
TECHNICAL MEMORANDUM

Subject	Water Study Analysis Results		
Project	Metro Vancouver Cape Roger Curtis Regional Park Water Study		
To	Lydia Mynott Metro Vancouver	From	Laura Christensen and Neal Whiteside
Date	23 June 2023	File ref	Water Street File # 361.300
Version	0	Status	Final

1. INTRODUCTION

1.1. PURPOSE

This technical memorandum assesses the water demand and available water supply for a proposed regional park with campground at Cape Roger Curtis in Bowen Island.

1.2. BACKGROUND

Metro Vancouver (MV) is exploring the conversion of 24 lots in the Cape Roger Curtis area of Bowen Island to a regional park offering overnight camping and day use. The land is currently zoned as RR1 – Rural Residential and has the OCP designation of Rural. The proposed park development concept evaluated includes 50 walk-in/bike-in camp sites, 3 group camp sites, 10 tent cabins, 35 vehicle access camp sites, and a day use area. The camp sites are divided generally into 3 areas; (1) Cape Drive (lots C-F), (2) Huszar Creek/Group Sites (lots 30-34), and (3) Waterfront (lots 23-29). The site plan for the campground is shown in Figure 1, attached.

There are several existing wells on the properties (also shown on Figure 1). A well water source certification was completed for all wells by Stantec in 2014. The results from the Stantec report and the well water source documentation were used to assess the potential available water supply for the campground.

1.3. LIMITATIONS

This technical memorandum is based on the information provided by Metro Vancouver. Additional well testing is recommended to confirm the well supply quantity and quality prior to proceeding with park development or well completion.

It must be read with the Statement of Limitations below.

2. WATER USE ESTIMATE

2.1. PROPOSED WATER USE

The campground is proposed to provide drinking water via taps distributed amongst the campground, mainly for drinking and domestic use for overnight campers, as well as day users. Other water use includes a flush washroom facility, shower block (coin operated/timed system), park office with shower, and operational uses. The operational uses were deemed to be negligible compared to the other uses and were not calculated.

Metro Vancouver provided an estimate of the number of different types of camp sites that will be provided, in addition to an estimated number of people per site (Table 1). It was assumed that the peak water use when all sites are occupied at the rates provided in Table 1. At peak, there are an estimated 250 overnight users and 285 day

users (see calculation and breakdown by zone in Table 2). Metro Vancouver research indicates a typically day use duration of 2.7 hours per visit.

The campground will offer flush toilets in addition to pit/vault style toilets. The campground is proposed to have only one block of toilets (8 flush toilets total) and one block of showers (6 to 8 coin operated/timed showers) located in the Cape Drive area. To provide a conservative estimate of water use, it has been assumed that all campers from all zones will use the flush toilets and showers in the Cape Drive area.

Table 1: Campground uses and assumed people per site

Site Type	Assumed People/Site*
Walk/Bike in Tent Sites	2
Group Tent Camp Sites	12
Car accessible tent sites	2.5
Tent Cabins	2.5
Park Office	1
*values provided by Metro Vancouver	

Table 2: Distribution of camp sites and calculated number of users

	North of Cape Drive*	Huszar Creek/Group Sites	Waterfront Zone	TOTAL
Walk-in/bike-in tent sites			50	50
Group tent sites		3		3
Car accessible tent sites	35			35
Tent Cabins		10		10
Park Office	1			1
Total Overnight Users	90	61	100	250
Day Users			285	285
*flush toilets and showers for the entire campground to be located in the North of Cape Drive area				

2.2. DESIGN DEMAND RATES

Sources for design water demand rates for campgrounds is limited. The best available source located is from the US Forest Service (US Forest Service, 2004). An excerpt, converted to L/user/day, is provided in Table 3. For comparison, a study of an RV resort & campground located in Manitoba found the water use to be 31-83 L/day/site (i.e. 12-33 L/user/day) (RJ Burnside & Associated Ltd, 2012).

Table 3: Design demand rates (US Forest Service, 2004)

Site Type	Water Use (L/user/day)	
	Low Estimate	High Estimate
Campground without flush toilet	18.9	37.9
Campground with flush toilet	75.7	113.6
Campground with flush toilet & shower	94.6	189.3

It is noted that the US Forest Service data dates from the period where wide-spread adoption of low volume flush toilets was not in place. A review of the 2016 Residential End Uses of Water (Water Research Foundation, 2016) shows that typical residential indoor water use (in houses) is 222 L/ca/day. This value was further broken by use type which indicated that 96 L/ca/day was for toilets and faucets. Also considered was an ultra-efficiency benchmark that indicates a total usage of 65 L/ca/day for faucets and toilets (with homes with efficient fixtures).

Therefore, it is recommended that the US Forest Service low estimate be used for planning (95 L/ca/day for campground with flush toilets and showers). Analysis of water use from existing regional campgrounds (either MV's or others in BC) would assist in further refining the water use estimate. However no suitable existing data was found for this study.

The water use for day users was based on the provided duration of 2.7 hours per visit and the conservative assumption that all day users will use the flush toilets. A literature value of 0.375 toilet uses/hour (Vickers, 2001) and a typical low flush toilet rate of 6 L/flush were used. It was assumed that other water use (i.e. drinking water) by day users was negligible.

2.3. WATER DEMAND SUMMARY

The peak camp user estimate (Table 2) and the design demand rates (Table 3) were combined to calculate the peak day water use, which is estimated at 25,400 L/day. See Table 4 for a breakdown by zone.

Table 4: Peak day water demand summary by zone

Zone	Estimated Peak Water Use (L/day)
North of Cape Drive (Lots C-F)	22,300
Huszar Creek/Group Sites (Lots 30-34)	1,200
Waterfront zone (Lots 23-29)	1,900
Grand Total	25,400

3. WATER SUPPLY AVAILABLE

3.1. WELL SUMMARY

Figure 2 shows the well locations near the proposed camp sites and their estimated yield. Based on the analysis results available to us, some of the wells appear to meet the Canadian Drinking Water Quality Guidelines, and have been indicated (Health Canada, 2022). However, the Stantec report indicated that all wells required treatment to meet CDWQ guidelines.

Generally, the wells in the waterfront zone have higher levels of contaminants (i.e., manganese, arsenic) that make them unsuitable for drinking without additional treatment. PW14-29, just outside of the Waterfront camping area, appears to meet the Canadian Drinking Water Quality Guidelines, but does exceed the aesthetic objective for turbidity (4.82 NTU vs ≤ 1.0 NTU), which may pose issues with disinfection, if required.

The key wells that could supply the area are summarized in Table 5, with the well drillers estimated yield. These are compared to the conservative estimate of zone peak day demands (as calculated in Section 2.3). Each zone could be supplied by a single well. We recommend further analysis of these wells to confirm the estimated maximum yield and water quality.

Table 5: Potential supply wells

Well ID	Zone	Estimated Yield (L/day)	Estimated Zone Peak Day Demand (L/day)
PW14-E	North of Cape Drive	27,000	22,300
PW14-F	North of Cape Drive	16,000	
PW14-32	Huszar Creek/Group Sites	55,000	1,200
PW14-33	Huszar Creek/Group Sites	109,000	
PW14-29	Waterfront Zone	2,700	1,900
Total		209,700	25,400

4. CONCLUSIONS AND RECOMMENDATIONS

The proposed campground at Cape Roger Curtis has an estimated peak occupancy of 250 overnight users and 285 day users. The estimated peak water use is 25,400 L/day.

An analysis of the well certification records shows there is a sufficient quantity of water available to meet the estimated peak demands of the proposed campground. It appears based on the analysis results provided that some wells meet the Canadian Drinking Water Quality Guidelines. The Waterfront zone may be challenging to provide water without additional treatment.

It is recommended that additional testing of wells PW14-E, PW14-F, PW14-29, PW14-32, PW14-33 be conducted to confirm the quantity and quality of water available. Disinfection or additional treatment for contaminant removal may be required.

5. CLOSURE

We trust this document meets your present requirements. Please contact the undersigned with any questions or comments.

WATER STREET ENGINEERING LTD.



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 Project Engineer

Neal Whiteside, MASc, PEng
 Technical Reviewer

EGBC permit to practice number 1000830

ATTACHMENTS

- Figure 1: Site Layout & Well Locations
- Figure 2: Estimated Well Yields

REFERENCES

- Health Canada. (2022). *Guidelines for Canadian Drinking Water Quality: Summary Tables*.
- RJ Burnside & Associated Ltd. (2012). *Rubber Ducky Resort & Campground Water and Sewer Expansion Design Brief*. Winnipeg.
- Stantec. (2014). *Well Water Source Certification*.
- US Forest Service. (2004). *Sanitary Engineering and Public Health Handbook*. Washington.
- Vickers, A. (2001). *Water Use and Conservation*. Amherst, MA: WaterPlow Press.
- Water Research Foundation. (2016). *Residential End Uses of Water*.

STATEMENT OF LIMITATIONS

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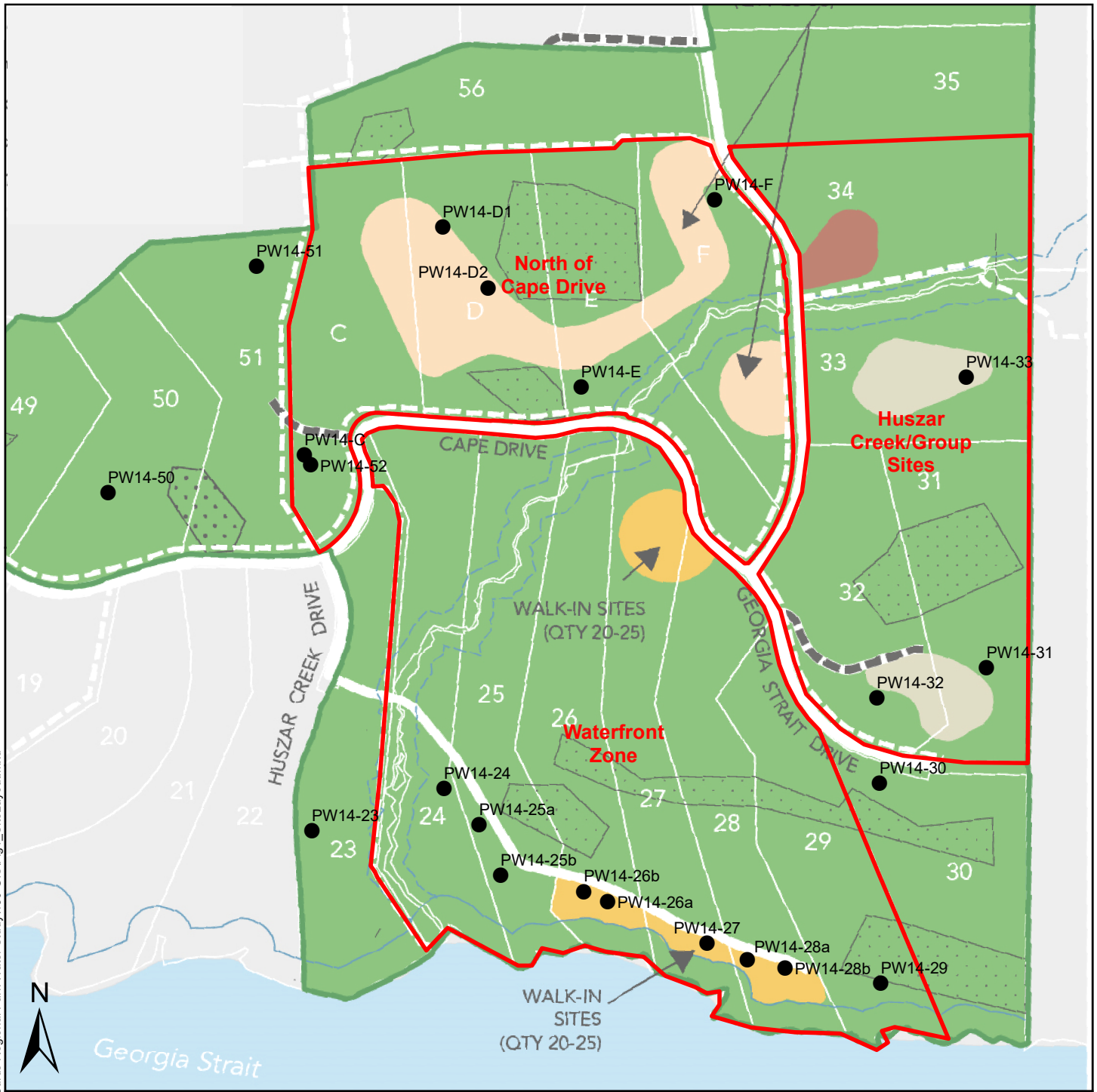
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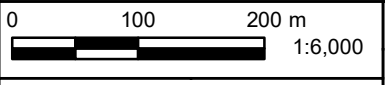
REVISION HISTORY

Version	Status	Date	Description of Revisions	Author
0	Final	23 June 2023	Updated day use water consumption from draft	LC

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Legend ● Existing Wells ■ Camp Zone	RESTRICTIVE COVENANT [Pattern] Environmental [Dashed] Riparian Protection [Blue] Oceanside	PARK USES [Green] Regional Parkland Overnight use (no. of sites) [Yellow] Walk/Bike-in tent camping (40-50) [Light Green] Group tent camp (3-5) [Orange] Car accessible tent camping (25-35) [Red] Tent cabin (10)
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EGBC Permit to Practice #1000830

**Cape Roger Curtis
Regional Park Water Study**

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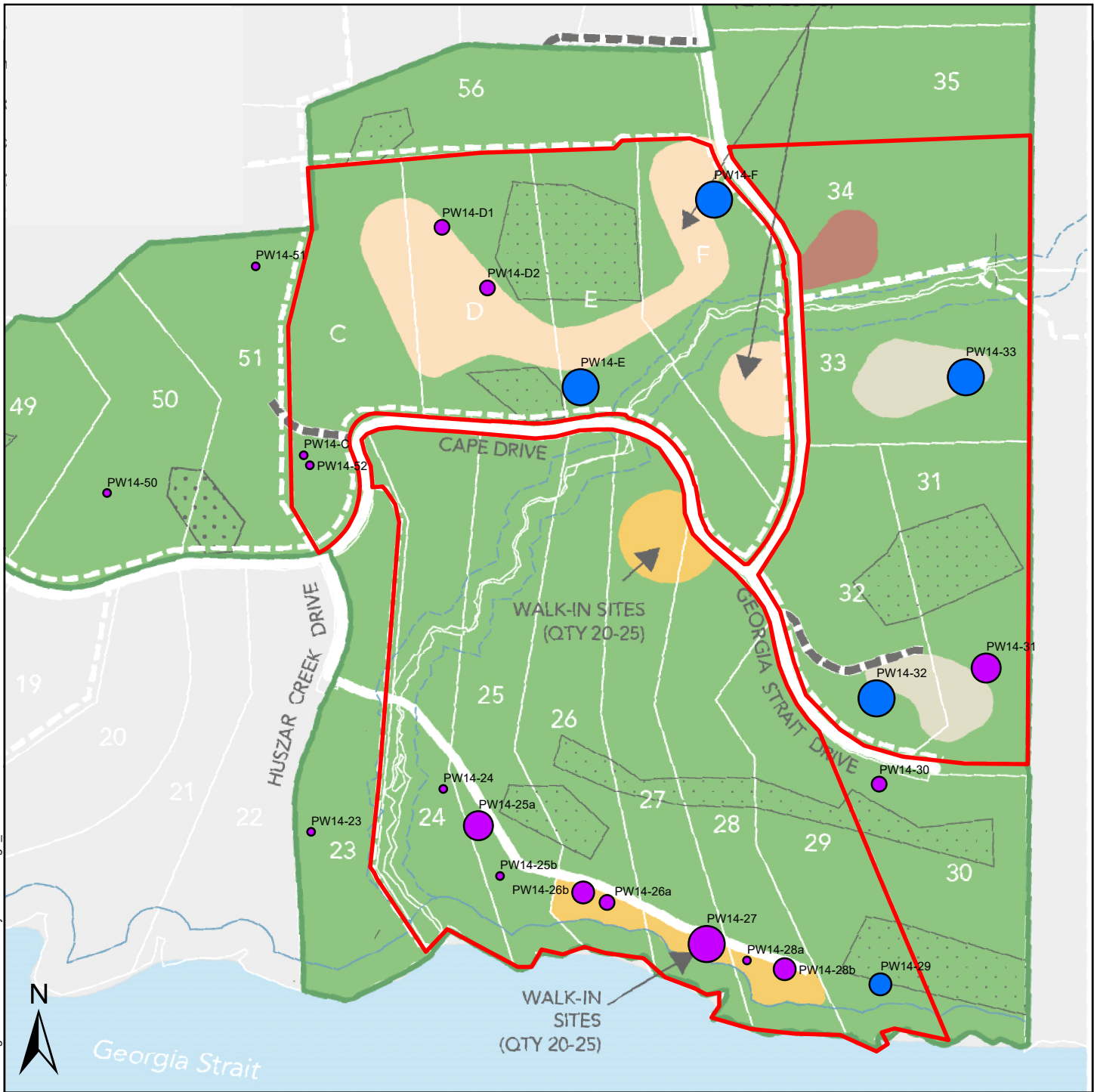


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**Site Layout
and Well Locations**

Figure 1



Legend

- | | | | | |
|-----------------------------|-----------------|-------------------------|------------------|-------------------------------------|
| Camp Zone | 2,001 - 5,000 | Does meet WQ guidelines | 5,001 - 10,000 | Regional Parkland |
| Does not meet WQ guidelines | 5,001 - 10,000 | Estimated yield (L/day) | 10,001 - 109,020 | Overnight use (no. of sites) |
| Estimated yield (L/day) | 10,001 - 27,255 | 2,001 - 5,000 | | Walk/Bike-in tent camping (40-50) |
| 0 - 1,000 | | | | Group tent camp (3-5) |
| 1,001 - 2,000 | | | | Car accessible tent camping (25-35) |
| | | | | Tent cabin (10) |



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Estimated Well Yields

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Figure 2