

# Drought and Climate Change



Water Purveyor Working Group  
January 24, 2023

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West Coast Region



# Outline

Drought, Climate change and groundwater

Provincial Resources and Tools

Preparing for Drought

Monitoring

Well and System Maintenance

Seawater intrusion

Water Licensing

# Drought, Climate Change and Groundwater



- With climate change, we are seeing less predictable trends in our climate
- Longer periods of drought and shifting in seasons (like our wetter summer last year and then early fall drought)
- More intense periods of precipitation, which prevent effective infiltration of water into the ground
- Less predictability and reliability of water sources
- Lower stream flows

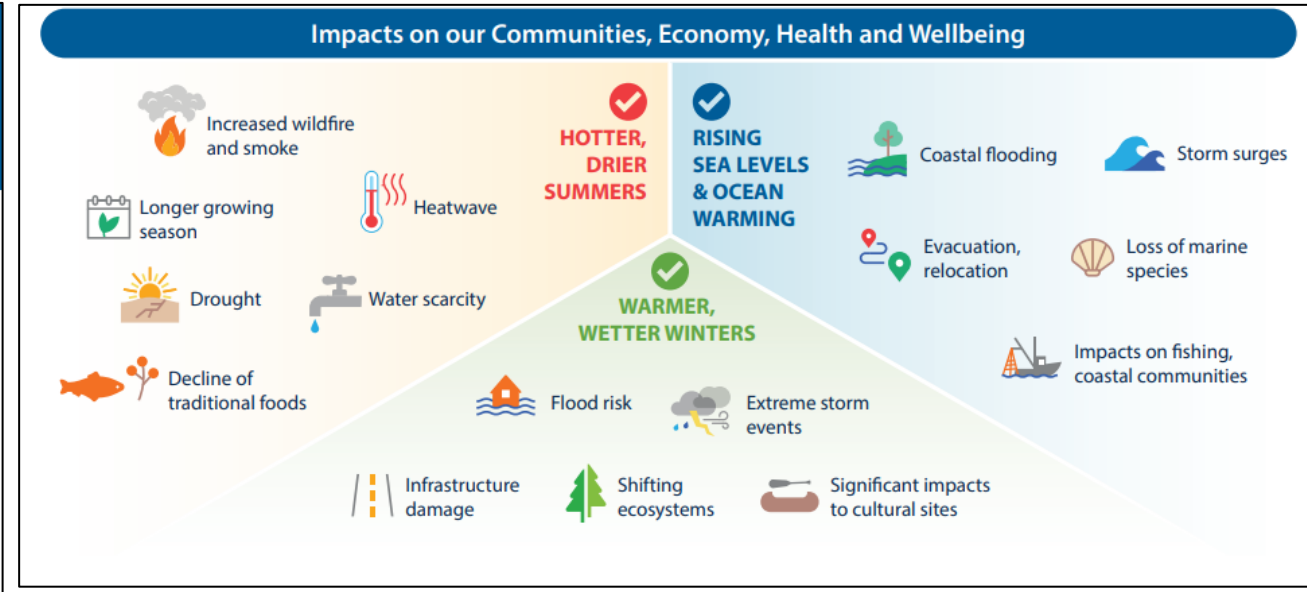
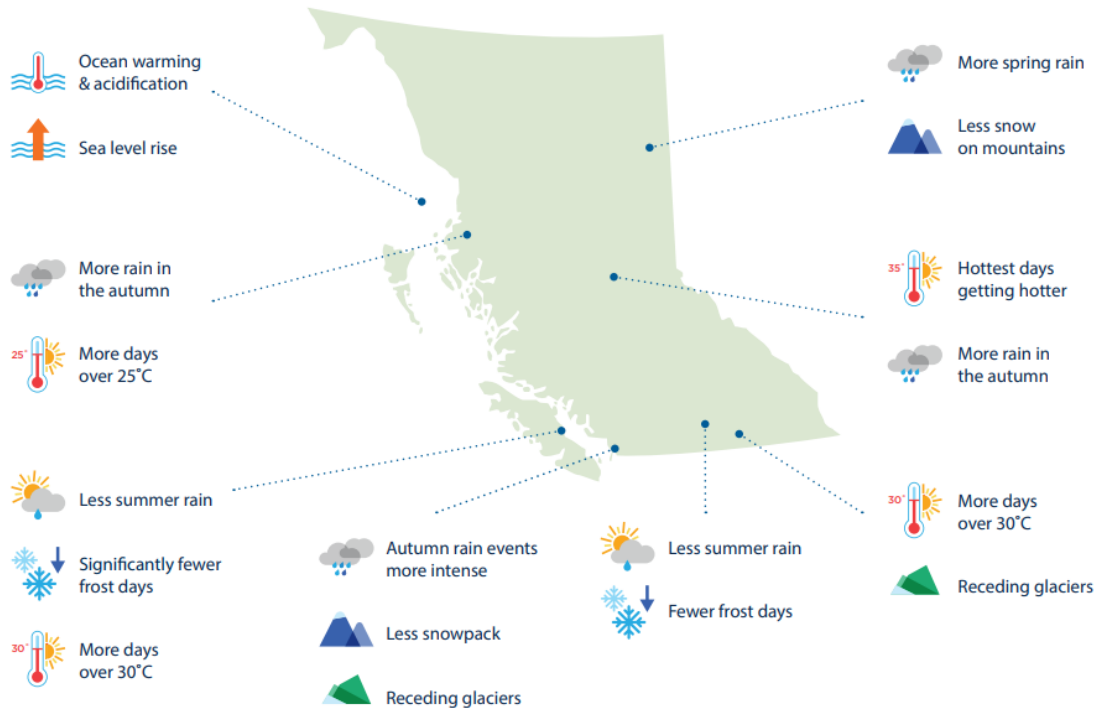
Can = a decrease in groundwater levels



# What can you Expect?

## Climate Projections & Impacts in BC

The map below illustrates the type of changes that we can expect to see in BC by the 2050s. Every region will experience slightly different impacts, and not all are depicted here.



Remember: connectivity between groundwater and surface water, and impacts to streams have cascading effects to our groundwater supplies



# Examples we have seen so far

- This past summer was wetter, but we had a very dry early fall
  - Concern for low levels in streams and spawning populations
  - Observation well levels (typically) very low and took longer to recover than usual
  - Water restrictions across Vancouver Island
- Sechelt water ban on non-essential businesses
- Mount Washington water shortage
- Koksilah area water concerns due to high allocation and high demand

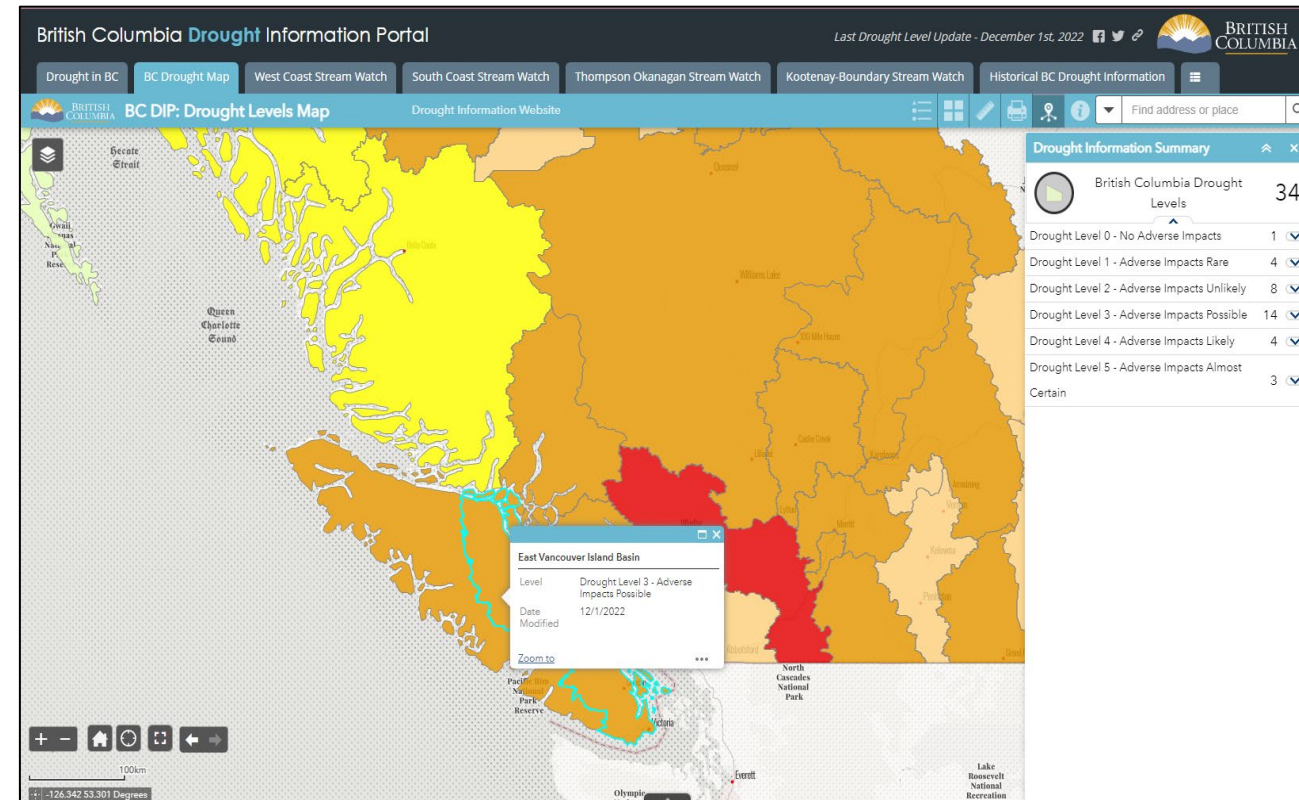
Continued development puts additional pressure on our aquifers



# Drought

“Recurrent feature of climate involving a deficiency of precipitation over an extended period, resulting in a water shortage for activities, communities or aquatic ecosystems” – British Columbia Drought and Water Scarcity Plan

- Drought information portal [British Columbia Drought Information Portal \(arcgis.com\)](https://arcgis.com)
  - Drought map, west coast stream watch with drought ratings
  - Currently Drought level 3 – Adverse Impacts Possible on Vancouver Island
- Drought and Water Scarcity Response Plan [British Columbia Drought and Water Scarcity Response Plan \(gov.bc.ca\)](https://gov.bc.ca)
  - Details provincial steps
  - Responsibilities
- Dealing with Drought: a Handbook for Water Suppliers in British Columbia [Dealing with Drought \(gov.bc.ca\)](https://gov.bc.ca)
- Provincial Groundwater Observation Well network

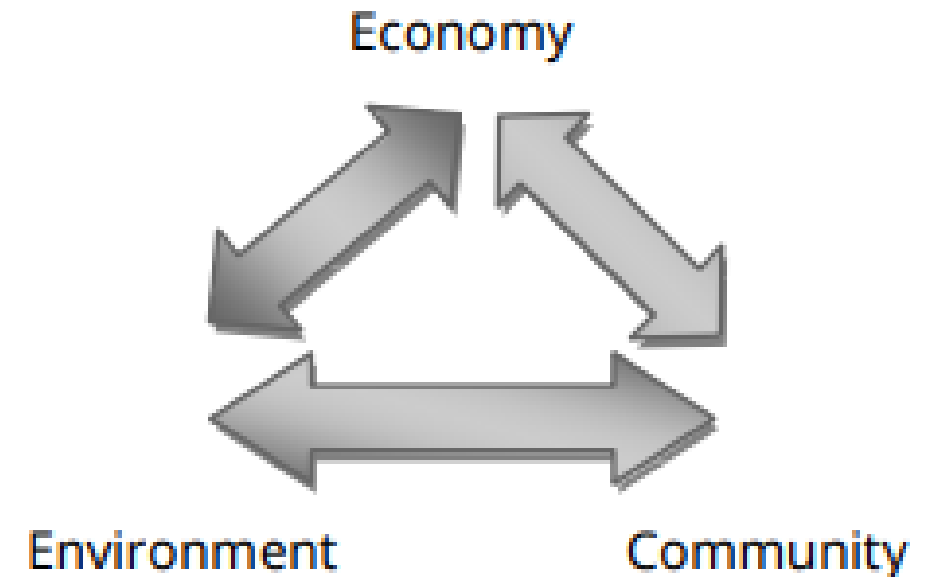




# Drought

continued

- What are the some effects of drought?
  - Lower surface water and groundwater levels
  - Changes in water quality from lower water levels
  - More reliance and use of groundwater with lower surface water levels
  - Impacts to agriculture and food production
  - Forest fire risk
  - Threatens fish and aquatic species
  - Prioritizing and protecting water for essential needs
  - Less predictability in your water source





# Why Prepare for Drought?

- ★ It **IS** your responsibility to manage your water supply
- ★ You want to protect your community water supply for various purposes including drinking water and fire protection
- ★ It will help to protect fish and aquatic ecosystems
- ★ It will help to support economic activity



# Ways to Prepare for Drought preparation and planning

Register your well with first use! In times of scarcity, FITFIR can be used



- **Plan ahead**, don't react after the fact
- Hire a professional (i.e. hydrogeologist) to assess your well system, groundwater conditions and supply
- Create a local drought management team (see handbook for details)
- Have a drought response plan
- Conserve water
- Assess the system needs, priorities and information gaps
- Talk to local government, health authorities and provincial drought planners
- Have an emergency plan and plan for the water restrictions in place
- Reference other systems' drought information and plans

## Dealing with Drought A Handbook for Water Suppliers in British Columbia

Updated August 2022





# Ways to Prepare for Drought

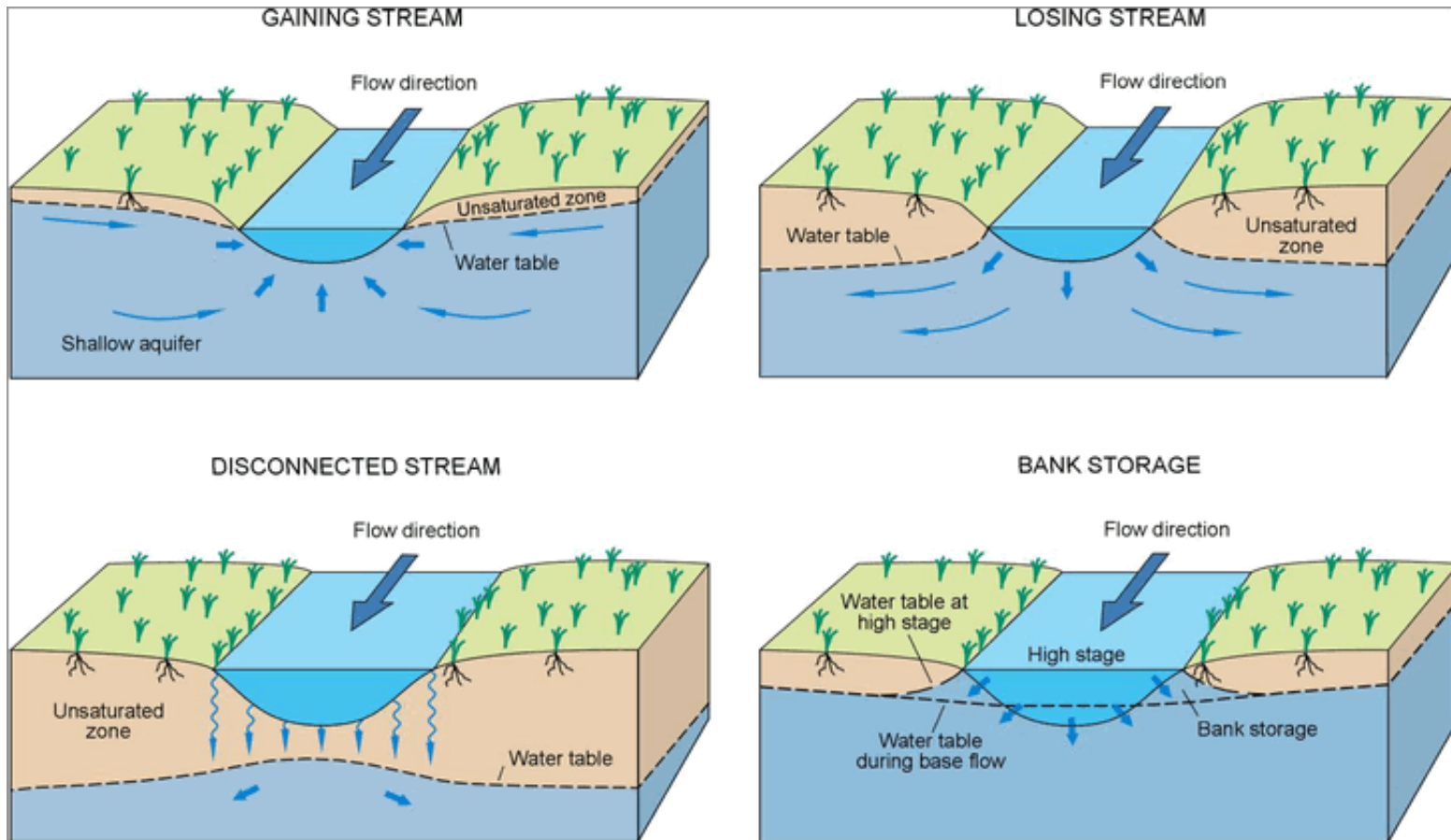
## Infrastructure and knowledge

- Know all about your water source and system (you may need to hire a professional—i.e. hydrogeologist)
- Utilize water storage or other water sources (i.e. rainwater collection)
- Establish a monitoring program—know your usage and water levels
- Know when conservation is needed
- Know if there could be a leak or another issue
- Maintenance and system monitoring
- Watch out for leaks, water waste etc.
- Improve water use efficiency
- Educate, communicate, participate



[Provincial monitoring well - Monitoring Aquifers: Provincial Groundwater Observation Well Network - Province of British Columbia \(gov.bc.ca\)](https://www2.gov.bc.ca/gov2/industry/monitoring/monitoring_aquifers/monitoring_aquifers.htm)

# Don't Forget about Groundwater and Surface Water Connection



- In times where surface water levels are low, groundwater can supplement the stream and vice versa. So low surface water levels can directly impact your water source
- Know these possible connections to help predict how your source will change seasonally and with drought

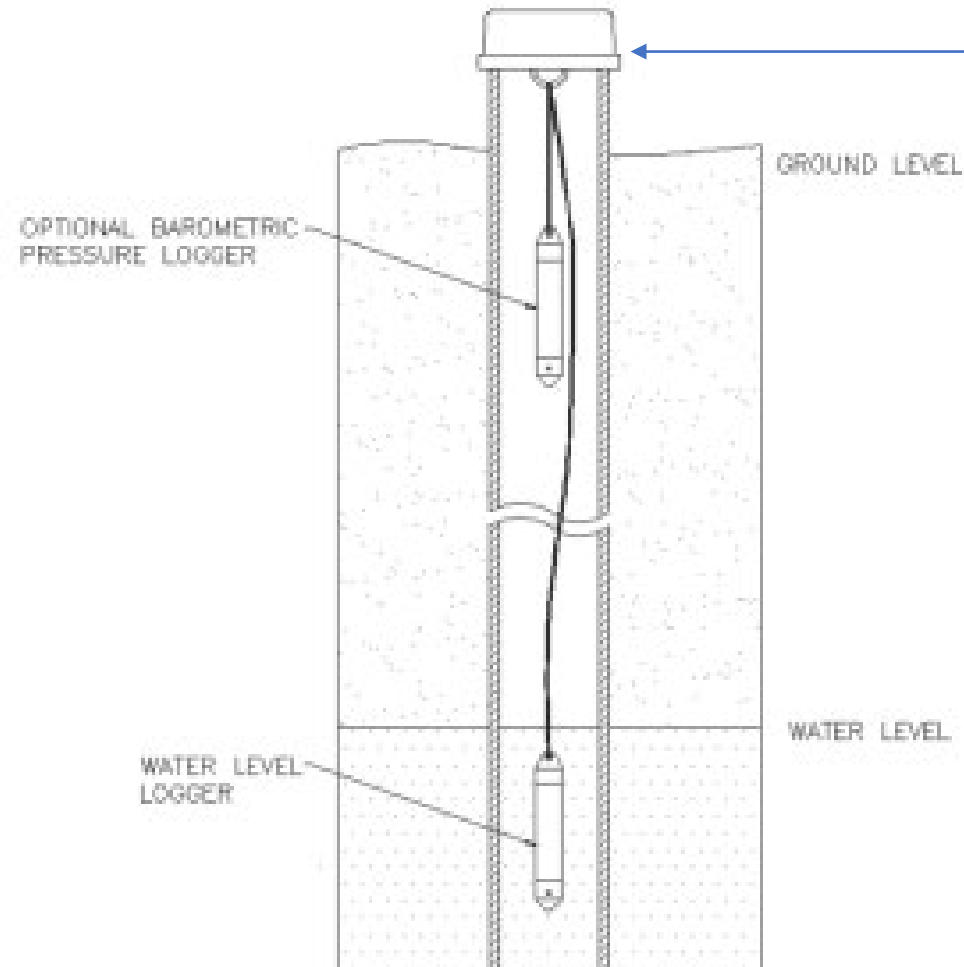




One of the best ways to know more about your groundwater source trends, levels etc.

# Monitoring

- ★ Remember that most tasks for wells require a professional (registered well driller, registered pump installer, P. Eng. or Hydrogeologist)
- You must hire a qualified professional to install/remove monitoring equipment (this is to protect your source, well and the aquifer)
- The type of monitoring you can do will depend on your set up and system, needs, budget etc.
- Some equipment can allow for water levels without removing the data logger (a data port can be installed/Bluetooth technology etc.)
- Any monitoring program will typically require support from a professional
- This is an investment in your system
- Identify water use, conservation, leak detection drought management and other benefits
- Consult with a professional on the best option for your system



A data port can be installed so removal of logger every time is not necessary



# Well and System Maintenance

- Important for longevity of well and system
- Can prevent and identify leaks
- Inspect your system and wells regularly
- Conduct any maintenance as soon as possible
- Work on the well and/or pump must be done by a registered well driller or registered well pump installer (depending on work to be done)



Even small leaks can lead to big impacts on your system

- Check your appliances
- Monitor your system
- Be on lookout for any changes and possible leaks
- Can cause seawater intrusion

# Sea water Intrusion

- Well operation causing sea water intrusion violates *Water Sustainability Act S.58*
- Seeing more wells with sea water intrusion & at risk areas being developed
- Changing climate is causing more impacts (i.e. deepening groundwater levels due to longer drought periods)
- Even a tiny leak can cause seawater intrusion
- This can be very difficult and expensive to reverse (well may have to sit, trucking in water, additional monitoring and testing...)
- Could become more of an issue and affect more wells with sea level rise from climate change

## Best Practices for Prevention of Saltwater Intrusion



### What is saltwater intrusion and why is it a concern?

Saltwater intrusion occurs when saline (salty) water is drawn into a freshwater aquifer. Saltwater intrusion can affect one well, or multiple wells in an aquifer, making the water unpotable (unpleasant to drink). People with hypertension should not drink groundwater with a high salt content. The health of plants and fertility of soil can be negatively impacted if irrigated with saline groundwater. Once saltwater intrusion occurs, the changes in the aquifer may be permanent or may take many years to recover.

### What causes saltwater intrusion?

Saltwater intrusion can occur due to either natural processes or human activities. In aquifers adjacent to the coast and on islands like the Gulf Islands, freshwater floats as a lens above the saltwater, forming a wedge that extends inland from the shoreline (see Fig. 1). Salinity typically increases gradually at the base of the freshwater lens, but in fractured rock aquifers a single fracture can deliver saltwater to a well (Fig. 3). The

While intermixing of freshwater and seawater is one of the main causes of saltwater intrusion in coastal B.C., groundwater within deeper aquifers may also be salty due to geologic processes and interactions between rocks and water over a long time period (e.g. millennia). If a well draws water from one of these deeper aquifers, it can cause saline water to migrate or mix with fresher groundwater in shallow aquifers. Isolated areas of saltwater have also been found at relatively shallow depths e.g. < 50 m in some areas such as Saanich, Mayne Island, Saltspring Island and near Parksville.

### What areas are at highest risk?

Areas at highest risk of saltwater intrusion include locations:

- » Close to the coast;
- » Where there is a low to moderate slope;
- » On peninsulas or in areas with a limited source area for groundwater recharge;
- » Where there is a high density of wells;



# Sea Water Intrusion Mitigation

## Well pump set-up and Operation

- Reduce pump depth
- Avoid excessive drawdown of groundwater level below sea level
- Adjust pumping rate & frequency
- Timing
- Increase storage (pump in wet season)
- ★ Leak prevention ★
  - Stop use (may be necessary during drought periods or to allow a well to freshen)
  - Monitor water quality during pumping tests

### Well pump set-up and well operation:

**Reduce use:** Conserve water, install low water use appliances and irrigation systems, xeriscape gardens, and consider options for water re-use.

**Pump depth:** Reduce the pump depth.

**Low-volume, high-frequency pumping:** Increase the frequency and reduce the duration of well pumping (“well sipping”) to minimize drawdown in the well and the surrounding aquifer.

**Pump timing:** For multi-well systems, program the wells to pump at different times rather than simultaneously.

**Increase storage:** Increase water storage (e.g. cisterns) and pump in wet season for use in drier periods, or augment the supplies using water from other sources such as rainwater collection. Ensure water in tanks or cisterns is kept free from contaminants by following health guidelines for water storage and disinfection.

**Prevent leaks:** Install water meters or other alarms/indicators so that leaks can be detected and fixed quickly. Many intrusion problems start with over-pumping because of an unchecked leak.

**Discontinue use:** If a well is severely impacted by saltwater intrusion, it may be necessary to discontinue using it for a period of time, and use alternate sources, to give the well time to recover, or the well may need to be decommissioned permanently. Refer to the *Water Sustainability Act (reference 6)* for the regulations regarding well operation and saltwater intrusion.

# Sea water intrusion water quality indicators - Thresholds and Guidelines



Well should only be pumped if water produced meets these operational thresholds



Groundwater quality parameter	Operational threshold for prevention of sea water intrusion <sup>1</sup>	Drinking Water Quality Guideline <sup>2</sup> (guideline type)	BC Water Quality Guidelines for Aquatic Life, Wildlife & Agriculture <sup>3</sup>		
			Aquatic life (Long-term)	Livestock	Irrigation
<b>Chloride (mg/L)</b>	<b>150</b>	<b>250 (AO)</b>	<b>150</b>	<b>600</b>	<b>100</b>
<b>Electrical conductivity (EC) (µS/cm)</b>	<b>1000</b>	<b>ng</b>	<b>ng</b>		
<b>Total Dissolved Solids (mg/L)</b>	<b>700</b>	<b>500 (AO)</b>	<b>ng</b>		

ng=No guideline

<sup>1</sup>[Province of B.C., 2017. Best Practices for the Prevention of Salt Water Intrusion.](#)

<sup>2</sup>[Health Canada, 2020. Guidelines for Canadian Drinking Water Quality.](#)

<sup>3</sup>[Province of B.C. 2021. B.C. Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture.](#)



# Licensing and Registration





# Outline

Context

When is a groundwater license required?

Your groundwater license

Consequences of not applying

How to apply

Well Registration

The end!

# Context



WSA brought into force February 29, 2016

- Allows surface water and groundwater to be managed and protected as one interconnected source
  - Fair and transparent system for managing use during scarcity
- Previously, groundwater was used under common law
- The first 6 years were a transition period
- A license provides a right to divert groundwater from an aquifer for use on the property
- [Requirements for Groundwater Users - Province of British Columbia \(gov.bc.ca\)](http://gov.bc.ca)

The deadline for Existing Use has passed, now all applications would be under New Use

# Context



- The deadline for existing use license application has passed (March 2022)
  - Received double the applications leading up to the deadline
  - 50% of anticipated existing use submissions and most of larger volume users
- All non-domestic new use groundwater users must have a license before using groundwater
- License holders pay an annual water rental based on the purpose and amount to be diverted.





# License Processing

- Large backlog of existing and new use license applications
- Water authorizations continue to use techniques to streamline and improve backlog/time for applications
- Authorizations has spatialized the applications to get a better idea of the areas that have applied and to be more efficient
- Water allocation notations on imapBC identify aquifers with possible water shortages and fully recorded sources
- Uncertainty with sustainable water sources growing and scarcity becoming more of a concern

Water conservation is important with your system!



# When is a licence required?

## Licence required

Examples:

- Water supply systems (small water systems, stratas, municipalities)
- Agricultural irrigation, livestock
- Commercial (stores, restaurants, campgrounds, bed and breakfasts)
- Institutional (community centres, churches)
- Industrial (hatcheries, greenhouses, golf courses)



Non-Domestic  
Use

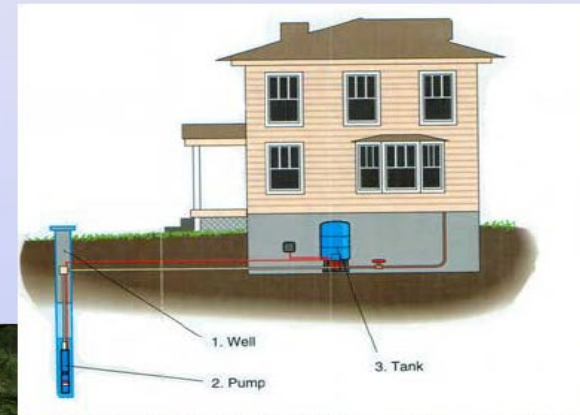


# A license is not required for...

## Domestic (Single Household) Use

### No licence required

- Drinking water
- Food preparation
- Sanitation
- Fire prevention
- Water for pets and household animals or poultry
- Irrigating a garden adjoining the dwelling (under 1000 m<sup>2</sup>, 0.25 acre)







# Your groundwater license

- A license is:
  - Attached to the land, not the people
    - Requires a “transfer of ownership” (a simple process) if the land is subdivided or sold;
  - Not attributed to a well. The well is the works. A license is a right to use the works;
  - For a specific use only e.g., irrigation, drinking water system, livestock watering;
  - For a pre-determined volume
  - Sometimes for a specific timeframe e.g., winter only.
- Includes date of first use, ensures your right to water based on First-In-Time, First-In-Right (FITFIR)
- Enhances property value
- During scarcity, right to water will be dictated by FITFIR, based on date of first use.
- Potential Buyers
  - Do they know the licensing requirements?
  - Do they plan to use a domestic well to supply other water needs?
- Not the same as registering a well



**Contact Front Counter BC  
for licensing questions:  
1-877-855-3222**

# Consequences of Not Applying



- You are committing an offense under the Water Sustainability Act
- Could be subject to fines and penalties
- May be ordered to cease using water
  - Would have to have another source like trucking water in
- If you did not apply before deadline
  - Lose historical rights
  - Application could be refused
- Regions are starting compliance projects for existing use users who did not apply for their license

# How to Apply!

## 1. Register for a BCeID

[www.bceid.ca](http://www.bceid.ca)

Allows you to begin your application and return to it later, if needed

## 2. For application form, required information, fees, links and tips, please visit: [groundwater.gov.bc.ca](http://groundwater.gov.bc.ca)

## 3. Allow for about 2 hours to complete your application online; apply early to avoid technical issues

*Call FrontCounterBC for assistance*

**1-877-855-3222**





# General Licence Process

- You submit an application through FrontCounter BC (in person, online [Water Licence - New - Authorization Guidance - Natural Resource Online Services \(gov.bc.ca\)](https://www2.gov.bc.ca/gov/content/water/water_licensing/water_licensing_new_authorization_guidance_natural_resource_online_services))
- The application is reviewed, and any questions/gaps are filled in (you may get requests for more information)
- Once this is completed, your application is assigned to a water officer for further assessment and determination
- The water officer may also need more information
- First Nations consultations are required for each application (batch applications are being done where possible)
- Further assessment is needed for some applications (i.e. pump tests, hydrogeological assessment, monitoring if there is high risk to affect other users, sea water intrusion risk etc.)

# Why are We Licensing Groundwater?

To protect our groundwater resources – just like other regulated resources (i.e. forestry, surface water)

Groundwater is not an infinite resource

We continue to develop land and need more water, whereas resources are not increasing and are seeing impacts from drought and climate change

Fair and transparent process for who uses water especially in shortages

Protects aquifers and streams

Helps to manage groundwater resources in a sustainable way

This benefits you, your business and everyone using groundwater

# Domestic Well Registration

- Not required for wells drilled before February 29, 2016
- Wells drilled after this date must be registered by the well driller
- Your well will be in the GWELLS database once registered [Groundwater Wells and Aquifers - Province of British Columbia \(gov.bc.ca\)](http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/well_construction-alteration_form.pdf)
- Why?
  - Will ensure that your well is considered with any water assessments, research, etc.
  - In any emergency, your well location and details will be easier to identify
  - Can help better inform new groundwater license applications
  - Can prevent someone from developing or constructing too close to well
- Supports sustainable planning

[Well Registration Form \(gov.bc.ca\)](http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/well_construction-alteration_form.pdf)



## Domestic Well Registration Form

This form is for registering groundwater wells used only for [domestic water use](#). Domestic use is exempt from the requirements for an authorization or payment of fees and rentals. Registering creates a record of your well location and water use. Registration ensures your use is known when decisions are made on licence applications.

Domestic purpose is defined in [Section 2 of the Water Sustainability Act](#) as water used for the occupants of a private residence (e.g., not a multi-family apartment building, hotel, strata or cooperative building) for household uses. Household uses include: drinking water, food preparation, sanitation, fire prevention, water for animals kept for household use or as pets, or irrigation of a garden not exceeding 1000 m<sup>2</sup>.

Please visit [www2.gov.bc.ca](http://www2.gov.bc.ca) if you are unsure whether your use is domestic, or to apply for a licence if your well is used for any other purpose.

You can only use this form if your well was dug or drilled **prior to** February 29, 2016.

If your well was dug or drilled **after** February 29, 2016, your well driller had to register your well.

- Please contact [groundwater@gov.bc.ca](mailto:groundwater@gov.bc.ca) if your driller did not give you the construction record (either through the online GWELLS database or a hard copy).
- If your well is not registered, you must register it using the Schedule 3 Well Construction form: [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/well\\_construction-alteration\\_form.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/well_construction-alteration_form.pdf)

**Red lettering indicates information that must be provided for domestic well registration.**

### Owner Information

Well Owner Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_ Town \_\_\_\_\_ Prov. \_\_\_\_\_ Postal Code \_\_\_\_\_

Email Address: \_\_\_\_\_ Phone No.: \_\_\_\_\_

### Well Location Information

Provide at least two of these property descriptors:

1) Address: \_\_\_\_\_ Town \_\_\_\_\_

2) Legal description (available from the property tax assessment notice):

Lot: _____	Block: _____	Range: _____
Plan: _____	Section: _____	Land District: _____



# Well registration form

Red lettering indicates information that **must** be provided for domestic well registration.

## Owner Information

Well Owner Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_ Town \_\_\_\_\_ Prov. \_\_\_\_\_ Postal Code \_\_\_\_\_

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## Well Location Information

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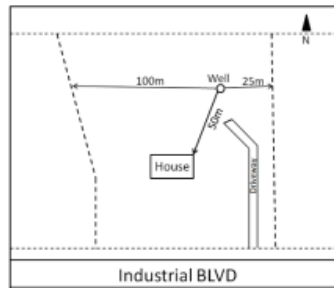
1) Address: \_\_\_\_\_ Town \_\_\_\_\_

2) Legal description (available from the property tax assessment notice):

Lot: _____	Block: _____	Range: _____
Plan: _____	Section: _____	Land District: _____
District Lot: _____	Township: _____	

3) The parcel identifier number for the property **PID**: \_\_\_\_\_

## Well Location Map



**Well location map.** Attach a sketch or diagram (e.g., property assessment drawing) or Google Earth/iMapBC image to show where the well is located on the property relative to the property boundaries, a road or any other structures on the land.

**Example sketch**

Description of well location on the property: \_\_\_\_\_

e.g., the well is located 25m from the eastern property line and 50m NE of house.

## GPS Coordinates of the Well

You can find well coordinates using a GPS unit, a mobile app, or a mapping tool such as iMapBC or Google Earth.

Latitude (e.g., 49.20184°): \_\_\_\_\_ Longitude (e.g., 122.58376°): \_\_\_\_\_

**OR**

UTM Zone (NAD83): \_\_\_\_\_ UTM Easting: \_\_\_\_\_ UTM Northing: \_\_\_\_\_

Source of coordinates (check one): GPS  Google Earth  Other (please specify) [ \_\_\_\_\_ ]

## Well Information

If the well construction report is available, please attach it to this form. Attached  Not Available

If no well construction report is available, please complete the following:

Well Identification Plate Number (a steel plate attached to some wells): \_\_\_\_\_

Date well drilled (YYYY/MM/DD): \_\_\_\_\_

If the drilling date is unknown, enter the date you took possession of the property (YYYY/MM/DD): \_\_\_\_\_

Drilling Company: \_\_\_\_\_

Drilling method: Drilled  Excavated or Dug

Well depth (ft): \_\_\_\_\_ Well Diameter (inch): \_\_\_\_\_

Well cap (yes/no): \_\_\_\_\_ Well height above ground (inches): \_\_\_\_\_

## Disclaimer

The information provided on this form, including personal information, will be added to the Provincial Groundwater Wells and Aquifers (GWELLS) application, accessible to the public at <https://apps.nrs.gov.bc.ca/gwells/>.

Information relating to the well and well owner submitted to the Deputy Comptroller in this form shall be considered part of the Provincial Government records and is collected by the minister responsible for the Ministry of Environment Act under *Section 26(c) of the Freedom of Information and Protection of Privacy Act*.

For more information on the [Water Sustainability Act](#) or [Groundwater Protection Regulation](#), please visit <http://gov.bc.ca/water>.

To update your information, or if you have questions about the collection of your personal information, please contact the Groundwater Data Specialist at [GroundWater@gov.bc.ca](mailto:GroundWater@gov.bc.ca)

## Consent and Signature of Declaration

I have read and understand the above disclaimer and declare that the information provided on this form is true to

**What do we do with all this data?**

- Helps the Province improve assessment of current water demands on an aquifer
  - Informs water budgets
  - Informs area-based regulations i.e. water sustainability plans
  - Helps address stewardship issues, i.e. environmental flow needs
  - Supports meaningful First Nations consultation
  - Identifies areas for further data collection
  - Allows resolution of water use conflicts
  - Informs enforcement during times of scarcity
  - Informs conditions placed on authorizations





Thank you!

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