High Level Water Supply Concepts

Storing surplus winter storm-water at high elevation

...Trevor Wicks ... April 2015

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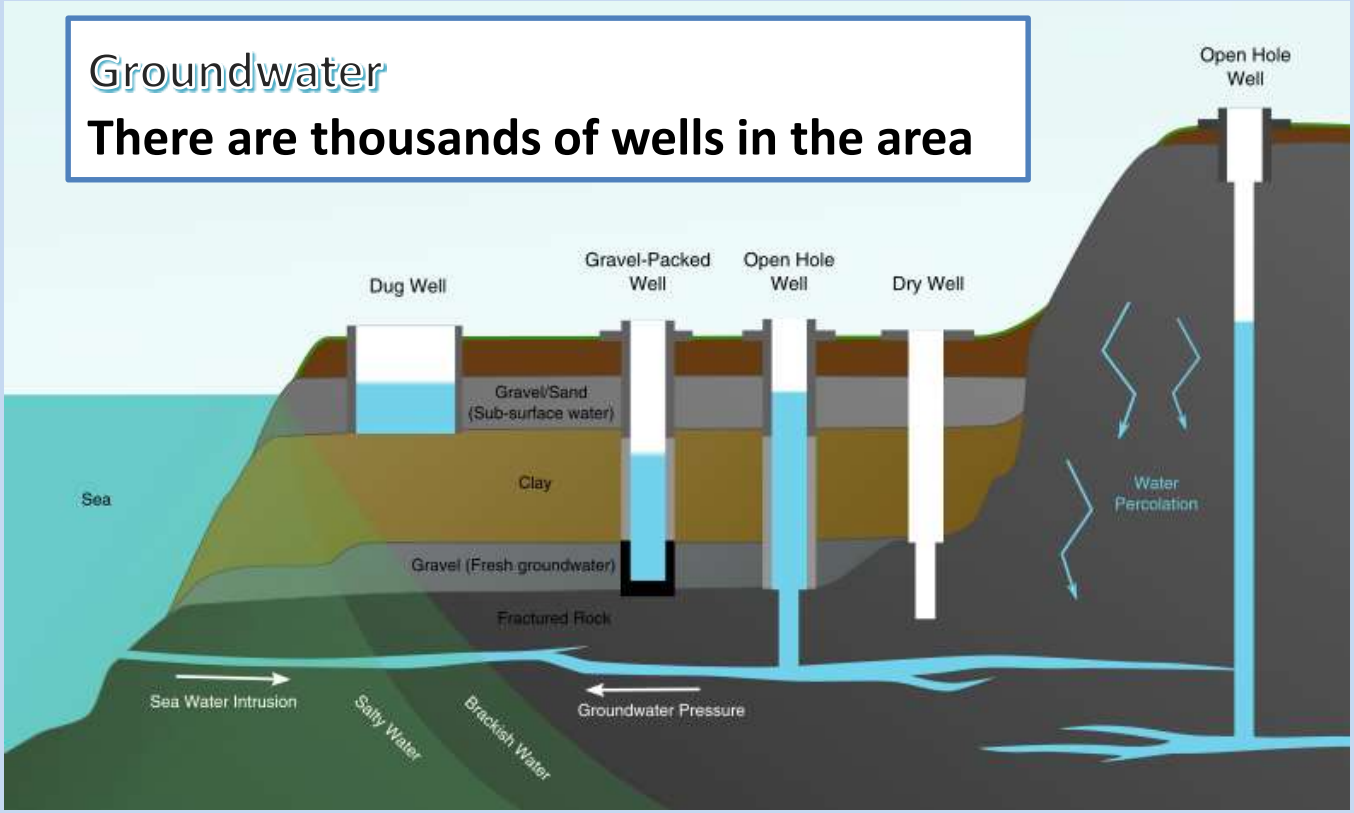
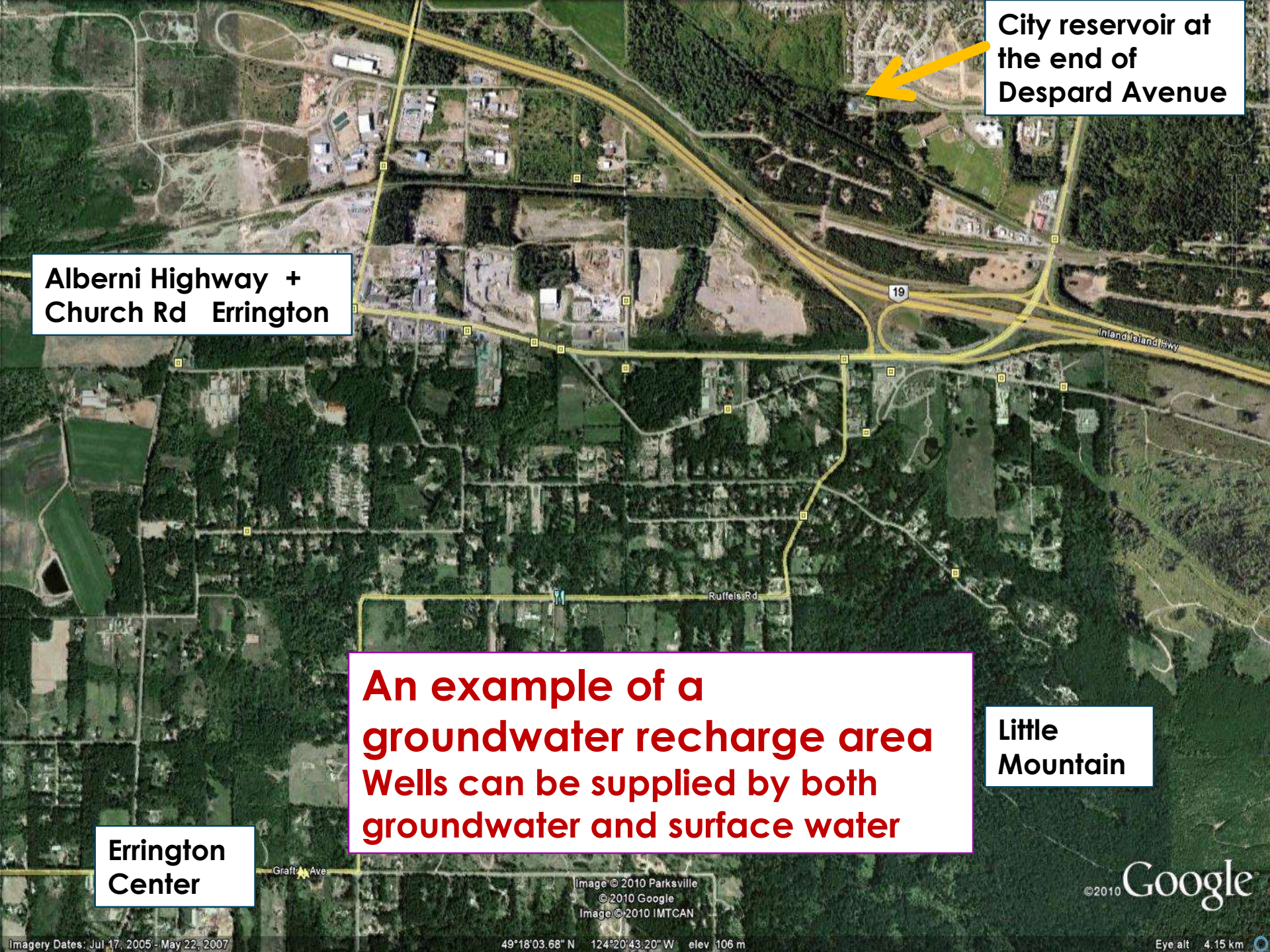
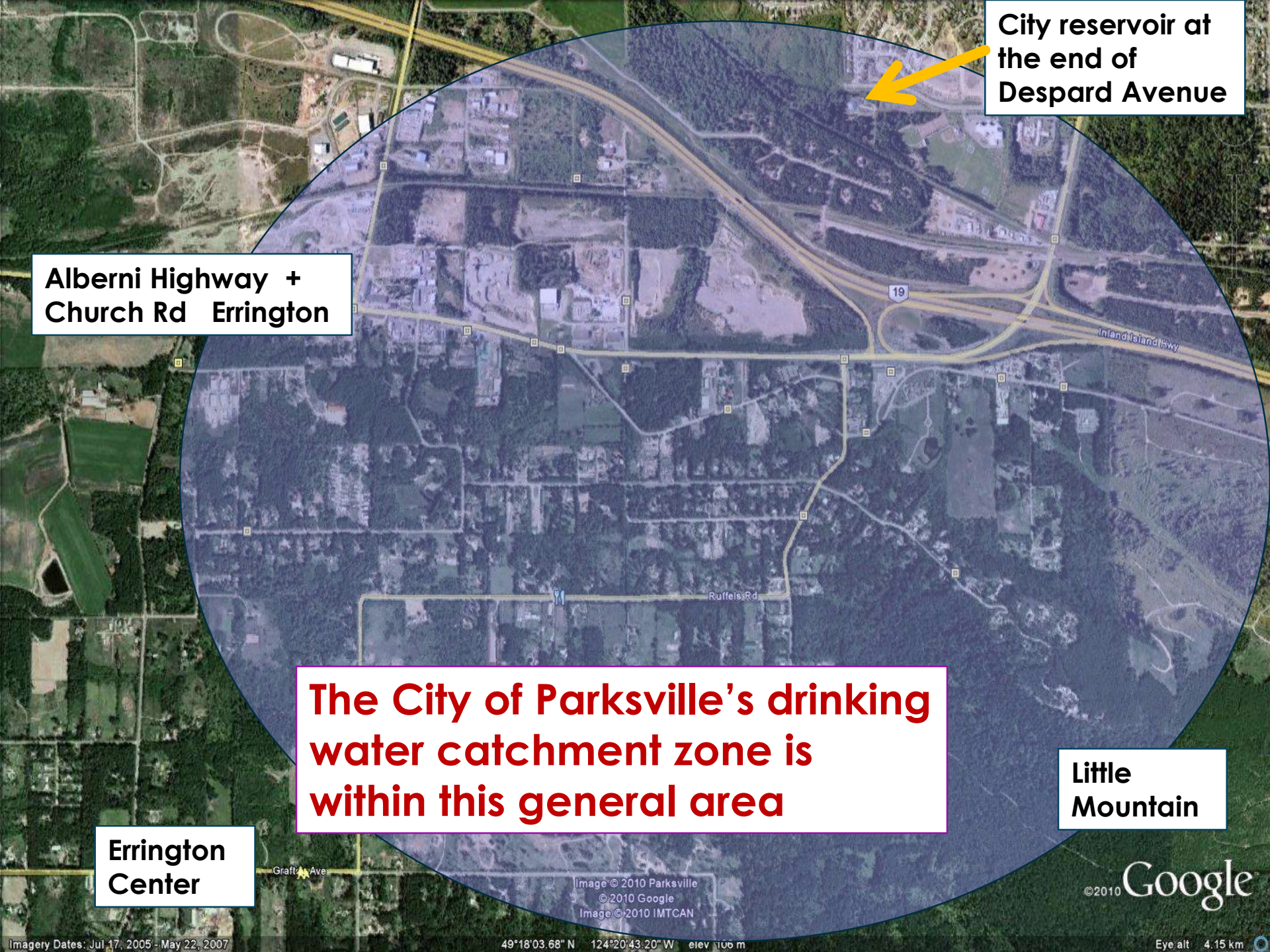
The Arrowsmith – Oceanside area depends on both groundwater and surface water to supply a population of just under about 35,000 people.



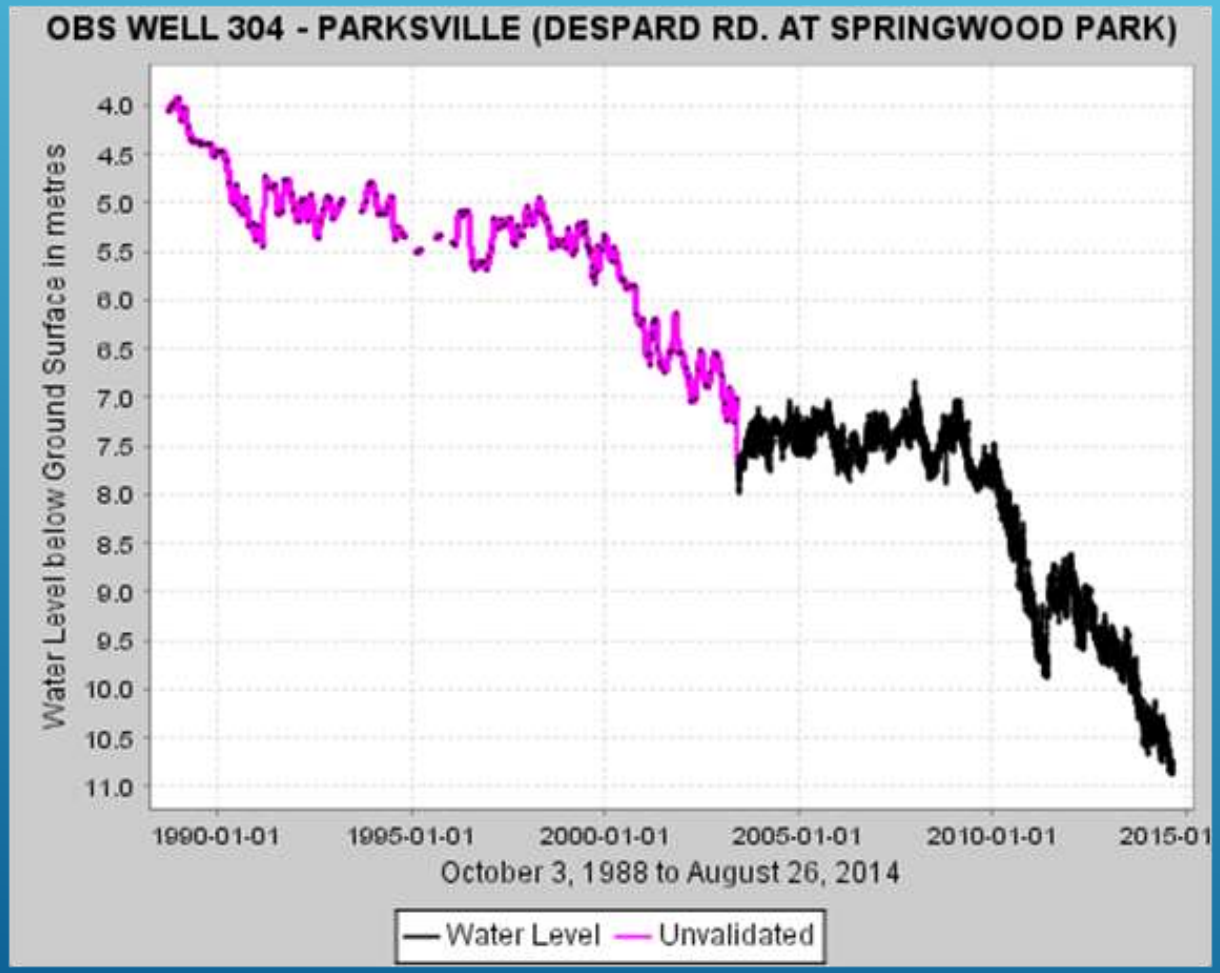


An example of a groundwater recharge area

Wells can be supplied by both groundwater and surface water


City reservoir at the end of Despard Avenue
Alberni Highway + Church Rd Errington
19
Inland Island Hwy
Ruffels Rd
The City of Parksville's drinking water catchment zone is within this general area
Little Mountain
Errington Center
Graft Ave
Image © 2010 Parksville
© 2010 Google
Image © 2010 IMTCAN
©2010 Google
Imagery Dates: Jul 17, 2005 - May 22, 2007
49°18'03.68" N 124°20'43.20" W elev 106 m
Eye alt 4.15 km

The groundwater levels at an observation well in Springwood Park continue to drop at an alarming rate. The level is now down to 11 meters. Historically the groundwater level was at the surface of the land.



The continued decline indicates that extraction at the current rates is unsustainable.

The lowering groundwater levels also increase the risks to human health from contaminating land uses in the groundwater recharge areas.

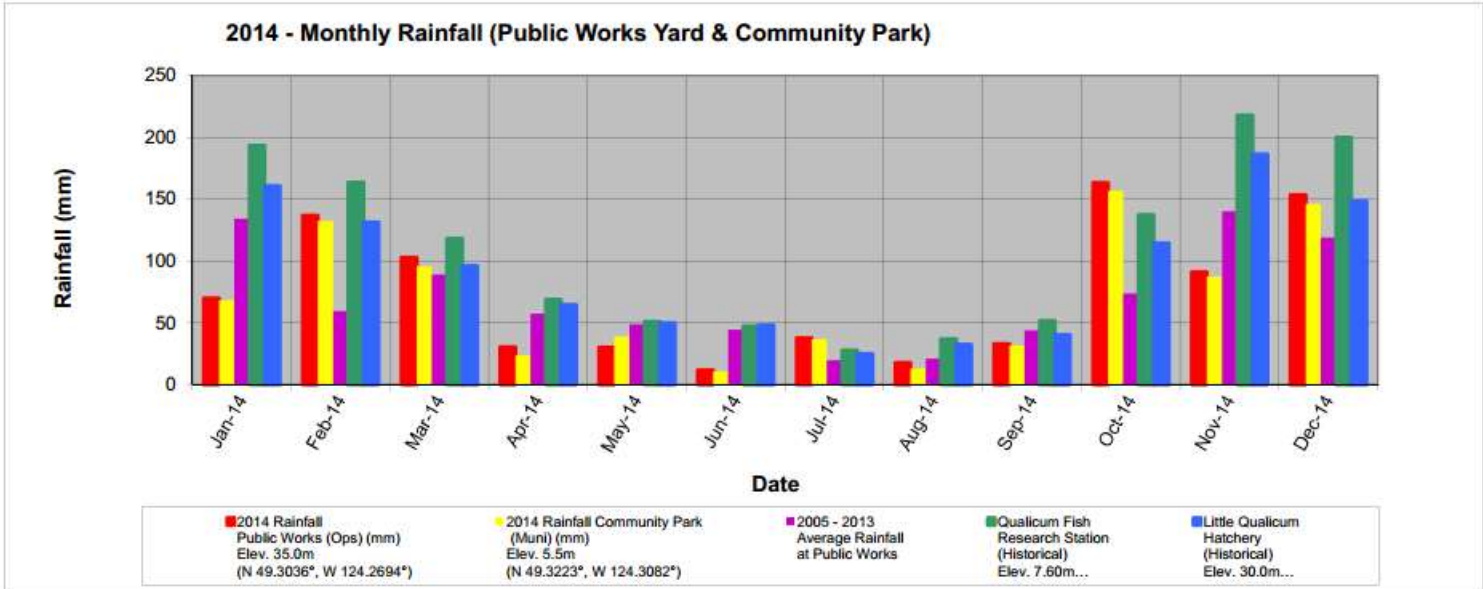

The current surface water intake is not dependable to supply safe drinking water, for a growing population

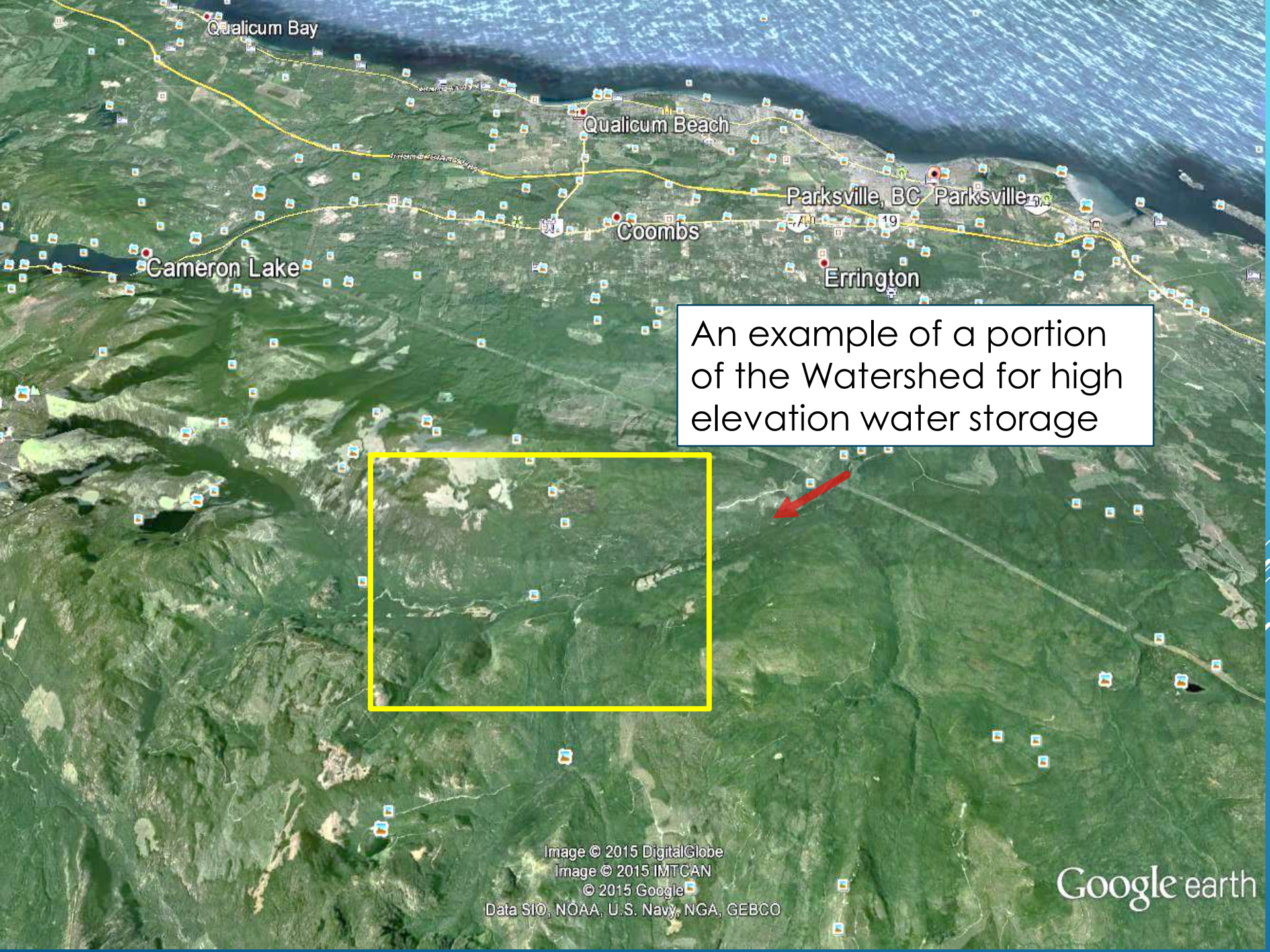
The watersheds inland from the coast, provide excellent potential for high elevation water storage

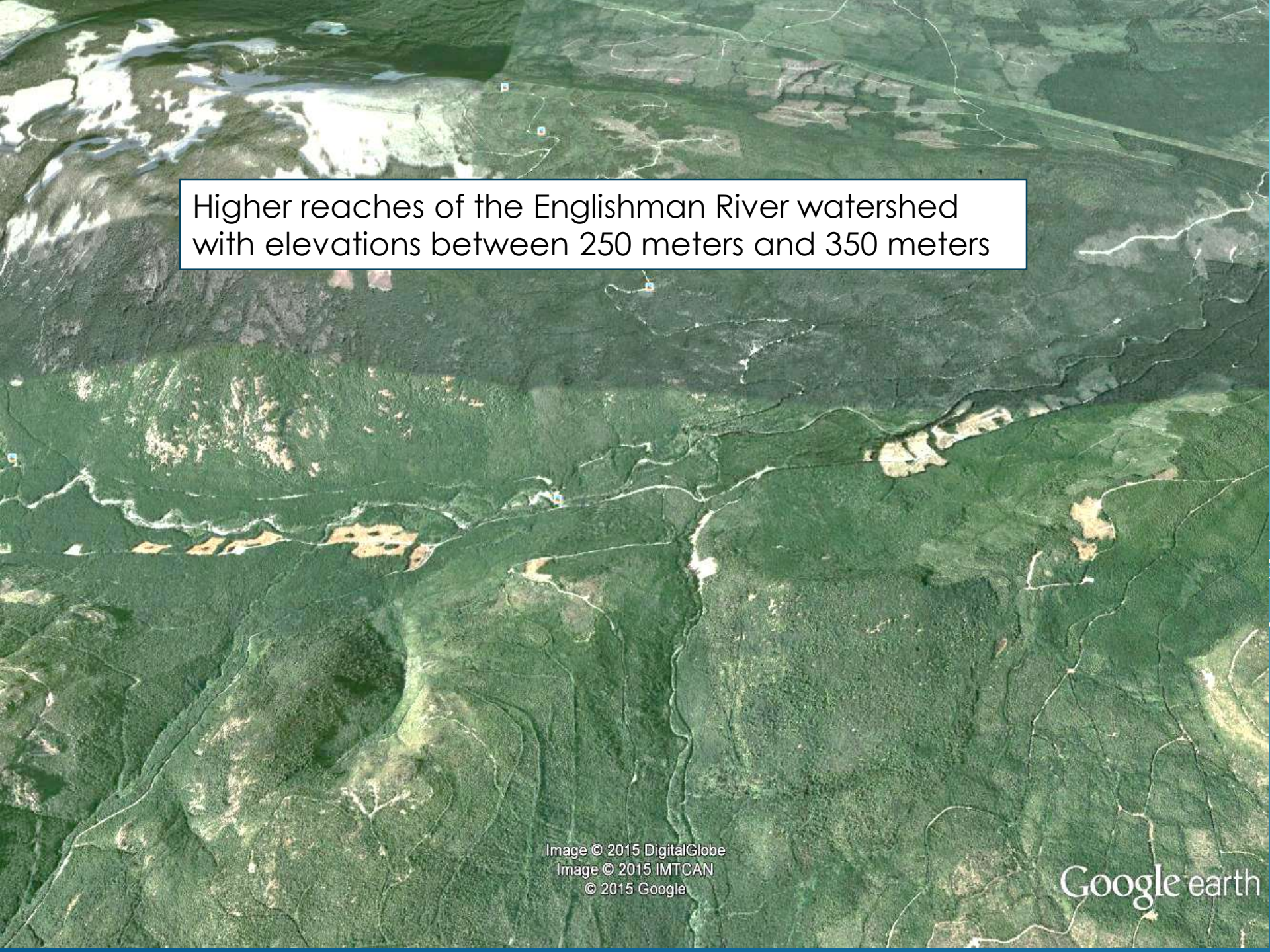
Storing high quality water, at high elevation has many benefits

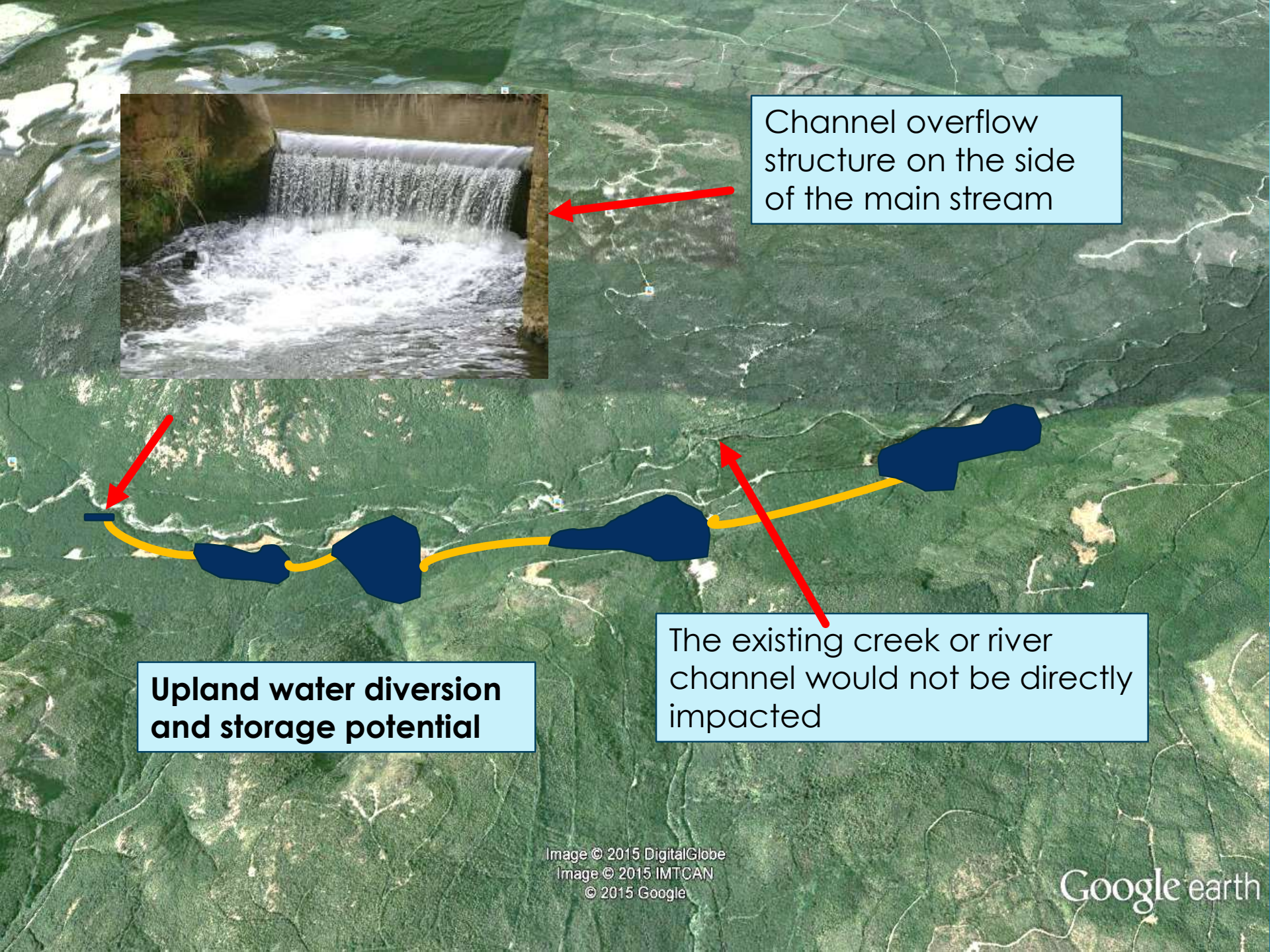
1. Water is relatively clean
2. Minimal contamination risk
3. Provides ecological and fisheries benefits
4. Eliminates the need for summer extraction from the river
5. Reduces storm flooding
6. Will flow downhill for free
7. Very low operational costs
8. Can generate electric power
9. Can supply many different areas

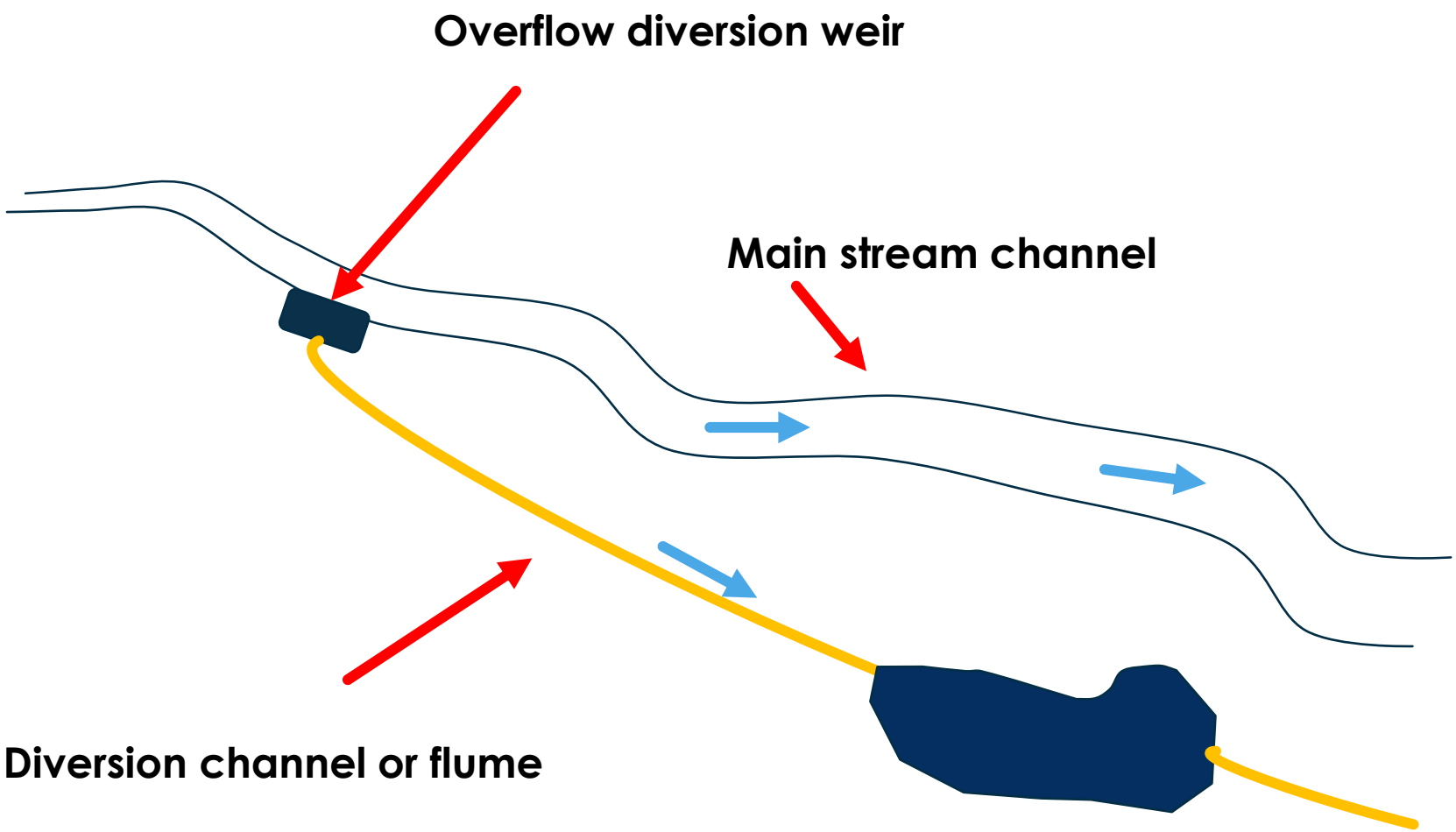
High flow diversion and storage of water, would occur in late fall, winter and in spring and early summer during storm events.




Qualicum Bay
Qualicum Beach
Parksville, BC
Parksville
Coombs
Cameron Lake
Errington
An example of a portion of the Watershed for high elevation water storage
Image © 2015 DigitalGlobe
Image © 2015 IMTCAN
© 2015 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth


Higher reaches of the Englishman River watershed with elevations between 250 meters and 350 meters
Image © 2015 DigitalGlobe
Image © 2015 IMTCAN
© 2015 Google
Google earth


Channel overflow structure on the side of the main stream
The existing creek or river channel would not be directly impacted
Upland water diversion and storage potential
Image © 2015 DigitalGlobe
Image © 2015 IMTCAN
© 2015 Google
Google earth


Overflow diversion weir
Main stream channel
Diversion channel or flume

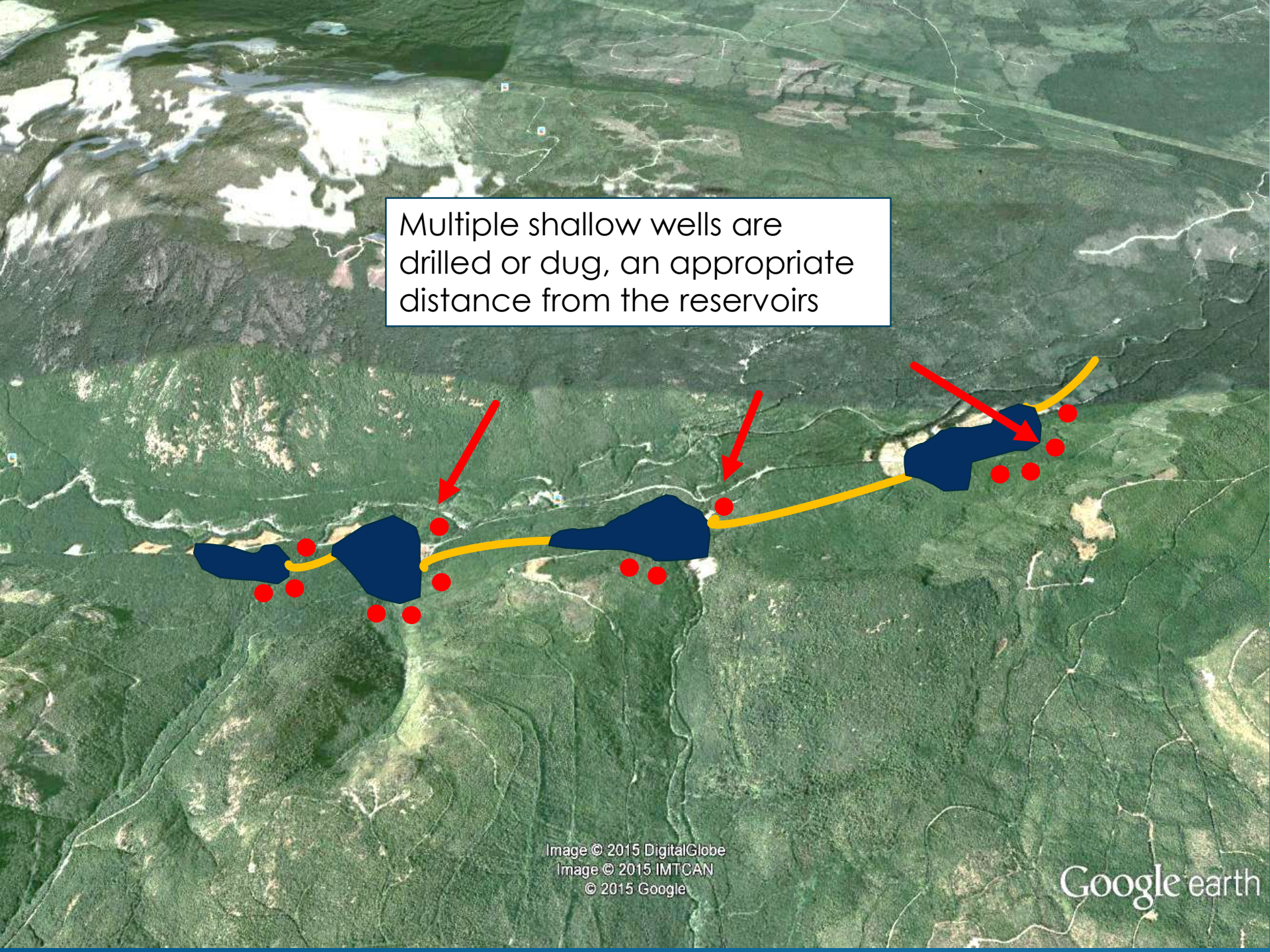
The diversion channels carry water, to fill constructed storage ponds / lakes

The ponds /lakes are constructed into the natural topography and are interconnected with naturalised streams and/or wetlands

The ponds/lakes will be vegetated with indigenous plants and trees.

Many of the retention areas will receive inflow from surrounding land

Overflow structures allow the fresh water to fill the ponds and the surplus to flow back to the stream


Multiple shallow wells are drilled or dug, an appropriate distance from the reservoirs
Image © 2015 DigitalGlobe
Image © 2015 IMTCAN
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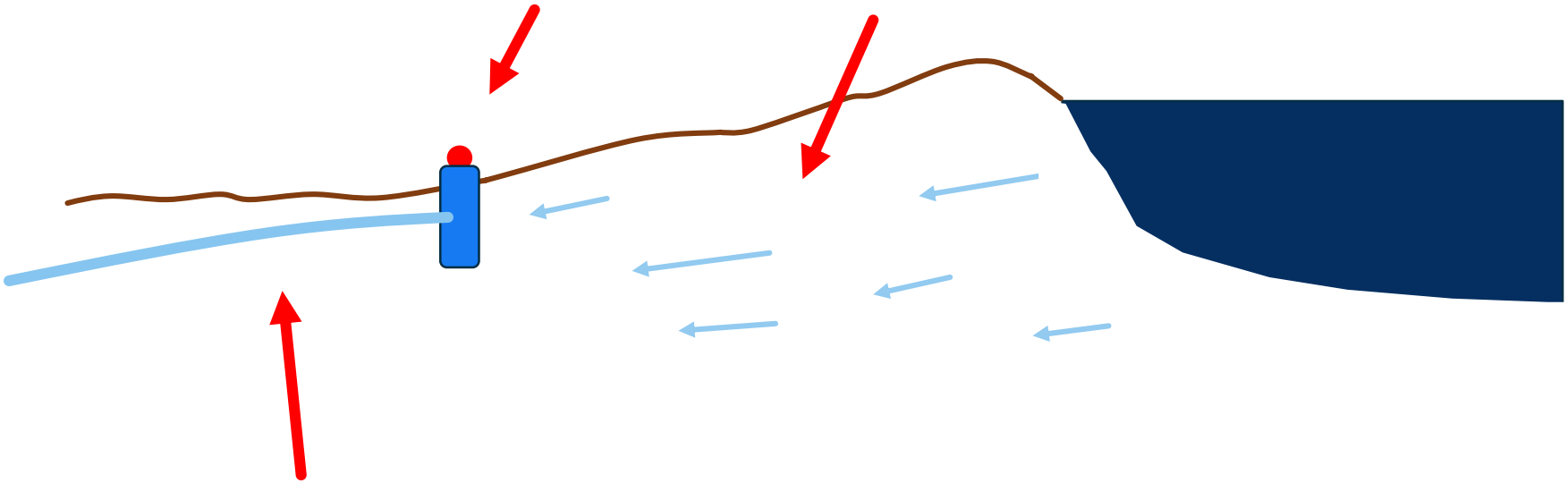
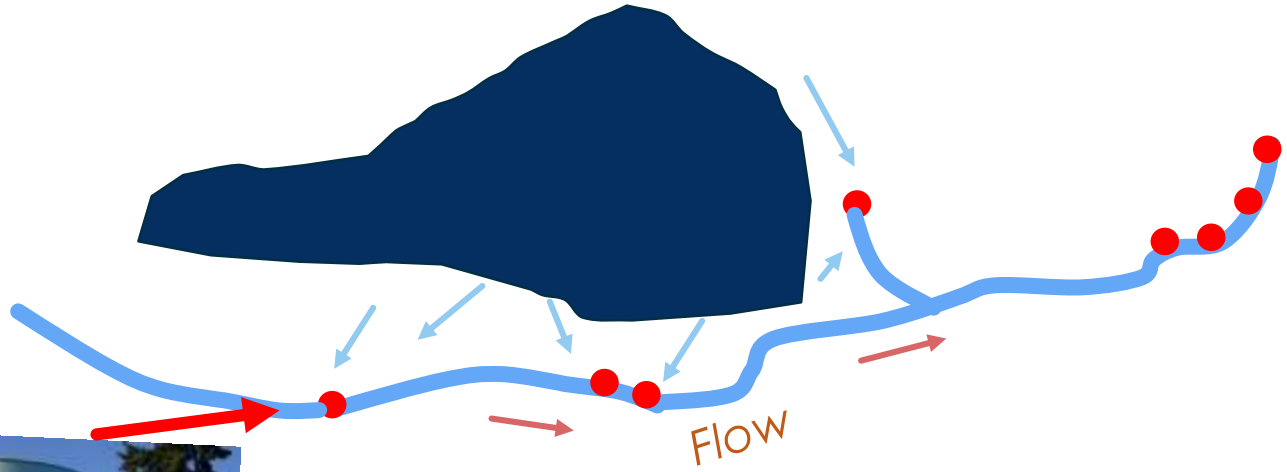
Google earth

The water from the reservoirs slowly infiltrates the surrounding land and recharges the groundwater for the wells.



The wells are inter-connected by small diameter syphon pipes, that carry the water downhill under pressure

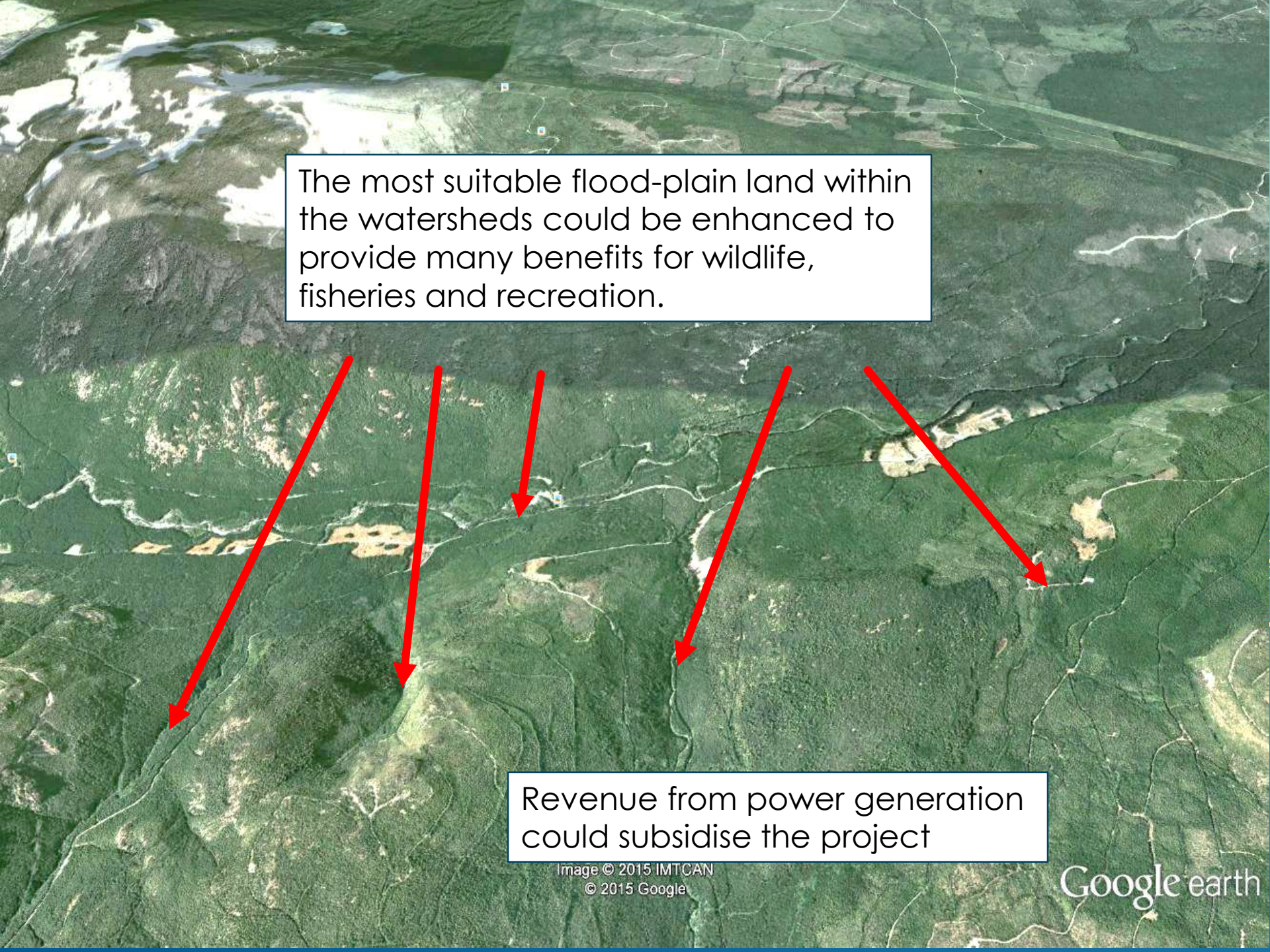
The multiple syphon pipes are sized for continuous flow with remotely controlled valves downhill



A reservoir of 'head water' is maintained by pumps powered by in-line turbine generators

Micro hydro in-line turbines could be installed, anywhere in the downhill pressure side of the supply system.

An advantage of multiple, small diameter, high pressure gravity lines, is that the source to delivery has many available options.


The most suitable flood-plain land within the watersheds could be enhanced to provide many benefits for wildlife, fisheries and recreation.
Revenue from power generation could subsidise the project
Image © 2015 IMTCAN
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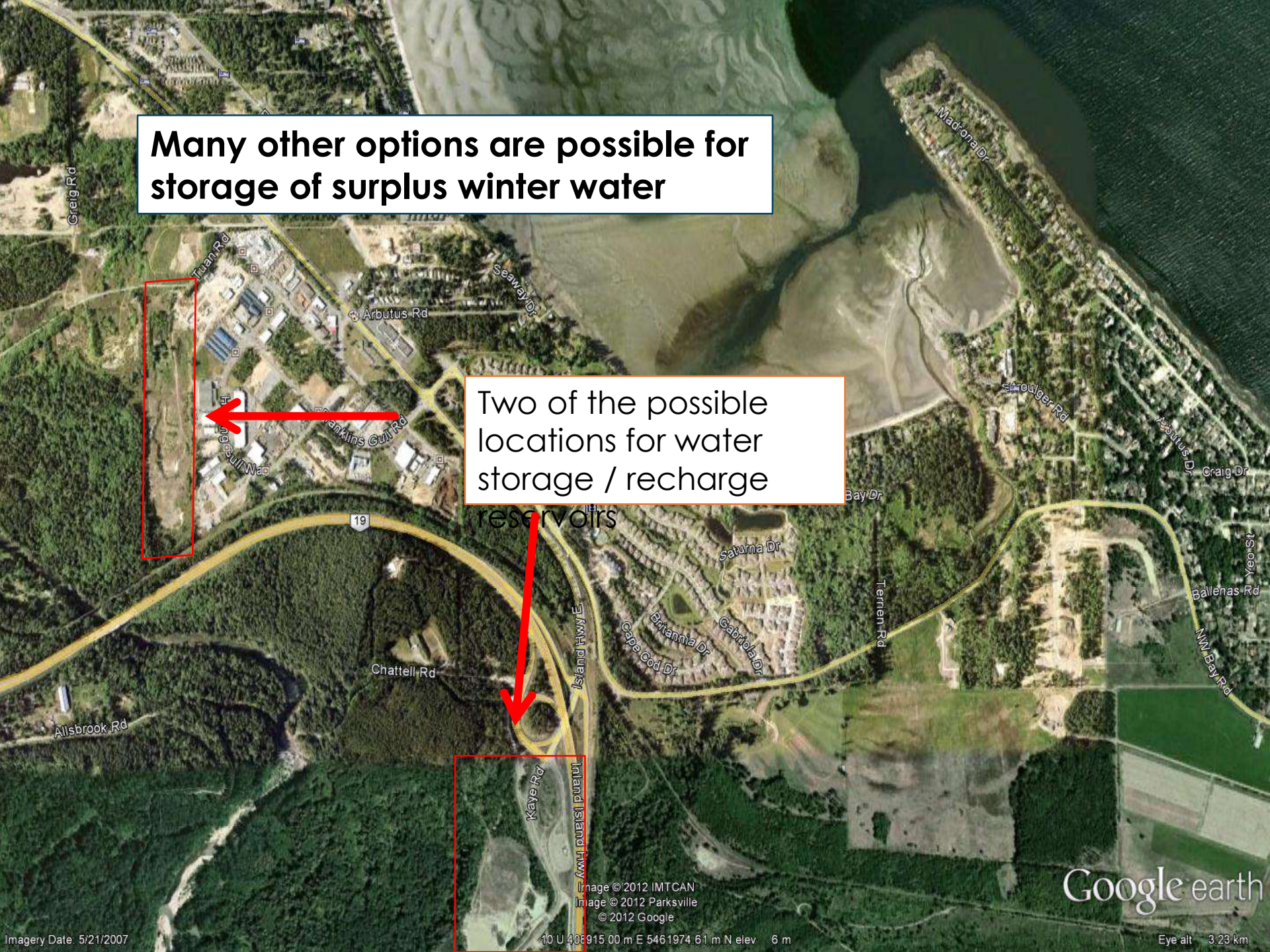
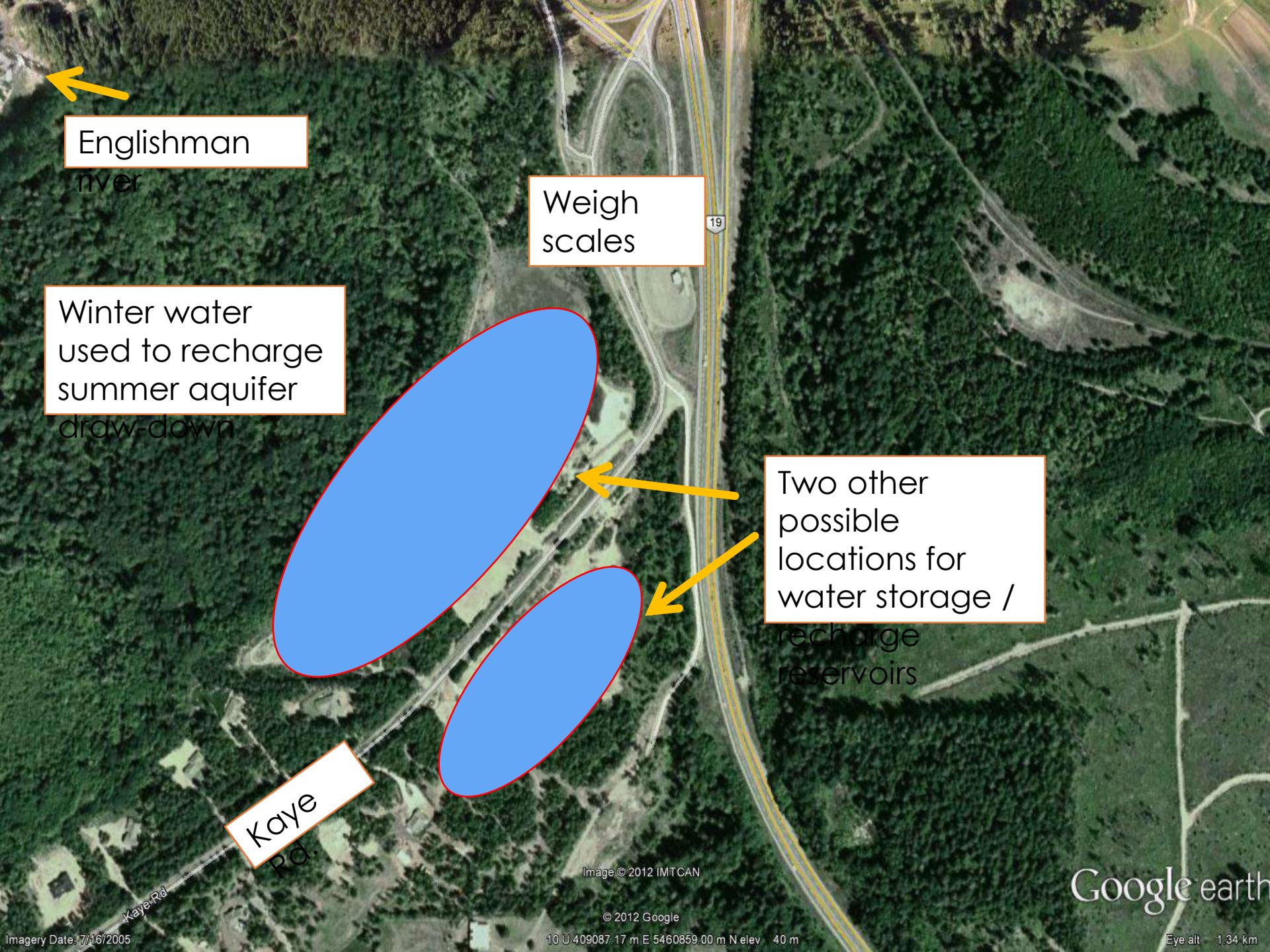

Many other options are possible for storage of surplus winter water
Two of the possible locations for water storage / recharge reservoirs
Greig Rd
Tuan Rd
Arbutus Rd
Seaway Dr
Madrona Dr
Franklins Gull Rd
Rouger Rd
Arbutus Dr
Craig Dr
Bay Dr
19
Saturna Dr
Terrien Rd
Ballenas Rd
Yeo St
NW Bay Rd
Island Hwy E
Cape Cod Dr
Britannia Dr
Gabriola Dr
Chattell Rd
Allsbrook Rd
Kaye Rd
Inland Island Hwy
Image © 2012 IMTCAN
Image © 2012 Parksville
© 2012 Google
Google earth
Imagery Date: 5/21/2007
10 U 408915.00 m E 5461974.61 m N elev 6 m
Eye alt 3.23 km


Englishman river
Weigh scales
Winter water used to recharge summer aquifer draw-down
Two other possible locations for water storage / recharge reservoirs
Kaye Rd.
19
Kaye Rd
Image © 2012 IMTCAN
© 2012 Google
Imagery Date: 7/16/2005
10 U 409087.17 m E 5460859.00 m N elev 40 m
Google earth
Eye alt 1.34 km

Another option

Does an underground stream exist that could help supplement the water supply?

An underground stream of fresh water appears to flow into Craig Bay

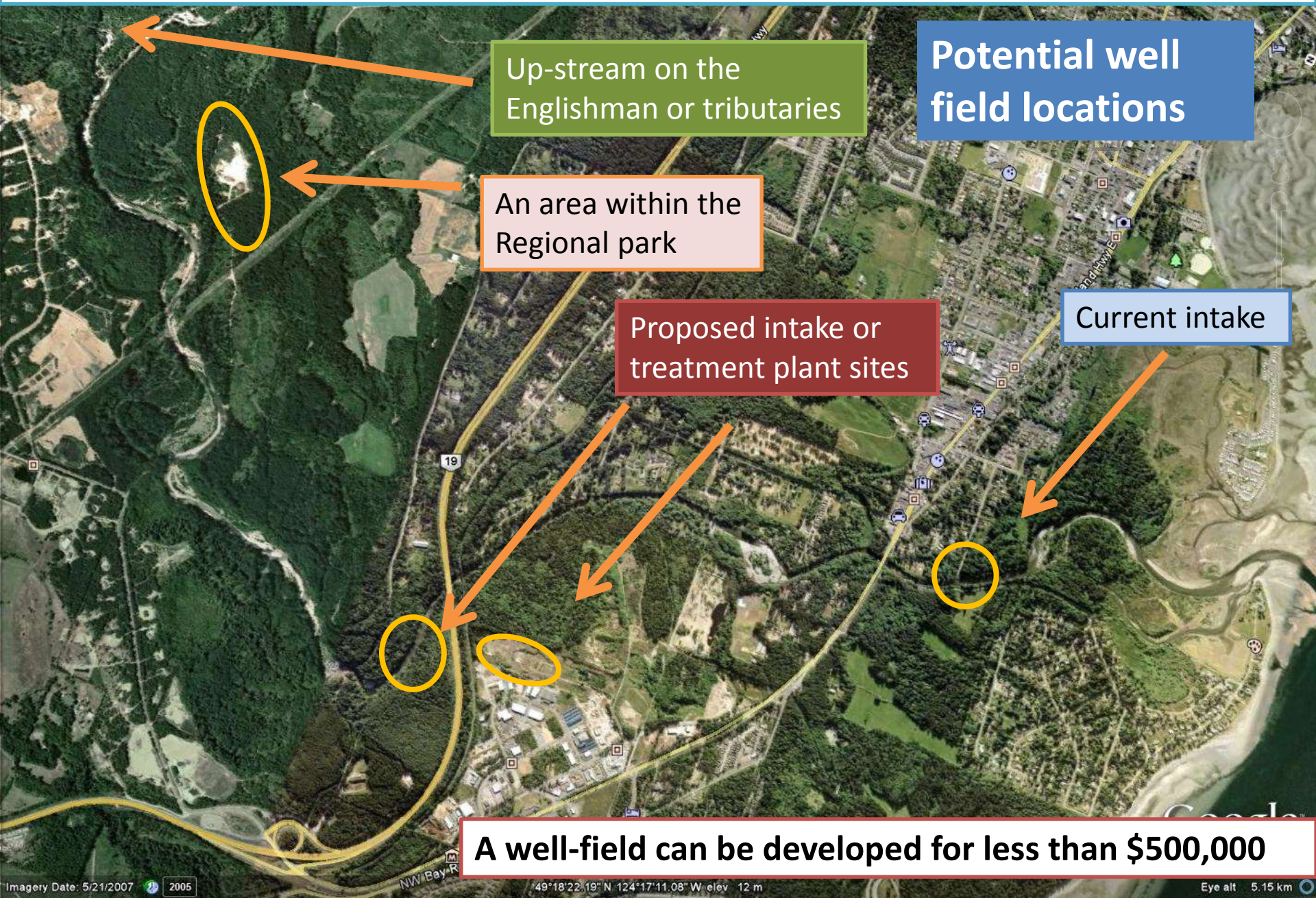
This area would be a good location to drill a test well to evaluate the flow

Englishman River

Develop a well field/s upstream and in proximity to the Englishman River or a tributary?
The location and depth of the wells could eliminate the need for a full water treatment plant, as with San Pareil and Qualicum's river wells.

The cost of drilling a well $12,000 – $20,000
10 inch main pipe $26,000 per kilometre

Potential sites for well-field development utilizing naturally filtered water to reduce or eliminate the necessity for water treatment other than disinfection.



Encourage rainwater harvesting, storage and utilisation systems.

Drinking Water Free Refill Center

Pure drinking water, free of chemicals, UV disinfection preferred.

Thank You

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