

**Associated Environmental**

**Merritt**  
FLOURISH UNDER THE SUN

## Protecting Source Water and Importance of Source Protection Plans

Marta Green, P.Geo.

March 22, 2022 Webinar  
Online Help Centre for BC Small Water Systems

1

### From this session, we will discuss...

1. What
2. Why
3. How
4. Key Take-aways

2

## What is a Source Protection Plan?

3

### What is a Source Protection Plan?

- A document that identifies hazards to the source water and recommends actions to improve protection to the source.

4

## Why do a Source Protection Plan?

5

“The first barrier to the contamination of drinking water involves protecting the sources of drinking water”

**Justice O'Connor,  
Walkerton Inquiry, 2002**

6

## Why do a Source Protection Plan?

- It's the first step in the multi-barrier approach

7

## Why do a Source Protection Plan?

- It can help you develop your emergency response plan (Sec 13 of Drinking Water Protection Regulation)

**“13 ... A water supplier must include the following in an emergency response and contingency plan: ... (c) the steps to follow in the event of an emergency or abnormal operational circumstance;”**

8

## Why do a Source Protection Plan?

- Helps with public engagement

9

## Why do a Source Protection Plan?

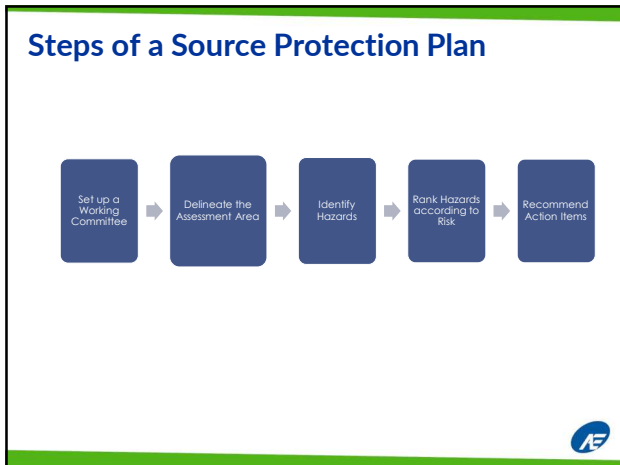
- Helps with resiliency in a changing climate.

10

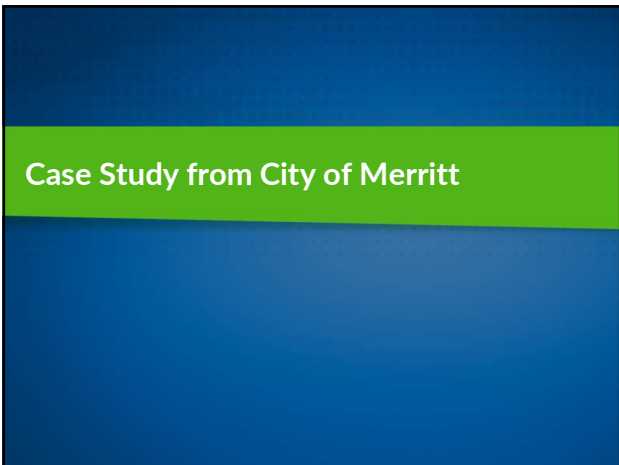
## Steps of a Source Protection Plan

11

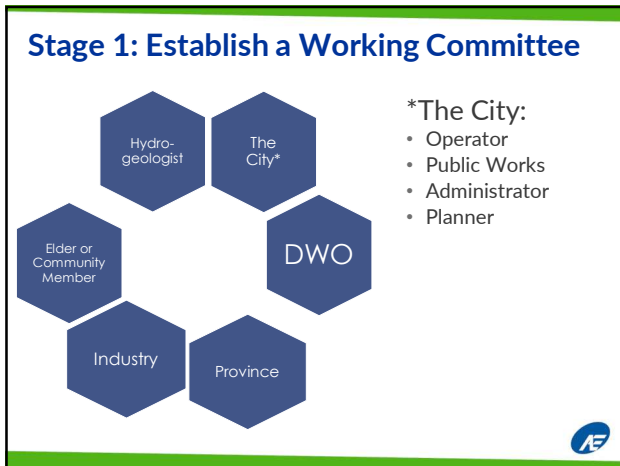
12



13



14



15

### Delineate the Assessment Area

1. Map out watershed or well capture zone

Protection Zone	Focus
IPZ-1	Area considered most vulnerable
IPZ-2	High probability of reaching the intake within 2 hours

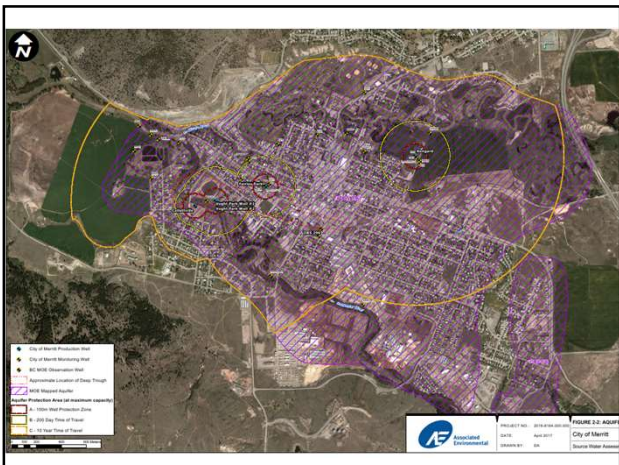
16

### Delineate the Assessment Area

1. Map out watershed or well capture zone

Capture Zone	Focus
100 m	Well-head Protection Zone
2 year	Pathogenic (viruses, and protozoa) hazards
5 year	Chemical hazards
25 year	Only most persistent hazards

17



18

## Describe the Sources (Well/Intake)

Table 2-1  
Summary of City of Merritt groundwater supply wells

Well ID	Voght Park #1	Voght Park #2	Collettville	Fairley Park	Kengard
Well Tag Number (WTN)	unknown	34180	108220	38902	97218
Well Plate ID (WPID)	12729	12728	12727	12730	29680
Maximum Supply Capacity (L/s) <sup>1</sup>	106.4	83.3	56.4	75.8	110+ <sup>2</sup>
Location					
Easting (m 10 U)	657254	657254	657090	657656	658859
Northing (m 10 U)	5553201	5553201	5553162	5553319	5553563
Elevation (masl)	595	595	594	597	602
Static Water Level (m bgs)	3.48	3.63	4.3	1.86	3.71
Well Depth (m bgs)	29.9	34.1	45.1	25.3	139
Screened Interval(s) (m bgs)	20.7 - 29.0	9.8 - 34.1	6 - 45.1	19.2 - 25.3	120 - 139
Casing diameter (mm)	400	400	250	300	400
Screen diameter (mm)	unknown	unknown	unknown	unknown	300

Notes:  
1 - As reported in Opus Dayton Knight (2012)  
2 - Kengard is reported as 50 L/s in Opus Dayton Knight (2012). However, a 5-day pumping test at 110 L/s in 2009 suggests a theoretical maximum supply capacity of 150 L/s.



19

## Identify Hazards



20

## Identify Hazards

Hazard	Owner	Distance to Source	Contaminants of Concern	Transport Mechanism
Down-well	City of Merritt	0 m	All (sabotage)	Direct entry
Sanitary sewer lines	City of Merritt	100 m is nearest	Nutrients (nitrate) and pathogens (viruses, bacteria, protozoa)	Infiltration then groundwater flow



21

## Rank Hazards by Risk

(Likelihood x Consequence)

Likelihood	Consequence				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
A (almost certain)	Moderate	High	Very High	Very High	Very High
B (likely)	Moderate	High	High	Very High	Very High
C (possible)	Low	Moderate	High	Very High	Very High
D (unlikely)	Low	Low	Moderate	High	Very High
E (rare)	Low	Low	Moderate	High	High



22

## Rank Hazards by Risks

Table 4-5  
Hazard risk characterization – non-point sources

Hazard No.	Hazard <sup>1</sup>	Likelihood Level <sup>2</sup>	Consequence Level <sup>2</sup>	Risk Level	Action <sup>3</sup>
A	Sanitary sewer lines	C	4	Very High	3,18
B	Lead in water supply infrastructure	A	3	Very High	21
C	Drainage dry wells (storm system)	D	4	High	13,14,15
D	Storm drainage mains and water mains	D	4	High	6,13,16,17
E	Roads and transportation infrastructure	C	3	High	13,17,18,19
F	Other Industry (from zoning)	C	3	High	13,22
G	Other Commercial (from zoning)	C	3	High	22
H	Natural gas lines and other private utilities (e.g. fibre-optic, natural gas, oil)	E	3	Moderate	23
I	Residential properties	E	3	Moderate	22
J	Other wells in capture zone (domestic, irrigation, monitoring)	E	2	Low	20
K	Animals and pests	E	1	Low	24
L	Residential heating oil underground or aboveground storage tanks	E	2	Low	5,25

Notes:  
1 See Appendix D for a more detailed description of each hazard.  
2 See Tables 4-1 and 4-2.  
3 See Table 5-2 for action details.

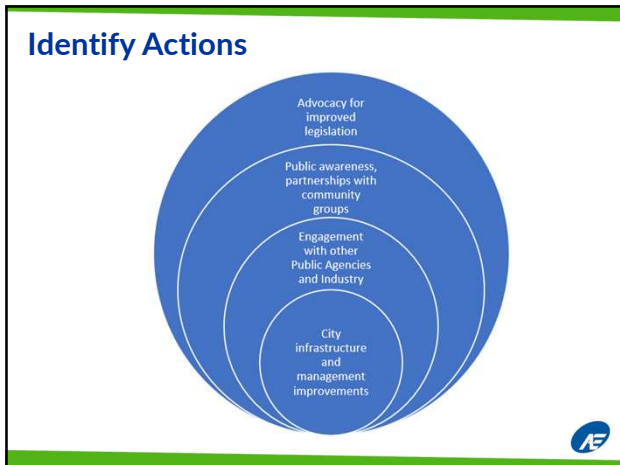


23

## Rank Hazards by Risks



24



25

### Identify Actions

Action #	Action	Responsible Party	Rough Cost	Timeframe
1	Inspect pumphouses regularly for vandalism, preferred pathways	Operations	n/a	Immediate (within 3 months)
3	Inspect sanitary sewers with priority for those in APA A.	Operations	\$10,000	Short term (within 1 year)
9	Sample for hydrocarbons and metals once a year.	Operations	\$3000	Short term (within 1 year)
17	Review emergency response plans for redundancy in capacity	Operations	n/a	Medium term (1-3 years)

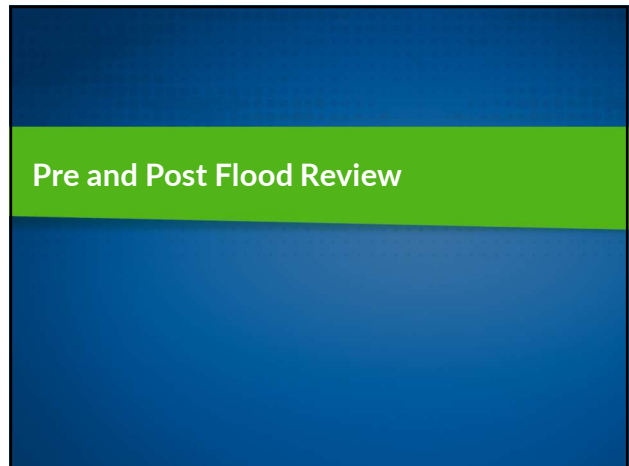
26

### Identify Actions

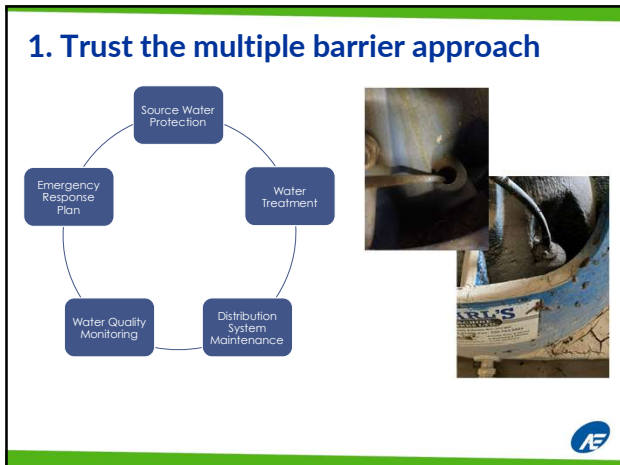
Action #	Action	Responsible Party	Rough Cost	Timeframe
7	Communicate to the public the importance of best management practices and connection to source water protection	Planning	n/a	Short term (within 1 year)
11	Consider developing a DPA for groundwater protection	Planning	n/a	Short term (within 1 year)
13	Share the plan with first responders and MOTI	Admin	n/a	Short term (within 1 year)

\*Example groundwater protection bylaws:  
<https://www.obwb.ca/library/groundwater-bylaws-toolkit/>

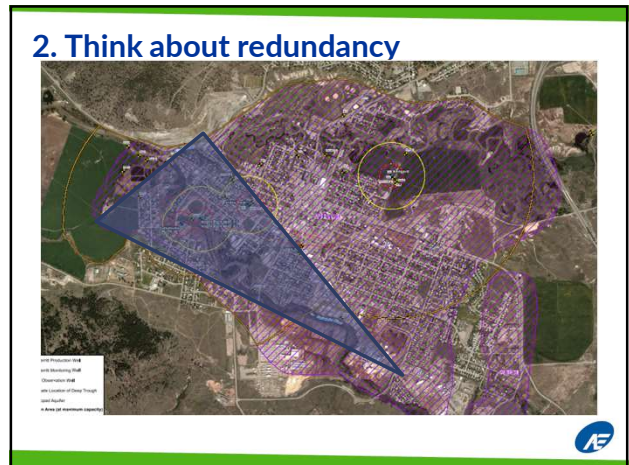
27



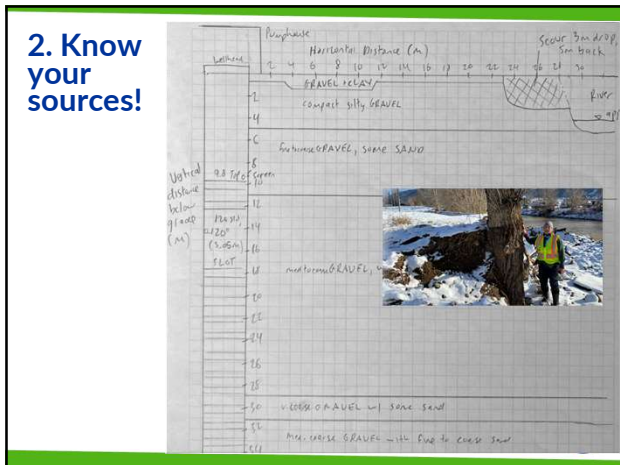
28



29



30



31

- ### 3. Have all your documents in one spot
- Annual water report
  - Historical water quality (good for comparison)
  - Well logs
  - Cross sections
  - Photos, as-builts, etc.
- 

32




33



34

## What can operators do to help?

35

- ### Discussion
1. Be active with the Working Committee
  2. Store all water quality and reports
  3. Talk to your Environmental Health Officer, Regional Hydrogeologist about funding.
  4. Grow your network
  5. Work with your planning department (put capture zones in GIS database, provide link to OBWB Groundwater Bylaws Toolkit)
- 

36

## Discussion

6. Document any concerns in your log book
7. Sample for an expanded list of water parameters every 3-5 years or before and after major land use changes (all parameters that have health MACs).
8. Lock fence, do inspections regularly.
9. Start a plan yourself.
10. Practice emergency response.



37

Aboriginal Affairs and Northern Development Canada / Affaires autochtones et Développement du Nord Canada

First Nations On-Reserve Source Water Protection Plan

Guide and Template

<https://www.aadnc-aandc.gc.ca/eng/1398369474357/139836572276>

Canada

38

## In Summary

39

## In summary, we discussed

1. What is a Source Protection Plan?
2. Why do a Source Protection Plan?
3. Steps of a Source Protection Plan
4. Example
5. What can operators do?

40



Acknowledgements: Kevin Vilac, City of Merritt  
Laurie Lyons, FLNR



Contact info: Marta Green, P.Geo.  
[greenm@ae.ca](mailto:greenm@ae.ca) 250-545-3672

41

3/22/2022

7