PREMIUM COASTAL SCREENING ASSESSMENT

Preliminary Environmental Data Compilation

Lake Minnewanka Day Use

Location: 51.2482°N, -115.4953°W • Alberta

Beach ID: UI5v2QIVZxM8opcmJmY1

⚠ IMPORTANT NOTICE ⚠

This is a PRELIMINARY SCREENING TOOL ONLY
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Site-specific assessment by licensed professionals (P.Eng/P.Geo)
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Report Information

Generated: January 20, 2026 at 09:37

Type: Preliminary Coastal Screening Assessment

Satellite Imagery: 2500px • Terrain Maps: 3000px • Coverage: 250m²

Nimpact Environmental Ltd.

Coastal Screening & Environmental Data Services

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Report Purpose and Limitations

IMPORTANT NOTICE: LIMITATIONS OF THIS REPORT

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It is intended as a screening tool and information resource only.

DATA SOURCES & LIMITATIONS:
• Satellite imagery analysis uses publicly available NASA/USGS Landsat and ESA Sentinel-2 data
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conducted by licensed professionals including, as appropriate:
• Professional Engineer (P.Eng) - for coastal engineering and infrastructure
• Professional Geoscientist (P.Geo) - for geological hazard assessment
• Professional Biologist (P.Biol) - for environmental impact assessment

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engineering or geoscience review. This report is valid only for the date of generation and may become outdated as
conditions change or new data becomes available.

Executive Summary

This report provides a preliminary screening assessment of coastal conditions using satellite imagery analysis and community observations. The following scores represent comparative rankings across similar beaches in the database.

Location Details

Coordinates: 51.248217°N, -115.495341°W
Province/State: Alberta
Municipality: Improvement District No. 9
Beach ID: UI5v2QIVZxM8opcmJmY1

Assessment Scores

Category	Score	Rating
Recreation	60/100	Good
Beach Quality	89/100	Excellent
Natural Features	32/100	Poor

1. Satellite Environmental Metrics

The following metrics are derived from seasonal satellite imagery snapshots (2020-2024) captured during equinoxes and solstices, compared against regional and global beach databases. This seasonal approach reveals important variations in water quality, temperature, and environmental conditions throughout the year.

Sampling Locations Map

Satellite image showing beach location and sampling points

This map shows the original beach pin location (tan/beige) and the water sampling point (blue) used for satellite-based water quality measurements. If the original pin is on land or in the intertidal zone, the system automatically adjusts the sampling point offshore to ensure accurate water measurements. For vegetation analysis, a land sampling point (green) may also be shown.

1.1 Water Temperature (Seasonal Snapshots)

Temperature measurements from equinoxes and solstices (2020-2024). These seasonal snapshots capture the full range of water temperature variation throughout the year.

Metric	Winter	Spring	Summer	Fall
Average Temp	No data	No data	7.1°C	7.8°C
Maximum Temp	—	—	12.2°C	13.0°C
Minimum Temp	—	—	2.0°C	0.0°C
Images Used	0	0	4	5

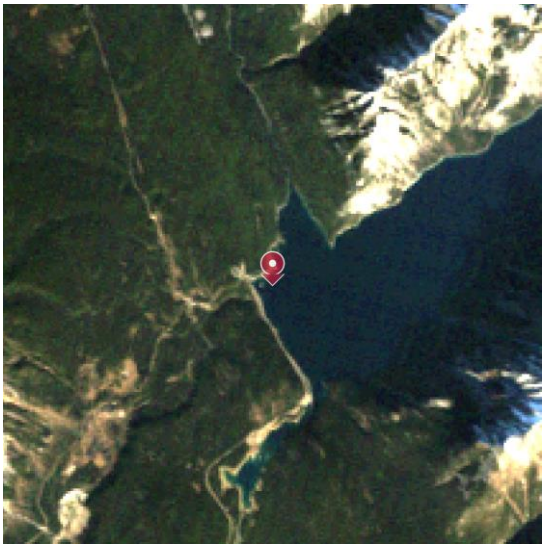
Seasonal Insights: Annual temperature variation of 0.7°C.

1.2 Water Clarity

Metric	Value
Clarity Score	5.9/10
Secchi Depth	0.9m
Turbidity	2.06
Images Analyzed	360

2. Satellite Imagery Analysis

Multi-temporal satellite analysis showing coastal changes from 1984-2025. 4 representative images selected from different time periods.



1984-1999

2000-2009

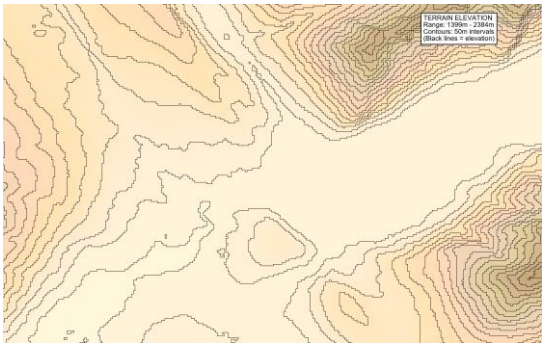
2015-2019

2020-2025

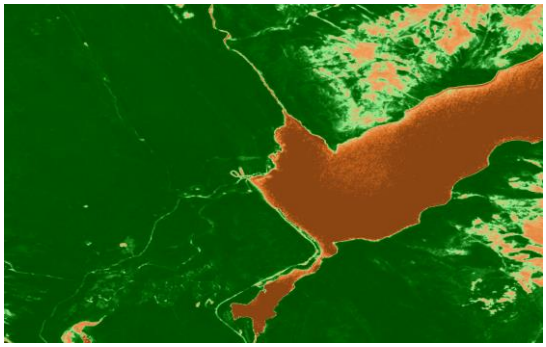
Source: Landsat 5/7/8/9 and Sentinel-2 imagery, 1986-2024. True color RGB composite, 250m² coverage area. 4 of 4 periods with cloud-free imagery.

3. Environmental Analysis Maps

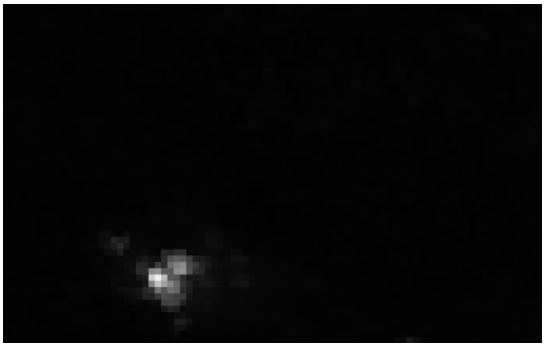
Comprehensive environmental mapping including terrain elevation, land cover, nighttime lighting (development proxy), and population density.



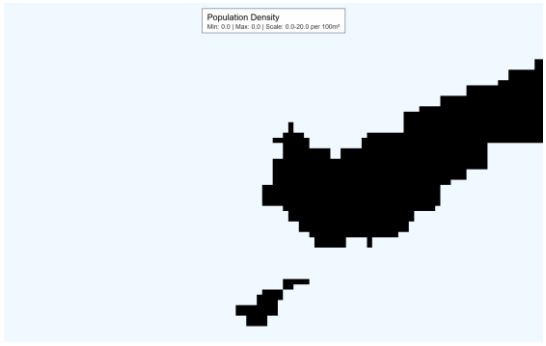
Terrain Elevation (SRTM)



Land Cover (NDVI)



Night Lights (VIIRS)



Population Density

Sources: SRTM elevation (±6m accuracy), Sentinel-2 NDVI (10m), VIIRS night lights 2022-2024 (500m), WorldPop population (100m). 250m² coverage area.

4. Lake Environmental Analysis

4.1 Beach Width Variability

Metric	Value
Width Change	-11.4m
Annual Rate	-0.57m/year
Trend	Water level decline

4.2 Shoreline Vegetation Health

Metric	Value
NDVI Score	0.603
Vegetation Health	Excellent
Health Score	90.1/100

4.3 Water Quality Indicators

Metric	Value
Overall Score	85.0/100
Quality Level	Excellent
Turbidity Index	1.937
Turbidity Level	Good
Chlorophyll Index	-0.109
Chlorophyll Level	Excellent

4.4 Land Surface Temperature

Metric	Value
Temperature Class	Moderate

4.5 Light Pollution Assessment

Metric	Value
Mean Radiance	0.62 $nW/cm^2/sr$
Light Pollution	Remote/Dark

4.6 Urban Development Assessment

Metric	Value
Development Index	-0.334
Development Change Pressure	Declining
Built Area	0.0%

Note: *Current Development Level indicates the existing built environment. Development Change Pressure indicates rate of change over the past 20 years.*

4.7 Environmental Stability Assessment

Environmental stability assessment considers multiple factors including elevation, vegetation buffer, water level variability, and historical patterns. This preliminary assessment indicates susceptibility to environmental changes and water level fluctuations.

Metric	Value
Stability Class	Good

Note: *Low stability suggests increased vulnerability to water level changes or environmental variability. Professional assessment recommended for structures near shoreline.*

5. Advanced Coastal Analytics

This section provides advanced coastal metrics derived from multi-year satellite analysis. These indicators supplement standard assessments but do not replace site-specific professional evaluation.

5.1 Suspended Sediment Analysis

Metric	Value
Sediment Index	0.542
Sediment Level	Low
Images Analyzed	112

Suspended sediment affects water clarity and can indicate erosion or runoff. High values may suggest upstream disturbance or natural turbidity.

5.2 Development Pressure Index

Metric	Value
Pressure Score	15.6/100
Pressure Level	Low
Night Lights (1km)	0.517
Night Lights (5km)	0.524

Night lights serve as proxy for population density and development. Higher values indicate greater human activity and potential anthropogenic impacts.

5.3 Marine Debris Assessment

Metric	Value
Debris Index	0.0396
Risk Level	Low
Maximum Detected	0.4156

Debris index estimates accumulation potential based on optical signatures. Field verification recommended for beaches with elevated indices.

5.4 Topographic Exposure

Metric	Value
Mean Slope (SRTM 30m)	3.71° (6.5%)

Lake shorelines experience minimal wave energy compared to coastal environments. Topographic metrics shown for reference only.

5.5 Vegetation Health Trend (5-Year NDVI Analysis)

Metric	Value
Trend Classification	Stable
Total NDVI Change (2022-2025)	-0.013
Percentage Change	-2.0%

Annual Rate of Change	+0.0002 NDVI/year
Concern Level	Low
Years of Data	4

Annual NDVI Values: 2022: 0.642 | 2023: 0.602 | 2024: 0.643 | 2025: 0.629

Interpretation: *NDVI (Normalized Difference Vegetation Index) measures vegetation health and density. Declining trends may indicate habitat degradation, drought stress, development pressure, or invasive species impacts. Stable or improving trends suggest healthy vegetation resilience. Analysis uses growing season satellite imagery over a 5-year period.*

6. Water Quality & Algae Monitoring

Lakes are prone to seasonal algae blooms (R^2=0.55 prediction model). This section provides satellite-based water quality assessment including temperature, clarity, and algae indicators.

6.1 Current Assessment

Risk Level: MEDIUM

Moderate chlorophyll (14.3 mg/m^3). Mesotrophic - acceptable but watch during summer.

⚠ Summer Bloom Assessment

Moderate summer bloom risk. Monitor water quality during warm months. Avoid swimming if visible scum or discoloration present.

Risk Factors Identified:

- Temperature data unavailable - using conservative assessment
- Warm summer temperatures (20.0°C) support algae growth in nutrient-rich lakes
- Seasonal temperature swings (15.0°C range) create favorable bloom conditions
- Shallow water (0.9m clarity) allows nutrient mixing from sediments
- Elevated turbidity (2.06) may indicate existing algae or nutrient loading

Peak Bloom Period: June-September

6.2 Satellite Water Quality

Water Temperature

Temperature data unavailable.

Water Clarity

Metric	Value
Secchi Depth	0.9m
Clarity Level	Fair
Turbidity	2.06

6.3 Algae Indicators

Chlorophyll-a (Total Algae)

Metric	Value
Concentration	14.3 mg/m^3
Source	measured
Level	Moderate - Typical algae levels

Cyanobacteria Index

Metric	Value
Index	0.0249
Source	measured
Risk	LOW - Acceptable levels

6.4 Regional Context

This beach's chlorophyll level (14.3 mg/m^3) is at the 69th percentile among 80 lake beaches (regional average: 12.9 mg/m^3).

6.5 Recommendations

Lake Water Quality:

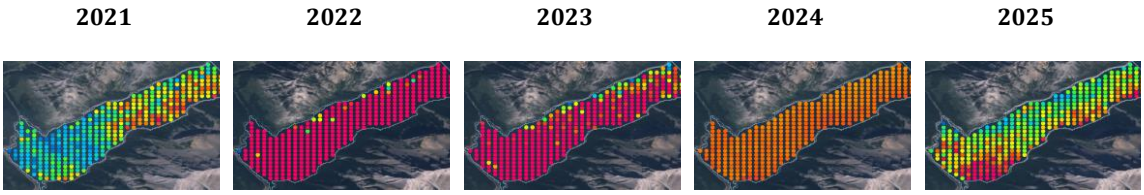
- ⚠ This lake can develop seasonal algae blooms during warm weather
- 🟡 Summer blooms are possible - monitor water conditions closely
- Peak bloom risk: June-September (summer months)
- Watch for: green/brown scum, paint-like surface, musty odors
- Avoid swimming if blooms are visible
- Do not swallow water; shower after swimming
- Keep pets away from algae; wash immediately if exposed
- Check local health advisories before visiting

Important: Algae conditions can change rapidly. This assessment uses recent satellite data. Always check local health advisories before swimming. If water looks unusual, smells bad, or has visible algae, avoid contact.

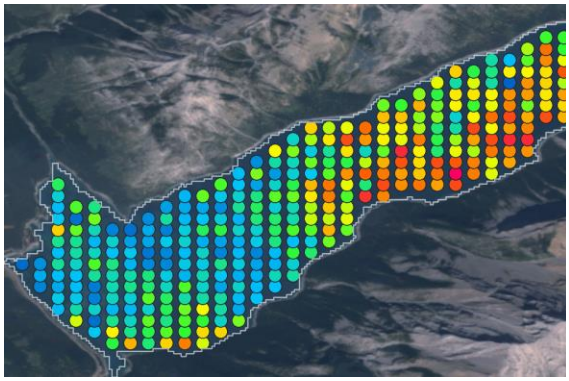
6.6 Five-Year Algae Analysis

Satellite analysis of summer algae distribution (June-September) for 2021-2025. Heat maps show chlorophyll concentration across lake.

Year-to-Year Overview



Yearly Analysis



Summer 2021

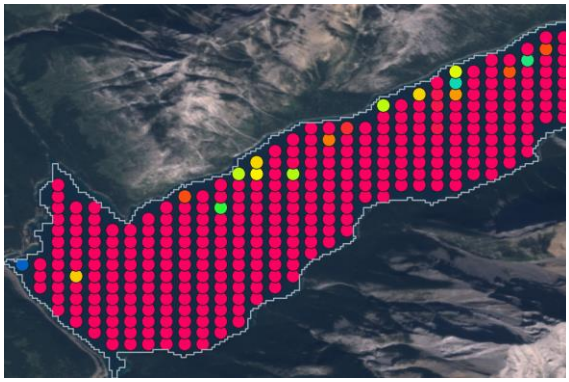
Risk: **HIGH**

Avg: 20.1 mg/m³

Peak: 24.2 mg/m³

High-risk area: 100%

Widespread blooms



Summer 2022

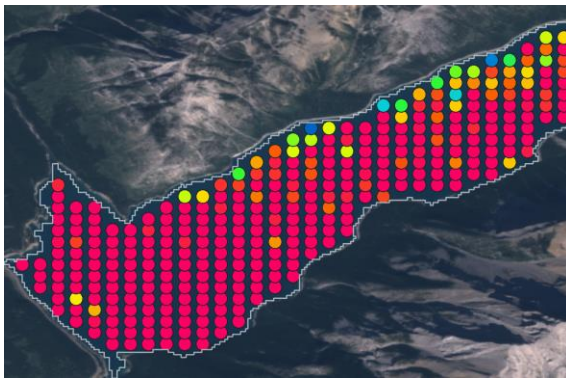
Risk: **HIGH**

Avg: 30.0 mg/m³

Peak: 30.0 mg/m³

High-risk area: 100%

Widespread blooms



Summer 2023

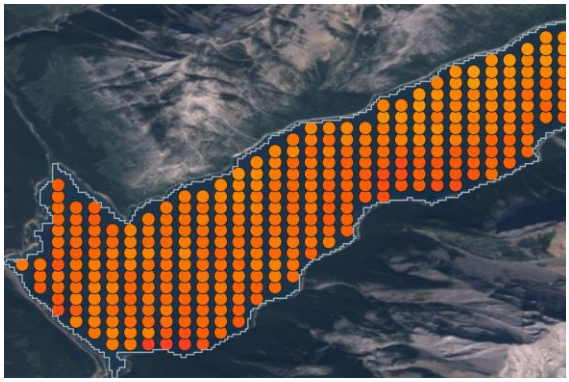
Risk: **HIGH**

Avg: 29.8 mg/m^3

Peak: 30.0 mg/m^3

High-risk area: 100%

Widespread blooms



Summer 2024

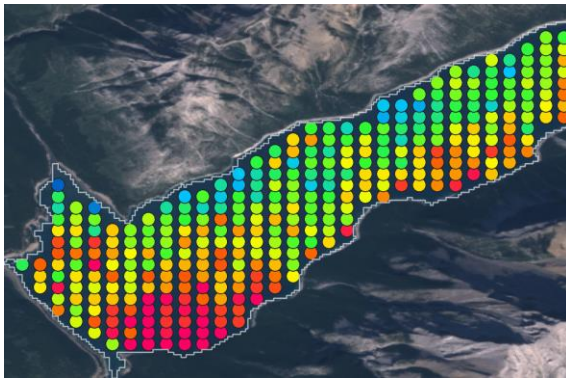
Risk: **HIGH**

Avg: 24.2 mg/m^3

Peak: 29.6 mg/m^3

High-risk area: 100%

Widespread blooms



Summer 2025

Risk: **HIGH**

Avg: 27.1 mg/m^3

Peak: 30.0 mg/m^3

High-risk area: 100%

Widespread blooms

Color Scale: 🟢 Low (0-8 mg/m^3) 🟡 Medium (8-15 mg/m^3) 🔴 High (15+ mg/m^3)

➡️ Trend: Stable. Worst: 2022. Best: 2021.

Note: Maps show peak summer concentrations. Conditions vary daily - check local advisories.

7. Community Observations & Beach Assessment

The following data was contributed by beach visitors via the My BeachBook platform. These observations provide valuable local knowledge and are compared against similar beaches in the region to provide context.

Total Contributions: 1

7.1 Regional Comparison Beaches

This beach is compared to 5 nearby lake beaches to provide regional context. The following map and table show the comparison beaches used.

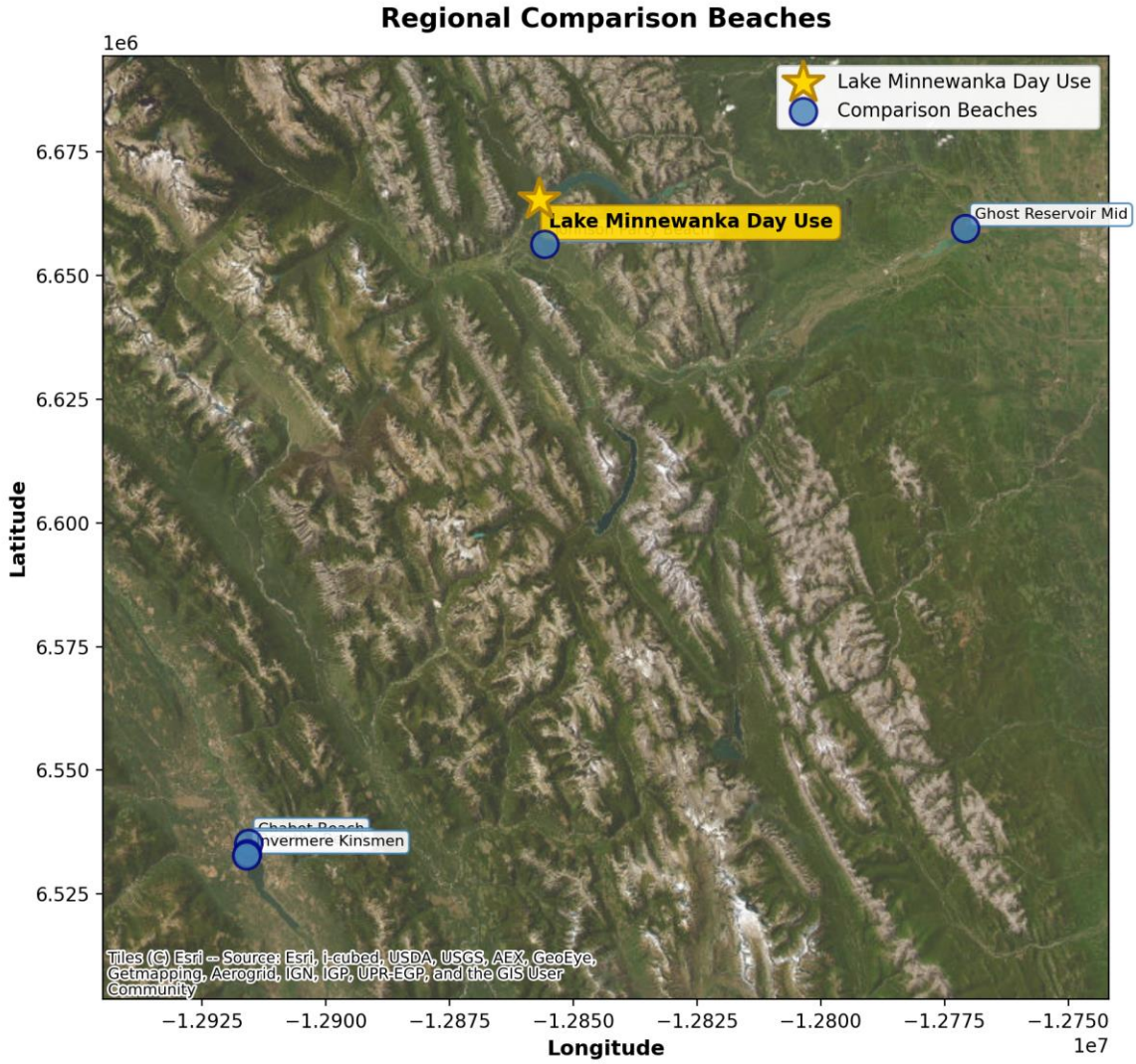


Figure: Location of comparison beaches used in this assessment

Beach Name	Distance	Marine Life	Beach Quality	Recreation	Natural Features
Lake Minnewanka Day Use (This Beach)	0.0 km	0/100	100/100	42/100	27/100
Johnson Party Beach	5.7 km	0/100	100/100	25/100	9/100
Ghost Reservoir Mid	53.9 km	0/100	100/100	25/100	41/100
Chabot Beach	89.9 km	17/100	88/100	58/100	38/100
Dorothy Beach	91.2 km	0/100	100/100	25/100	25/100
Invermere Kinsmen	91.5 km	0/100	100/100	75/100	32/100

Note: Scores are calculated from community observations on marine life diversity, beach cleanliness, recreational features, and natural characteristics.

7.2 Beach Assessment Overview

Figure: Multi-dimensional beach assessment compared to regional average

7.3 Marine Life Diversity

No significant marine life abundance recorded by community observers.

7.4 Beach Composition & Substrate

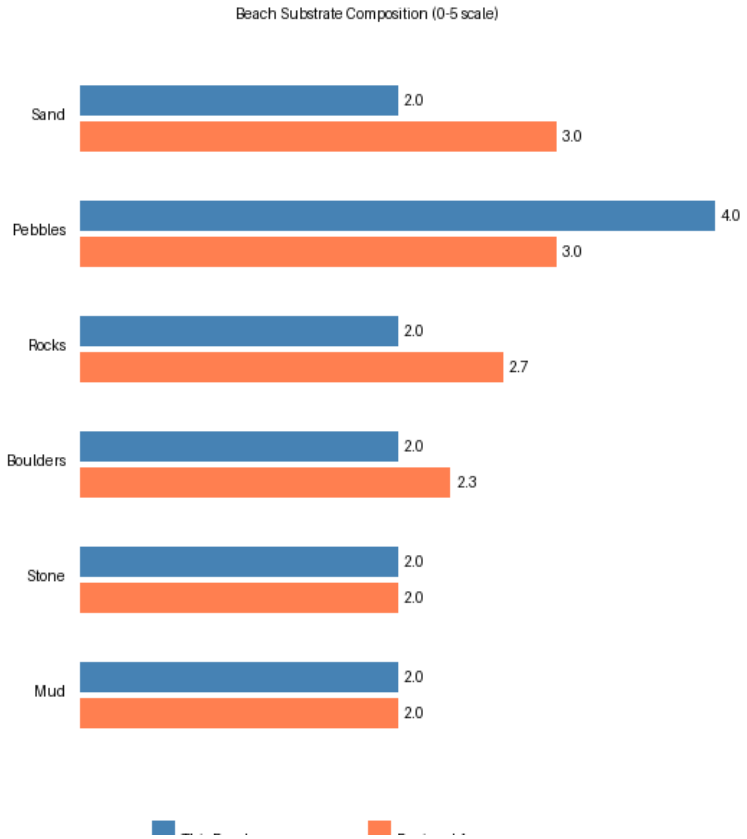


Figure: Beach substrate composition compared to regional average

Physical Characteristics

Measurement	Value
Width	12m
Length	170m
Bluff Height	30ft
Bluff Grade	Not recorded

7.5 Beach Features & Conditions

Feature	Present	Feature	Present
Boats on Shore	✗	Lookout Point	✗
Caves	✗	Private Access	✗
Patio Nearby	✗	Odor Issues	✗
Gold Panning	✗	Wind Exposed	✓

Environmental Quality

Indicator	Level	Assessment
Litter/Debris	None	Clean
Crowding	Moderate	Quiet

7.6 Visitor Information

Information	Details
Best Tide	Don't matter
Parking Distance	Not specified
Beach Shape	Concave
Rock Type	Not specified
Shade Available	in the morning,, in the afternoon,, in the evening

Facilities & Infrastructure

- Benches
- Seawall
- Walkway
- Picnic Tables
- Garbage Cans
- Boat Dock
- Campground
- Boat Launch
- Bathrooms

8. Shoreline Variability Analysis

Shoreline variability measures how much the waterline position changes over time. Higher values indicate greater shoreline movement, which may reflect erosion, accretion, or natural tidal/seasonal variations.

8.1 This Beach

Metric	Value
Shoreline Risk Proxy	0.2805
Variability Level	High
Water Body Type	Lake

Lakes with values >0.28 show significant shoreline changes, often due to water level fluctuations.

8.2 Comparison to Nearest Beaches

Beach Name	Distance (km)	Risk Proxy	Level
Lake Minnewanka Day Use ★	0.0	0.2805	High
Johnson Party Beach	5.7	0.2535	Moderate
Ghost Reservoir Mid	53.9	0.2048	Low
Riverfront Park Beach	70.6	0.1811	Low
Stoney Trail North Beach	89.7	0.1866	Low
Chabot Beach	89.9	0.2246	Low

Local Area Statistics: Average = 0.2219, Range = 0.1811 to 0.2805

This beach ranks #1 out of 6 beaches in the immediate area (highest variability).

8.3 Regional Context

Compared to 81 lake beaches globally, this beach's variability ranks at the 65th percentile. The average lake beach has a risk proxy of 0.2587.

9. Preliminary Screening Guidance

Note: This section provides general guidance based on industry standards. *Site-specific assessment by licensed professionals (P.Eng, P.Geo) is required for development decisions.*

9.1 Lake Beach Considerations

Lake shorelines are subject to water level fluctuations and wave action.

High variability suggests significant water level changes. Professional geotechnical assessment recommended for structures within 30m of shoreline.

9.2 Additional Considerations

- Steep bluffs present - geotechnical slope stability assessment recommended

10. About This Report

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- SRTM elevation data - 3000px resolution, 250m coverage (±6m vertical accuracy)
- My BeachBook community observations (crowd-sourced, not professionally verified)
- Google Earth Engine analysis platform

Report prepared by:
Nimpact Environmental Ltd.
Email: info@nimpact.ca
Platform: myBeachBook (Android only currently)

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