 1 community well, Pintail Estates
- (French Creek north of Hwy) – 2 community wells, Oakleaf Mgmt (south of French Creek Estates) – 1 well,
- French Creek Estates , COOMBS COUNTRY CAMPGROUND – 2 wells.Zelloc Holdings Ltd. – 1 well,
- Coombs County Fair, Coombs General Store, A Childs Place,
- Willow Mobile Home Park, Errington Village Centre, Parksville Acres, Zorkin Enterprises, Ocean Villa Homes,
- City of Parksville – Railway and Springwood well fields

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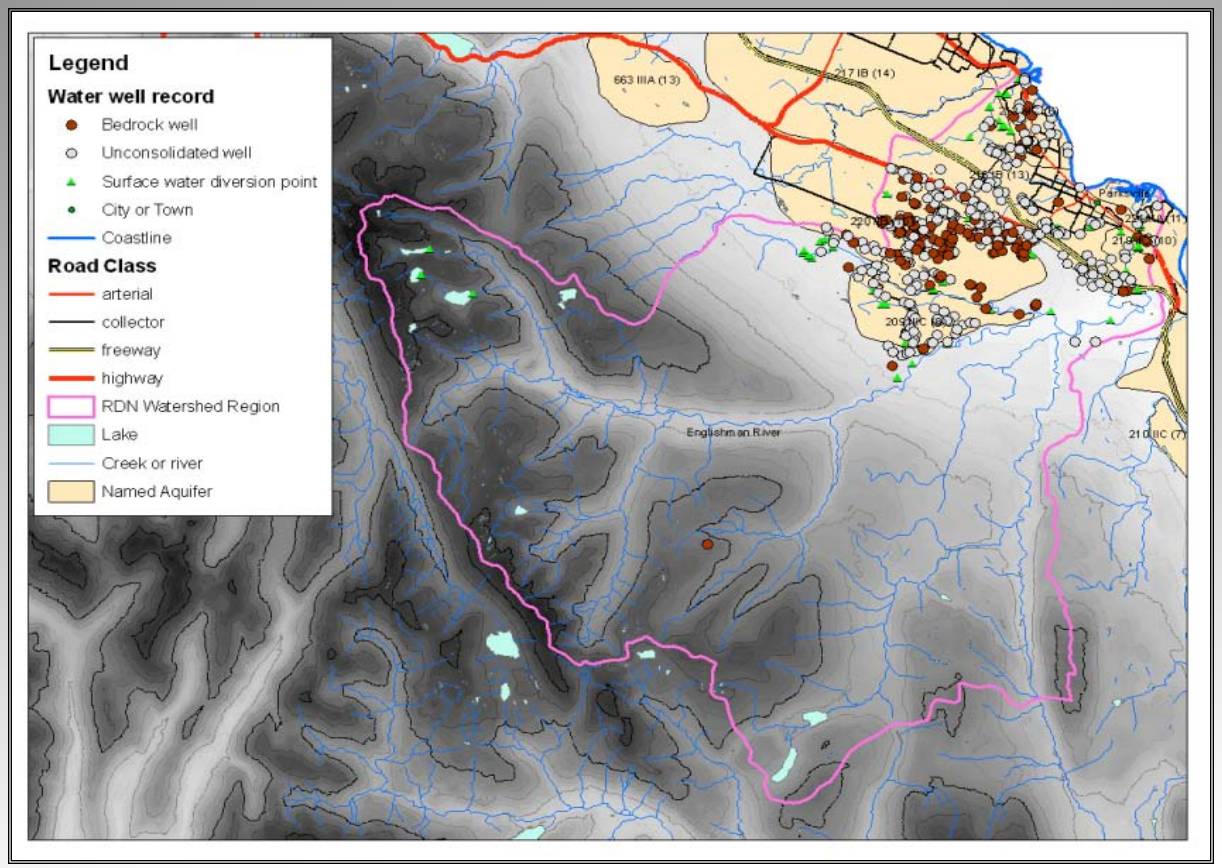
WATER REGION #4: ENGLISHMAN RIVER



Water Region #4 Area= 355 km^2	(619 Wells)
Active surface water diversion	95
Watershed name	**Wells by Watershed**
<no name>	87
	8
	4
	104
French Creek	9
Morison Creek	94
Morningstar Creek	187
Romney Creek	126

- AWS gets water from Englishman River for distribution to S. Wellington Water Region, and The City of Parksville.
- Englishman River Falls Mobile Home Park
- BC Parks Englishman River Falls
- Town of Parksville – community well
- Voigt well

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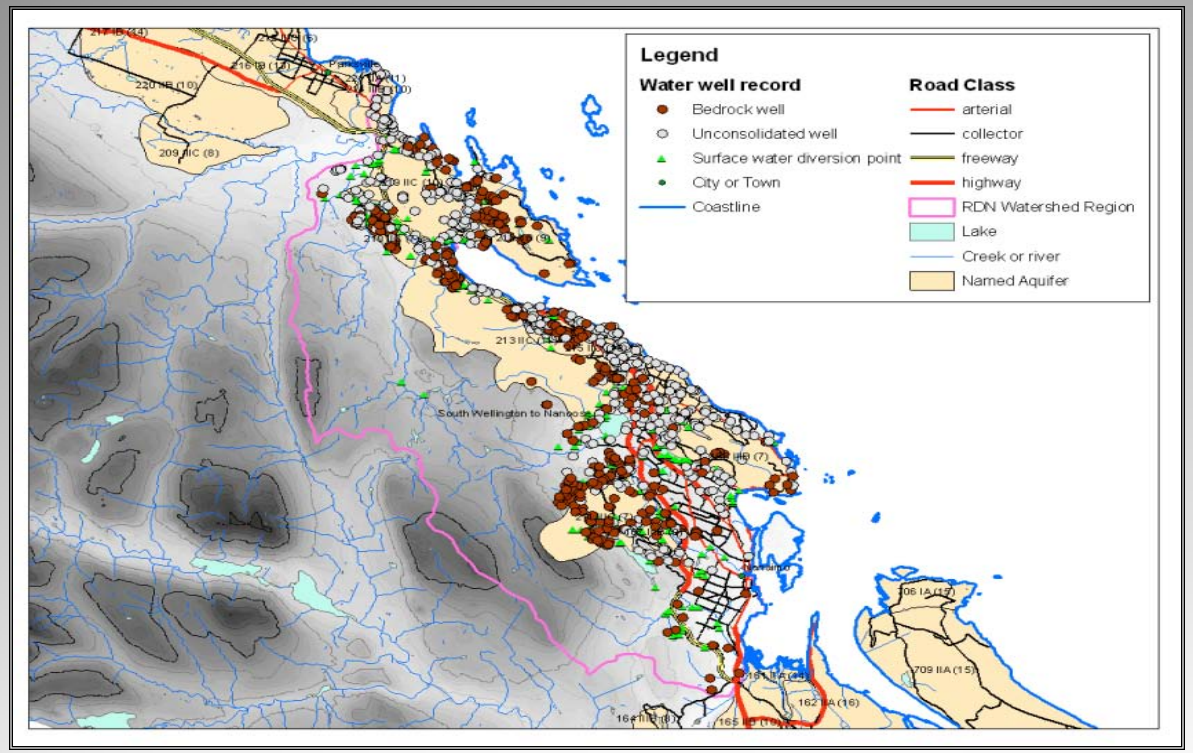
WATER REGION #5: SOUTH WELLINGTON TO NANOOSE



Water Region #5 Area= 322 km^2	to Nanoose (1688 Wells)
Active Surface water diversion pts	380
Watershed name	**Wells by Watershed**
<no name>	709
	3
Bloods Creek	151
Bonell Creek	17
	19
Cottle Creek	18
	69
Departure Creek	33
	6
Enos Creek	6
Hardy Creek	13
Knarston Creek	61
McGarrigle Creek	120
Metral Creek	41
	273
Nanoose Creek	149

- Nine aquifers have been named.
- RDN – River's Edge – 2 wells
- Tigh-na-mara Resort
- Fairwinds
- RDN Madrona, Nanoose, Fairwinds, Pacific Shores,
- Fairwinds Real Estate Co. – 2 wells
- Bel Oaks Waterworks District
- Arbutus Park Estates Ltd.
- DoL wells

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