

September 26, 2022

Dear Resident:

Following a report of a minor landslide that occurred last year in the area above Manuels River between Kingfisher Bridge and the steps to Martha's Place, the Town of Conception Bay South contacted the Geological Survey of Newfoundland and Labrador (GSNL), Government of Newfoundland and Labrador, Department of Industry, Energy and Technology Geological Survey Division to conduct an assessment to provide guidance on future development.

The GSNL undertook a site inspection of this area and submitted a memorandum to the Town, dated October 22, 2021, to outline its findings. The GSNL recommended that no future development occur within 30-meters of the cliff or bank edge. Further, it was recommended that a qualified geotechnical engineer be consulted to assess the types and level of risk associated with hillslope erosion in relation to any future proposed developments.

Based on those recommendations, the Town hired Stantec Consulting Ltd. to do a geotechnical assessment of a site in this area to fully understand how development may proceed in a safe and responsible manner.

While no major signs of recent or impending slope instability concerns were identified, Stantec recommended that subsurface investigation be conducted to confirm the existence of suitable soils and bedrock.

Stantec has also suggested the Town complete further due diligence which can provide additional guidance on future development. Therefore, the Town has engaged Stantec to undergo a subsurface investigation consisting of general site investigation and exploration as well as potentially some subsurface exploration (borehole drilling) to confirm the quality of the embankment's foundation materials. With that being said, geotechnical engineers may be seen around your property as they undertake such work in the near future.

Stantec expects to drill only a limited number of boreholes and will ask property owners for permission prior to commencing work.

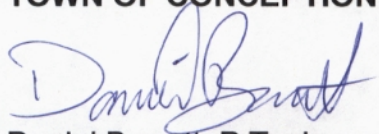
In summary, the Town of Conception Bay South is committed to public safety and is taking all necessary measures to fully understand the conditions of the embankment near your property. As mentioned previously, it is prudent to receive as much information as possible to ensure that any potential, future development in this area proceeds in the safest, most reliable manner.

The Town will keep you informed on the information it receives.

If you have any questions or concerns, please contact Daniel Barrett at 709-834-6500 ext. 413 or email [Daniel.Barrett@conceptionbaysouth.ca](mailto:Daniel.Barrett@conceptionbaysouth.ca).

Sincerely,

**TOWN OF CONCEPTION BAY SOUTH**

A handwritten signature in blue ink that reads "Daniel Barrett". The signature is stylized with a large, looped 'D' and 'B'.

Daniel Barrett, P.Tech  
Development Control Coordinator

cc: Corrie Davis, Director of Planning and Development





Stantec Consulting Ltd.  
141 Kelsey Drive, St. John's NL A1B 0L2

July 27, 2022  
File: 121624431

**Attention: Mr. Corie Davis, Director of Planning and Development**

Town of Conception Bay South  
11 Remembrance Square  
P.O. Box 14040  
Manuels, Conception Bay South, NL, A1W 3J1

Dear Mr. Davis,

**Reference: Results of Stage 1 Work Scope, Geotechnical Slope Stability Assessment,  
30 Flats Road, CBS, NL**

In accordance with our proposal redated May 13, 2022, Stantec Consulting Ltd. (Stantec) has completed the Stage 1 work scope to assess the risk of slope failures at the above reference property.

As presented in the proposed scope of work, the assessment of the site will be completed in three stages with Stage 1 consisting of a site reconnaissance survey to examine the site conditions and to map the exposed bedrock and overburden at the site. In addition, the Stage 1 work consisted of reviewing available geological reports and examining the site topography.

The results of the Stage 1 assessment are presented in this report. As noted in the proposal, the information obtained during Stage 1 would be used to determine the requirements and details of any subsequent required work scopes. Based on the findings presented herein, the Stage 2 and 3 scope of work which consist of borehole drilling will be required. Details for the Stage 2 and 3 work scopes are also provided in this report.

## **INFORMATION AVAILABLE**

Information reviewed in support of this assessment included:

- Memorandum - Comments regarding mass wasting along the Manuels River corridor. Government of Newfoundland and Labrador, Department of Industry, Energy and Technology – Geological Survey Division, dated October 22, 2021.
- Lidar topographic data provided by the Town of CBS.
- Liverman, D. and Taylor, D. 14: Surficial Geology of the St. John's (NTS 1N) and Trepassey (NTS 1K) Map Areas. Government of Newfoundland and Labrador, Department of Mines and Energy, Geological Survey Open File NFLD (2422), Map 94-230, Scale 1:250 000.
- Batterson, M.J. 1999: Landforms and Surficial geology of the St. John's map sheet (NTS 1N/10). Newfoundland Department of Mines and Energy, Geological Survey, Map 1999-19, scale 1:50,000. Open File 001N/10/0661.
- Plan showing strike of talc schist south of Conception Bay, by J. P. Howley, Newfoundland and Labrador Geological Survey, Internal Collection, undated [001N/0165]
- Newfoundland Department of Natural Resources, Bulletin #7: Pyrophyllite Deposits of Manuels, Conception Bay by John S. Vhay. Maps by Richard E. Stoiber., 1937

**Reference: Results of Stage 1 Work Scope, Geotechnical Slope Stability Assessment, 30 Flats Road, CBS, NL**

- Maps of Cambrian stratigraphy, east shore of Conception Bay, Newfoundland and Cambrian beds, east shore of Conception Bay, Holyrood map area, Newfoundland, by R. D. Hutchinson, W. D. McCartney and E. R. Rose, Newfoundland and Labrador, Geological Survey, Internal Collection, Non-Geological Survey Government Reports, 1953, 2 pages, [001N/10/0166], (Geological Survey of Canada)
- Batterson, Martin J. et al. Mapping and assessing risk of geological hazard on the northeast Avalon Peninsula and Humber Valley, Newfoundland. (2006).
- King, A.F. (compiler) 1988: Geology of the Avalon Peninsula, Newfoundland (parts of 1K, 1L, 1M, 1N and 2C). Map 88-001 (colored). Scale: 1;250 000. Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division. GS# NFLD/1680

## BACKGROUND

The Town of CBS contacted the Geological Survey of Newfoundland and Labrador (GSNL) regarding a report of a landslide that occurred on or about August 30, 2021. Based on the reports received, the Town temporarily closed a section of Canyon Trail West along Manuels River.

Staff from GSNL visited the site on October 14, 2021, to record the observations. Downslope movement of unconsolidated debris and debris cones were observed at several locations in Manuels Canyon between Kingfisher Bridge and the steps to Martha's Place. Shale clasts from cliff faces and scree slopes immediately upslope (i.e., from the cliffs directly above the scree slope) extend downwards from eroding shale beds. These beds were described as likely a member of the Middle to Upper Cambrian Manuels River Formation based on their review of a geology report<sup>1</sup>.

The GSNL report was unable to confidently describe the landslide but speculated that tree fall or rock fall along the well-defined joint planes may have triggered mass wasting in unconsolidated shale scree. The GSNL recommendations included:

1. Development buffers to all new development to reduce damage from mass wasting and head ward erosion:
  - a. a minimum 30 m setback from a cliff or bank edge.
  - b. minimum of 4 m above the high tide mark.
2. A qualified geotechnical engineer be consulted to assess the types and level of risk associated with hillslope erosion or mass movement when development is proposed in terrain with a slope greater than 15 degrees.
3. A monitoring program be implemented to quantify the rates of cliff retreat and to modify the set-back recommendations accordingly.

In addition to the above, based on correspondence and conversations with the Town of Conception Bay South (CBS), we also understand the following:

- A structure was removed from 30 Flats Road prior to 2020.
- 30 Flats Road is being considered for the construction of a new single-family residence.

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<sup>1</sup> King, A.F. (compiler) 1988: Geology of the Avalon Peninsula, Newfoundland (parts of 1K, 1L, 1M, 1N and 2C). Map 88-001 (colored). Scale: 1;250 000. Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division. GS# NFLD/1680



**Reference:** Results of Stage 1 Work Scope, Geotechnical Slope Stability Assessment, 30 Flats Road, CBS, NL

- The adjacent lot to the south was constructed recently with a relaxation of the setback required from Flats Road.
- The 30 m setback recommended by GSNL would prevent 30 Flats Road from being developed. Since several houses exist within the recommended buffer at the top of the Manuel's Canyon, the Town requested a geotechnical assessment of the slope stability at this site to establish a relaxed setback for the proposed new residential building. It was understood that the results of this investigation will be used to inform the requirements for further assessments on neighbouring lots.

## GEOLOGICAL SETTING

The review was completed of available geological reports and maps obtained from the Government of Newfoundland and Labrador's online Geoscience Atlas. A summary of the geological setting is presented as follows:

- The surficial geology is described as "Concealed Bedrock: bedrock, mainly concealed by vegetation; patches of till, sand and gravel and bog (usually less than 1.5 m thick) and exposed bedrock are common, but form less than 50 percent of the unit."<sup>2</sup>
- The depositional environment is glacial which includes all types of tills; composed of diamicton; transported and subsequently deposited by/or from glacier ice with significant sorting by water; and the morphology is described as a "blanket" or "eroded and dissected."<sup>3</sup>
- A strike of talc schist runs parallel to the slope in bluish slate with localized areas of greenstone.<sup>4</sup>
- The bedrock geology is described as "Mostly shales, some manganiferous horizons. Locally limestone and conglomerate at base."<sup>5</sup>
- Upper Cambrian; grey to black shale and siltstone.<sup>6</sup>
- Eroding unconsolidated cliffs are common features in the northeast Avalon Peninsula area. Erosion rates are uncertain, although cliffs monitored over a 12-year period in Conception Bay South showed erosion of up to 50 cm per year.<sup>7</sup>

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<sup>2</sup> Liverman, D. and Taylor, D. 14: Surficial Geology of the St. John's (NTS 1N) and Trepassey (NTS 1K) Map Areas. Government of Newfoundland and Labrador, Department of Mines and Energy, Geological Survey Open File NFLD (2422), Map 94-230, Scale 1:250 000.

<sup>3</sup> Batterson, M.J. 1999: Landforms and Surficial geology of the St. John's map sheet (NTS 1N/10). Newfoundland Department of Mines and Energy, Geological Survey, Map 1999-19, scale 1:50,000. Open File 001N/10/0661.

<sup>4</sup> Plan showing strike of talc schist south of Conception Bay, by J. P. Howley, Newfoundland and Labrador Geological Survey, Internal Collection, undated [001N/0165]

<sup>5</sup> Newfoundland Department of Natural Resources, Bulletin #7: "Pyrophyllite Deposits of Manuels, Conception Bay" by John S. Vhay. Maps by Richard E. Stoiber., 1937

<sup>6</sup> Maps of Cambrian stratigraphy, east shore of Conception Bay, Newfoundland and Cambrian beds, east shore of Conception Bay, Holyrood map area, Newfoundland, by R. D. Hutchinson, W. D. McCartney and E. R. Rose, Newfoundland and Labrador, Geological Survey, Internal Collection, Non-Geological Survey Government Reports, 1953, 2 pages, [001N/10/0166], (Geological Survey of Canada)

<sup>7</sup> Batterson, Martin J. et al. "Mapping and assessing risk of geological hazard on the northeast Avalon Peninsula and Humber Valley, Newfoundland." (2006).

Reference: Results of Stage 1 Work Scope, Geotechnical Slope Stability Assessment, 30 Flats Road, CBS, NL

## SITE OBSERVATIONS – STANTEC MAY 13, 2022

Stantec completed a site visit to inspect the slope at the property on May 13, 2022. On the day of the site visit, the weather was sunny with light winds and about +12°C. The site was clear of snow however, some heavy vegetation was present in the upper and lower slope areas. The area of interest was located between Flats Road and Manuel's River.

As a visual aid, Figure 1 is attached and presents an overhead view of the site with profiles. Figure 2 shows the profile based on the Lidar data provided by the Town. The main slope has a height of approximately 26 m with a relatively consistent angle of about 1.4H:1V and localized areas as steep as 0.7H:1V, which classifies as moderately steep to steep. For this discussion, the slope was divided into three areas, as shown in Figure 1:

- Area 1 included the upper slope with mature trees (Site Photograph 1). Some features (materials, debris, etc.) suggested this part of the slope may have been constructed with fill to increase the usable space at the top of the slope. Some of the older trees near the top of the slope had fallen over at different angles (Site Photograph 2).
- Area 2 included the unvegetated section mid-slope with exposed shale clasts and scree (Site Photographs 3 and 4). Small shale outcrops were seen in a few places (Site Photograph 5). Some small trees were observed growing vertically in this area. The scree slope was unconsolidated and showed signs of continual weathering and mass wasting.
- Area 3 included the lower slope and toe (Site Photographs 6 to 8). The lower slope area was less steep (1H to 4H:1V) and contained mature trees. The scree was observed to be accumulating above the older trees below the scree slopes. Some of the trees in this area were observed to be at different angles, but most were vertical. The toe of the slope had a section of near vertical exposed shale bedrock outcrops (Site Photographs 6). The bedding angle of these outcrops matched the orientation of the smaller outcrops observed in Area 2. The toe of the slope formed the shoreline of Manuels River, with shale clasts forming the riverbed.

From our site visit and document review, the anticipated subsurface conditions would include some overburden soils (fill and till) and talus from weathered bedrock overlying shallow bedrock. Based on the conditions observed at the site the slope grades in the area appear to be controlled predominantly by bedrock, not overburden soils.

## DISCUSSION AND RECOMMENDATIONS

The memorandum report provided by the Geological Survey Division provides a detailed summary of the site conditions. Based on our site assessment, we agree with the findings presented in this report.

From our May 2022 site inspection, no major signs of recent or impending slope instability concerns were identified. A large portion of the slope is covered with soil and rock fragments that have been interpreted as scree produced from weathering and mass wasting of the bedrock.

The slope grades appear to be primarily controlled by shallow bedrock based on the presence of exposed bedrock exposures within the mid-slope face and toe area. In addition, the site observation indicates fill materials were used at the upper portion of the slope to increase the usable space.

Based on the Lidar data, an average slope of 35 degrees is observed for the sloping ground, which is at or close to the angle of repose of the overburden soils and weathered bedrock scree as observed in the site. In general practices, the required factor of safety of a sloping ground is considered 1.5 for long-term

**Reference: Results of Stage 1 Work Scope, Geotechnical Slope Stability Assessment, 30 Flats Road, CBS, NL**

scenario. If the site consists of the overburden soils and weathered bedrock having an angle of repose less or equal to 35 degrees, the overall slope stability would be a concern for the site. However, if the subsurface conditions consist of a layer of over consolidated soils and intact bedrock, the current slope grades may be acceptable and the required factors of safety of 1.5 may be satisfied. Therefore, to verify the subsurface conditions and overall factor of safety of the slope, a subsurface investigation consisting of completing geotechnical boreholes is recommended. Moreover, a computer-based numerical analysis might be a useful tool for carrying out the rigorous slope stability analysis of the sloping ground.

We support the recommendation by the Geological Survey that the Town monitor cliff retreat along the Manuels River Canyon corridor and to modify set-back recommendations based on calculated annual rates of cliff retreat. We recommend that the Town retain a coastal erosion specialist to assess the area and determine an appropriate course of action for assessing the retreat rates.

### **BOREHOLE DRILLING WORK SCOPE**

Based on assessment of the site and to confirm the quality of the foundation materials we recommend completing a subsurface investigation consisting of drilling geotechnical boreholes. In general, the proposed scope of work consists of the following.

1. Subsurface Investigation (borehole drilling). A borehole investigation program will be required to determine the conditions at depth consisting of a total of three (3) boreholes at locations shown on the attached Figure 9. Target depth of each borehole is 10 to 15 m. A laboratory testing program will be completed on recovered soil and rock samples to determine the materials engineering properties necessary to complete a slope stability assessment.
2. Engineering and Reporting. Complete the necessary engineering and analysis and provide comments regarding the overall stability of the site and risks associated with short term and long-term failure. In addition, any appropriate mitigative measures will also be provided. The findings and recommendations will be presented in a final report.

Details of the proposed investigation and associated costs are provided under separate cover



July 27, 2022

Mr. Corie Davis, Director of Planning and Development

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Reference: Results of Stage 1 Work Scope, Geotechnical Slope Stability Assessment, 30 Flats Road, CBS, NL

## CLOSURE

Use of this report is subject to the attached Statement of Report Limitations General Conditions. It is the responsibility of The Town of CBS, who is identified as "the Client" within the Statement of Report Limitations General Conditions, and its agents to review the conditions and to notify Stantec should any of these not be satisfied.

The observations, comments, and recommendations included herein are based on the visual inspection of the site carried out on May 13, 2022. This report is based on the observations of visible conditions identified during the site visit and may not include conditions that became visible after the May 13, 2022, site visit.

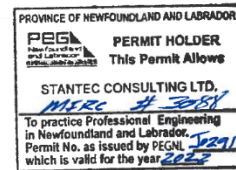
Should you have any comments or clarifications regarding the above report, please do not hesitate to contact the undersigned at your convenience.

Regards,

**Stantec Consulting Ltd.**



**Paul Deering**, P.Eng., P.Geol.  
Geotechnical Engineer



Attachment: Statement of General Conditions  
Figure 1: Site Plan  
Figure 2: Profiles from Lidar Data  
Figure 3 to 8: Site Photographs  
Figure 9: Proposed Borehole Locations  
Statement of Report

## **STATEMENT OF GENERAL CONDITIONS**

**USE OF THIS REPORT:** This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

**BASIS OF THE REPORT:** The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

**STANDARD OF CARE:** Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

**INTERPRETATION OF SITE CONDITIONS:** Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

**VARYING OR UNEXPECTED CONDITIONS:** Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

**PLANNING, DESIGN, OR CONSTRUCTION:** Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

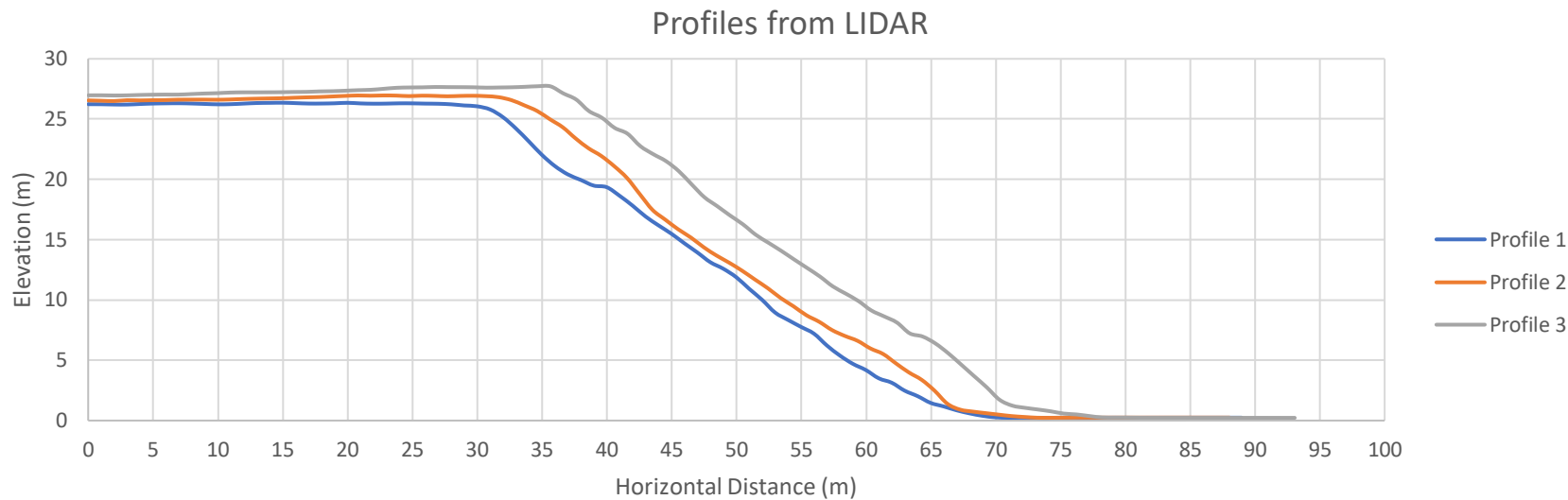


NOTES:

1. DO NOT SCALE FROM FIGURE
2. IMAGE FROM TOWN OF CBS INTERACTIVE MAP

FIGURE 1  
SITE PLAN





**FIGURE 2**  
**PROFILES FROM LIDAR**





**SITE PHOTOGRAPH 1**  
 PANORAMIC VIEW OF THE TOP OF THE SLOPE

PROJECT TITLE: <p style="text-align: center;">GEOTECHNICAL SLOPE STABILITY ASSESSMENT, 30 FLATS ROAD, CBS, NL</p>	SCALE: <p style="text-align: center;">NTS</p>	DATE: <p style="text-align: center;">JUNE 15, 2021</p>	DRAWN BY: <p style="text-align: center;">SS</p>	
FIGURE TILE: <p style="text-align: center;">SITE PHOTOGRAPHS</p>	APPROVED: <p style="text-align: center;">PD</p>	FIGURE NO: <p style="text-align: center;">3</p>	REV NO: <p style="text-align: center;">0</p>	





**SITE PHOTOGRAPH 2**  
SHOWING LEANING TREES NEAR TOP OF SLOPE



**SITE PHOTOGRAPH 3**  
SHOWING SHALE CLASTS AND SCREE SLOPE TO THE NORTH.

PROJECT TITLE: GEOTECHNICAL SLOPE STABILITY ASSESSMENT, 30 FLATS ROAD, CBS, NL

FIGURE TILE: SITE PHOTOGRAPHS

SCALE: NTS

APPROVED: LB

DATE: JUNE 15, 2021

FIGURE NO: 4

DRAWN BY: SS


REV NO: 0







**SITE PHOTOGRAPH 4**  
 PANORAMIC VIEW OF MID-SLOPE

PROJECT TITLE: GEOTECHNICAL SLOPE STABILITY ASSESSMENT, 30 FLATS ROAD, CBS, NL	SCALE: NTS	DATE: JUNE 15, 2021	DRAWN BY: SS	
FIGURE TILE: SITE PHOTOGRAPHS	APPROVED: PD	FIGURE NO: 5	REV NO: 0	





**SITE PHOTOGRAPH 5**  
 SHOWING SHALE CLASTS AND SCREE SLOPE WITH BEDROCK OUTCROPS.  
 TAPE MEASURE SHOWN FOR SCALE.

PROJECT TITLE:	GEOTECHNICAL SLOPE STABILITY ASSESSMENT, 30 FLATS ROAD, CBS, NL	SCALE:	NTS	DATE:	JUNE 15, 2021	DRAWN BY:	SS
FIGURE TILE:	SITE PHOTOGRAPHS	APPROVED:	LB	FIGURE NO.:	6	REV NO.:	0







**SITE PHOTOGRAPH 6**  
SHOWING BEDROCK OUTCROP AT TOE OF SLOPE

PROJECT TITLE:	GEOTECHNICAL SLOPE STABILITY ASSESSMENT, 30 FLATS ROAD, CBS, NL	SCALE:	NTS	DATE:	JUNE 15, 2021	DRAWN BY:	SS
FIGURE TILE:	SITE PHOTOGRAPHS	APPROVED:	LB	FIGURE NO:	7	REV NO:	0








**SITE PHOTOGRAPH 7**  
SHOWING TOE OF SLOPE



**SITE PHOTOGRAPH 8**  
SHOWING BEDROCK OUTCROP AT TOE OF SLOPE

PROJECT TITLE:	GEOTECHNICAL SLOPE STABILITY ASSESSMENT, 30 FLATS ROAD, CBS, NL	SCALE:	NTS	DATE:	JUNE 15, 2021	DRAWN BY:	SS	
FIGURE TILE:	SITE PHOTOGRAPHS	APPROVED:	LB	FIGURE NO.:	8	REV NO.:	0	





NOTES:

1. DO NOT SCALE FROM FIGURE
2. IMAGE FROM TOWN OF CBS INTERACTIVE MAP

FIGURE 9  
PROPOSED BOREHOLE LOCATIONS