A890 Stromeferry Bypass

Annual Slope Inspection Report 2023

The Highland Council

Project number: 60685712
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Quality information

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Revision History

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1. Introduction

1.1 General

AECOM Limited (AECOM) was appointed by The Highland Council (THC) on 29th April 2022 (THC letter ref. YEHAS6098) to undertake annual inspections of rock faces along part of the A890 in Wester Ross in the Scottish Highlands. The site forming the subject of this report extends between the properties of Attadale and Ardnarff, known locally as the Stromeferry Bypass. The scope of work also included the inspection of rock slopes to the north of Attadale at Maman Hill, which is reported under separate cover. The works were commissioned under the Scotland Excel Framework for Engineering and Technical Consultancy Services: Ref. 0820 – A890 Stromeferry Bypass Rockworks, Job No: YEHAS6098 which runs until 2026.

AECOM (formerly URS) first undertook a detailed inspection of the slopes between Ardnarff and Attadale in May 2012 under the Highlands and Islands Consultancy Services Term Commission (Lot 3, Rock slope), which expired in April 2015. It was recommended that ongoing annual inspections were undertaken by suitably qualified engineering geologists using a combination of roadside and targeted roped access inspections.

Since 2012, AECOM has undertaken and reported the following annual inspections:

- May 2012 –'Stromeferry Bypass, The Scottish Highlands - A890 Slope Inspection Report,' September 2012;
- April 2013 - 'Stromeferry Bypass, The Scottish Highlands - A890 Annual Slope Inspection Report for 2013', July 2013);
- June 2014 – 'Stromeferry Bypass, The Scottish Highlands - A890 Annual Slope Inspection Report for 2014', August 2014);
- (No inspection was undertaken in 2015);
- April 2016 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2016', May 2016;
- April/May 2017 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2017', August 2017;
- April 2018 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2018', July 2018;
- April 2019 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2019', July 2019;
- November 2020 (interim road level inspection during COVID-19 pandemic, reported on within the 2021 inspection report);
- May 2021 – 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2021', August 2021; and,
- June 2022 – 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2022', September 2022.

AECOM has also been involved in the design, specification and supervision of several phases of planned maintenance / remedial works since 2012. Planned maintenance / remedial works are carried out approximately every one to two years, with the Phase 6 works completed in 2012, Phase 7 works in 2013, Phase 8 works in 2015, Phase 9 works in 2017, Phase 10 works in 2018, Phase 11 works in 2019 and Phase 12 works in 2021.

Additionally, since 2012, AECOM has been involved in several emergency call outs following rock falls or other slope instabilities, and the design, specification and supervision of associated remedial works.

1.2 Background

The A890 serves as the main link-road along the west coast of Scotland and is also a significant transit for east to west traffic travelling between the Isle of Skye and Inverness. It is mainly single carriageway but frequently reduces to single track with passing places along the stretch between Attadale and Ardnarff. This section of the A890 is a national speed limit road.

The road was opened in 1970 following the formation of a number of rock slopes along the road alignment on the landward side of the Inverness to Kyle railway line, which was completed in 1870. Previous inspections have identified that over-blasting during construction resulted in the rock cuttings being left in a fractured state prone to rock falls. These conditions have also left the exposed rock mass susceptible to weathering, frost and root action.

There has been a history of rock falls at the site since the road was opened. In 1996 TRL Scotland undertook a risk assessment of the rock faces and a risk based maintenance management strategy was developed. Two phases of remedial works were completed in 2002 to bring the slopes into a manageable condition. Following the completion of these remedial works, the slopes were managed by monthly and annual inspections. It was noted that ongoing maintenance would be required along with remedial works for rock falls that develop due to deterioration of the rock slopes (Nettleton, 2003).

Rock falls have continued to occur and pose a risk to the road and users of the road. Additionally, on several occasions rock and soil has impacted the road from debris-flows originating from the adjacent slopes..

Further details on the site setting and geology are included in the 2012 A890 Slope Inspection Report (Ref. 46400079/GLRP0001, September 2012) and have not been discussed further in this report.

An approximately 500m length of the site, roughly centred on the 'avalanche shelter' is designated as a Site of Special Scientific Interest (SSSI) associated with exposures of structural and metamorphic geology. The site has no other environmental or historical designations. Whilst AECOM is not aware of any ecological constraints affecting the site it should be noted that AECOM personnel have observed white-tailed eagles on the hillside above the road in recent years. This presence of ecological constraints should be confirmed during the planning of any physical works.

1.3 Scope of Works

In line with the recommendations of the 2012 inspection report the following inspection regime was implemented between 2012 and 2016:

- Detailed roadside and rope access inspections every 5 years (to include examination of the condition of all the rock faces at the site and examination of the existing remedial works);
- Supplemented with annual lower resolution inspections using a combination of road-side and targeted rope access inspections of the higher risk rock faces and less accessible upper rock faces, which are not visible from the road.

Following the 2017 inspection, which comprised a 'detailed inspection', it was recommended that an annual inspection regime should continue but that reference to 'detailed' and 'lower resolution' inspections be dropped. It was recommended that each annual inspection should involve the roadside inspection of all slopes and targeted rope access inspections of selected higher risk slopes, particularly where potential hazards have been identified during previous inspections, and less accessible 'upper' rock faces that are not visible from the road.

The following provides a summary of the works undertaken during the preparation of this report:

- Review of any maintenance and rock fall protection works carried out since the 2022 annual inspection;
- Review of the drone survey carried out at the site in March 2023;
- Review of any significant events that have occurred at the site since the 2022 annual inspection (with reference to THC inspection records);
- Road level inspections of the rock slopes along the A890 between Attadale and Ardnarff (including update of the rock slope geotechnical assessment sheets where necessary);
- Targeted rope access inspections of selected higher risk slopes and less accessible 'upper' rock slopes;
- Identification of areas of potential risk (updated risk assessment) and provision of recommendations for maintenance / remedial works (including recommended timescales).

Whilst the annual inspections of the roadside and upper hillside slopes are carried out to identify and quantify risks to road users from falling materials, it should be recognised that given the size and terrain of the area that only limited locations and areas can be examined in detail. Furthermore the types of falls and wide range of contributing factors means that block falls and debris flows could occur at almost any location. The specific hazards and risks identified for the various slope sub-divisions should therefore be considered as indicative of the global risks associated with the site as a whole.

2. Rock Fall Risk Assessment Methodology

2.1 Background

The site has historically been divided into a number of sections based on slope geometry and natural features (such as watercourses or gullies) to allow assessment and a relative risk level to be assigned to each section with regard to rock slope stability. AECOM has continued to use the historical slope reference numbers, which have been linked to a local chainage system that begins with chainage (Ch.) 0m and at the road closure gates at Ardnarff (NGR NG 89063 35689) and ends with Ch. 3892 at the road closure gates towards the Attadale end of the site (NGR NG 91807 38166). Where new slopes have been identified and assessed these have been given a suffix, typically either 'A' or 'Upper' to provide them with a unique reference.

The locations of the various slopes and their reference numbers are shown on the drawings included in Appendix A. THC installed permanent roadside chainage markers at 100m intervals in early 2017 and the start and end chainages of each slope were revised to tie in with these. Chainages for specific locations have been measured from the nearest permanent chainage marker. (NB: During the April 2023 inspection it was observed that many of the chainage markers were either obscured by vegetation, had a missing number plate or had been damaged by grass cutting equipment.)

A risk assessment approach has been adopted to rank the relative rock fall risk presented by each slope to the road and its users. The risk assessment used is bespoke to this site and gives a risk level relative to the rest of the slopes at the site. The assessment considers the size of a potential rock fall (the hazard), the potential likelihood of debris from the rock fall reaching the carriageway (the pathway) and the available sighting distance on the carriageway (the receptor). The ratings assigned to each of these criteria are multiplied together to give a risk rating. Further details are provided in Sections 2.2 to 2.5.

The potential consequence of a rock fall will clearly vary depending on the presence/absence of road users beneath or approaching the slope at the specific time. It must be appreciated that due to the number or variables involved this is impossible to predict. It should be recognised that the assigned level of risk takes a conservative approach and assumes the potential presence of road users beneath or approaching the slope at the time of a rock fall. A more likely scenario is that a rock fall occurs when no road users are directly beneath and fallen blocks which have come to rest on the road present a hazard to road users after the event. To differentiate and risk rank the slopes, (e.g. to prioritise remedial works) sightlines and stopping distances are also factored into the assessment to recognise the higher potential for road users to interact with rock fall debris on the road at locations with poorer sightlines as opposed to straight sections of road (see section 2.4).

Following the initial risk assessment the inspecting geologists reviewed the relative risk rankings and, where necessary, adjusted the scoring to reflect the overall setting (including history and frequency of rock falls) and their professional judgement.

2.2 Hazard Rating

Four categories of hazard rating have been selected based on the main sizes of rock falls (and potential rock falls) identified at the site, as detailed in Table 2-1. During the risk assessment the hazard rating representative of the scale of observed or potential rock falls at each slope was selected.

Table 2-1: Hazard Rating

Hazard Rating	Description
1	Small ravelling type rock falls (typically up to 0.02m^3).
2	Moderate rock falls (typically between 0.02m^3 and 1m^3).
3	Large rock falls (typically between 1m^3 and 10m^3).
4	Very large rock falls (typically greater than 10m^3)

2.3 Pathway Rating

Each slope has been assigned a pathway rating (Table 2-2) based upon a qualitative inspection of the slope form (height, angle, profile/roughness, vegetation cover and presence or absence and suitability of existing remedial measures) between the position of a potential rock fall and the road. The rating also considers the estimated termination location of failed material. If debris from previous rock falls was evident, the location of this was considered during this assessment.

The design rock fall volume for the passive rock fall 'drape' netting systems installed across many of the rock slopes prior to AECOM's involvement at the site is unknown, however, based on the materials used and current design practices it would be estimated to be <1m^3. During the risk assessment it has therefore been assumed that potential rock falls in excess of this volume that have not already been remediated by other means (e.g. rock dowels) could breach the drape netting systems.

Table 2-2: Pathway Rating

Pathway Rating	Description
1	No falling blocks are expected to reach the road (e.g. effective remedial measures and/or a wide verge or rock trap ditch).
2	Most falling blocks are not expected to reach the road (e.g. largely effective remedial measures/verge/rock trap ditch).
3	Approximately half of the falling blocks are expected to reach the road (e.g. partially effective remedial measures/verge/rock trap ditch).
4	Most falling blocks are expected to reach the road (e.g. no or ineffective remedial measures and/or narrow verge/shallow rock trap ditch).
5	All falling blocks are expected to reach the road (e.g. no or ineffective remedial measures and no verge or rock trap ditch - fallen blocks are likely to free fall or bounce directly onto the road).

2.4 Receptor Rating

For slopes with pathway ratings of ≥2 (i.e. at least some blocks are expected to reach the road), a receptor rating is included in the assessment to reflect the potential of a vehicle coming into contact with, or having to take action to avoid, rock fall debris. The minimum sighting distance that a driver would have when driving adjacent to each of the slopes (in good weather conditions and during daylight hours) was estimated based on stopping distances from the Highway Code for cars travelling at 40mph and 60mph (36m and 73m respectively).

Table 2-3: Receptor Rating

Receptor Rating	Description
1	Sighting distance > 73m
1.2	Sighting distance 36 to 73m
1.4	Sighting distance < 36m

2.5 Risk Rating

The ratings assigned to the hazard, pathway and receptor were multiplied to give a risk rating for each of the slopes. The relative risk levels are described in Table 2-4, along with the colour coding used to depict these.

Table 2-4: Risk Rating

Risk Rating	Relative Risk Level	Description
<5	Low	Small to moderate sized rock falls with a low probability of causing damage to or closure of the road and/or injuries to road users. Risk normally tolerable.
5 to <10	Moderate	Moderate sized rock falls with potential to cause moderate damage to road and short term road closures (a few hours) but a low probability of causing injuries to road users. Risk likely to be tolerable but client needs to be made aware of hazards and monitor these.
10 to <15	High	Moderate to large sized rock falls with a higher probability of causing major damage to the road and/or road closures of a few days to a few weeks and potential of causing major

Risk Rating	Relative Risk Level	Description
		injury or loss of life should road users be present beneath (or approaching) slope at time of rock fall. Risk likely to require remedial measures / risk management actions.
>15	Very High	Large to very large rock falls which have a high probability of causing significant damage to road and/or long term road closures (weeks to months) and the potential of resulting in major injury or loss of life should road users be present beneath (or approaching) slope at time of rock fall. Risk likely to require remedial measures.

3. Works Since 2022 Inspection

3.1 THC Inspections

The ongoing management of the slopes alongside the A890 involves the completion of daily 'drive through' inspections and more detailed monthly 'walk through' inspections by local THC personnel familiar with the site and the inspection procedure. Any new rock falls or other slope instability hazards are reported directly to AECOM.

Since the completion of AECOM's last annual inspection on 22nd June 2022, THC's routine inspections have recorded three rock falls and one debris flow at the site, details of which are provided in Table 3-1.

Table 3-1: Summary of events since last AECOM Inspection

Date	Location	Event	Comments
3rd February 2023	**AA2A -** Ch.425	Debris Flow (c.25m³)	Vertical height to failure scar - c.40-50m above road level.
2nd March 2023	**AA19 Upper** - Ch.3100	Rock fall (c.0.25m³)	Vertical height to failure scar - c.55m.
10th March 2023	**AA12** - Ch.2480	Rock fall (c.0.2m³)	Vertical height to failure scar – c.10m. Further instability around scar (1.5m x 1.5m x 1m).
29th March 2023	**AA19 Upper** - Ch.3100	Rock fall (c.0.1m³)	Vertical height to failure scar – c.25m.

AECOM carried out an emergency inspection of the site following the 2nd March 2023 event. Further details are provided in Section 3.1.1.

3.1.1 Emergency Inspection at AA19 Upper, 8th March 2023

On the morning of 2nd March 2023, AECOM was made aware that a rock fall had occurred within the site the previous night. The rock fall originated from the section of the site known as AA19 Upper. A single 0.25m^3 block reached road level and came to rest in the middle of the carriageway. THC attended site on the morning of 2nd March and deemed there to be no imminent risk of further rock fall. The fallen block was moved to the edge of the carriageway and the road and railway remained open. However, as the origin of the failure was difficult to fully assess, THC contacted AECOM for further advice. As the potential source location of the rock fall was within an area that is extremely difficult to access, AECOM proposed a drone inspection be carried out to inspect the source area of the rock fall at height and provide a better assessment of the risks to the road and railway below. The outcome of this inspection would determine the need for a tactile inspection via rope access.

The drone inspection was completed on the 8th March 2023 by specialist contractor Geo-rope Ltd. and reviewed in real time by an experienced AECOM Engineering Geologist. The drone inspection did not reveal either the source location for the block or broken/flattened vegetation as evidence of a fall path. The drone survey included examining the crags for evidence of any more blocks that looked to be a risk but nothing was evident. This area was targeted for rope-access inspection during the annual inspection.

3.2 Scheduled Maintenance / Urgent Remedial Works

3.2.1 AA18/AA19 Urgent Works

In September 2022, urgent remedial works were undertaken at slope AA18/AA19 in response to a rock fall which occurred on the 25th May 2022. The source of the rock fall originated from AA19 Upper. The remedial works included:

- Clearing out the roadside catch pit and increasing its capacity; and,
- Light scaling to remove loose material from the source area and accumulation scree.

THC appointed Geo-rope Ltd. (a specialist contractor) to carry out the required remedial works in June 2022 and, subsequent to a period of planning with Network Rail the works were completed between 20th and 28th September 2022, following the installation of a temporary catch fence constructed between the road and railway.

3.2.2 Other Works

Other works which have occurred within the site since AECOM's last inspection include:

- The replacement of old/damaged ARMCO with new ARMCO which has been installed on the railway side of the road at slope refs. AA1, AA3, AA6A (at Ch. 1570), AA7 and AA8.

No other maintenance or localised rock fall protection works were carried out between the 2022 and 2023 inspections.

3.3 2023 Drone Survey

A high resolution photographic drone survey of the eastern half of the site (east of Frenchman's Burn) was completed by Geo-rope Ltd. on 8th March 2023. The purpose of the drone survey was to enable potential hazards not readily visible from the road be identified and, where appropriate, targeted during future annual inspections. The intention is that the photographic record can be compared to past and future surveys to provide an indication of what has changed and/or the rate at which conditions are changing e.g. tree falls. A review of the findings of the drone survey is presented in Section 4.

Additionally, the drone survey was used to attempt to identify the source area of the 2nd March rock fall event as discussed in section 3.1.1.

4. Drone Survey Review

The following drone surveys have been carried out at the site:

- March/April 2019, Geo-rope Ltd: high resolution photographic and topographic survey of the entire site and hillsides above;
- April 2020, Geo-rope Ltd: high resolution photographic survey of highest risk slopes (located to the east of Frenchman's Burn).
- March 2023, Geo-rope Ltd: high resolution photographic survey of highest risk slopes (located to the east of Frenchman's Burn).

One of the purposes of the drone surveys was to enable potential hazards not readily visible from the road to be identified. AECOM carried out a review of the 2023 drone survey images prior to the 2023 annual inspection, leading to the targeted inspections of several potential hazards. The findings of these targeted inspections are included within the geotechnical assessment sheets within section 5 of the report.

Another aim of the repeated drone surveys was to allow for the comparison of photographic records to better quantify the risk associated with time-dependent hazards such as tree falls. During previous inspections it has been observed that a high percentage of the trees within the conifer plantation above slopes AA12 to AA22A had fallen, a consequence of mature trees on thin superficial deposits providing poor anchoring for the tree roots. Tree falls within the steeper upper slopes (i.e. AA13-14 Upper, AA15 Upper and AA16-17 Upper) are considered a high risk event due to the potential for soil and pieces of rock to be dislodged from within exposed root balls, with the potential for them and the trees themselves to move downslope. With this in mind, drone survey images for these upper slopes have been reviewed to determine the number of trees that fell between surveys. This report provides a review of the 2023 drone survey to identify changes since the 2020 survey with findings presented in Appendix B and summarised in Table 4-1 below. The 2021 annual inspection provides a review on the time between the 2019 and 2020 drone surveys.

Table 4-1 Tree Fall Review

Slope ref.	Approximate No. of Trees Standing		Difference	
	2020	2023	No.	%
AA13-14 Upper	124	112	12	9.7%
AA15 Upper	128	113	15	11.7%
AA16-17 Upper	207	189	32	8.7%

The results presented above suggest a relatively low rate of tree falls in the time period of March 2020 to March 2023. Tree fall rates range between 8.7-11.7% suggesting an average annual fall rate of approximately 3%. This is comparable with the tree fall rate between 2019-2020 which ranged between 2.3-3.8% throughout the year. Such events will be largely weather dependant and a single storm event could fell many trees. Additionally, it should be noted that the 2023 survey was undertaken when snow was on the slopes limiting the accuracy at which the trees could be reviewed.

No areas of rock slope or boulders showing pronounced evidence of immediate failure were identified on the 2023 drone survey.

It is recommended that a repeat photographic drone survey of the slopes to the east of Frenchman's Burn be carried out in March/April 2024 to allow the quantification of the risk associated with tree falls to continue over an initial period of 5 years (i.e. 2019 to 2024).

5. 2023 Annual Inspection

5.1 Methodology

The 2023 annual inspection of the roadside rock faces and selected upper slopes was carried out by a team of four AECOM engineering geologists between the 18th and 21st April 2023. The weather was generally warm, sunny and dry.

All of the roadside rock slopes were inspected from road level with the aim of identifying significant changes and/or potential hazards and areas that would benefit from more detailed rope access inspections. The inspection of the upper slopes was generally restricted to the targeted inspection of high risk features, localities identified during previous inspections, areas of recent rock falls or potential hazards identified from the review of drone survey imagery.

Traffic management was provided by Alba Traffic Management Ltd. (a sub-contractor of Geo-rope Ltd.) for the duration of the inspection.

The inspections undertaken provide an indication of the stability / risk but are not considered definitive. Limitations included:

- Due to the extent of the slopes it was not practical for the inspectors to undertake a systematic inspection of the full extent of each rock face / slope. Assumptions have been made based on the area observed on foot. However, additional hazards that were not identified during the inspections may be present;
- Slopes covered or obscured by vegetation or soil could not be fully inspected; and,
- Rock faces which are covered by netting can be difficult to assess due to restricted vision.

5.2 Summary of Findings: Geotechnical Assessment Sheets

A Geotechnical Assessment Sheet for each slope ref. is provided within the following sections of this report. They include the inspection findings and a summary of the slopes risk rating. Additionally, within the Geotechnical Assessment Sheets, are photos references which have been provided for key observations identified during the inspection. Each photo has been given a unique reference number which relates to the slope reference; for example, photos of features from slope ref. AA1 have been referenced as ‘AA1-1, AA1-2, AA1-3’ etc. The photographs are provided within Appendix C.

5.2.1 Slope Ref. AA1

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA1	**Chainage:**	0000 - 0170	**Start Grid Ref:**	NG 89063 35689	**End Grid Ref:**	NG 89166 35810	**Elevation:**	17m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:								
Dip (°): 85	Azimuth (°): 302	Height (m): 7	Length (m): 170	Vegetation Cover:	Ch. 0 to Ch. 100: 50-90% Ch. 100 to Ch. 146: 30-50% Ch. 146 to Ch. 163: 10% Ch. 163 to Ch. 170: 90% Grass, moss, saplings and ferns.	Ditch Details:	Typically 0.5-1m deep, 1m wide. Reduces to 0.15m deep, 0.3m wide from Ch. 60 to 65 No ditch between Ch. 53 to 68	Roughness: Rough	Verge Width (m): 1.5

Engineering Description of Rock:
Very strong thinly foliated dark bluish grey fine to medium grained micaceous SCHIST (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2021	Ch. 146 to 163	To check condition of TECCO netting – specifically in waterfall area.

THC Monthly Reports:		
Date	**Location**	**Comments**
September 2018	Ch. 125	Timber in catch pit area of burn
September 2018	Ch. 160	New rock on verge

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	TECCO mesh installed between Ch. 146 to 163.	**2017 Inspection**: Surface corrosion noted on length of bottom anchor cable and eastern terminal cable noted. **2019 Inspection**: Surface corrosion / discolouration of bottom cable and spike plates noted within waterfall noted. **2020 Inspection**: 3 No. spike plates in waterfall showing surface corrosion noted. Very top and bottom of TECCO discoloured and lower cable has surface corrosion. TECCO in waterfall area appears to be in	No significant changes to netting and components observed from road level.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
		reasonable condition. Accumulation of organic debris behind netting in waterfall. **2021 Inspection:** TECCO netting generally in good condition. Rope access inspection was carried out to allow condition of netting system to be fully assessed. The following observations were made: - Surface corrosion noted on length of bottom anchor cable and eastern terminal cable - 1.5m wide x 8m high area of netting within waterfall is discoloured; - Boundary cables locally exhibit surface corrosion (most evident at base of waterfall) - 3 No. spike plates in waterfall exhibit surface corrosion - Within the vicinity of the waterfall the rock mass is locally fractured / loose.		
2015 – Phase 8 works	Works include: - Tree stump removed at April 2014 failure area - Ditch and bund improved - 2 No. dowels installed at Ch.60	Anticipated that the ditch and bund will serve as an adequate rock trap for ravelling / small block falls.	No significant changes observed	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Throughout AA1	**2012 Inspection:** Upper 2-3m of rock face prone to ravelling (block size typically 0.2m x 0.2m x 0.2m).	No change noted during 2023 inspection, ditch remains effective	
Throughout AA1	**2018 Inspection:** Evidence of ongoing ravelling of small blocks but retained by ditch. Few small blocks retained by TECCO mesh - not currently loading system.	No change noted during 2023 inspection, ditch remains effective	
Ch. 70	-	**2023 Inspection:** A 0.3m x 0.2m x 0.2m block in ditch, fallen from 3m above toe of slope. Area of high water flow, heavily fractured. Smaller size block up to 0.1m also in ditch.	AA1-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 150	**2021 Inspection:** Small accumulation of blocks on ledge behind TECCO netting ca. 8m above toe of slope. <0.1m³ total volume. Not straining or deforming netting so no maintenance requirements at this time.	No change noted during 2023 inspection	AA1-2
Eastern end of AA1	**2016 Inspection:** Small amount of debris accumulating behind TECCO mesh due to ongoing ravelling failures (blocks up to 0.1m³). Not currently loading the mesh but this should be monitored during monthly and annual inspections.	No change noted during 2023 inspection	
Above AA1	**-**	**2023 Inspection:** Old Forest Road above AA1 (disused/overgrown) c.20-25m above road level. Findings include: - Upslope box culvert/bridge spanning across small watercourse, slight debris accumulation under bridge (granular cobble/boulder size) at NG 89408 36019. - Downslope of forest road is steeply inclined with small waterfalls and localised accumulations of debris against branches and trees forming debris dams. - Across slope are branches/fallen trees.	AA1-3 AA1-4

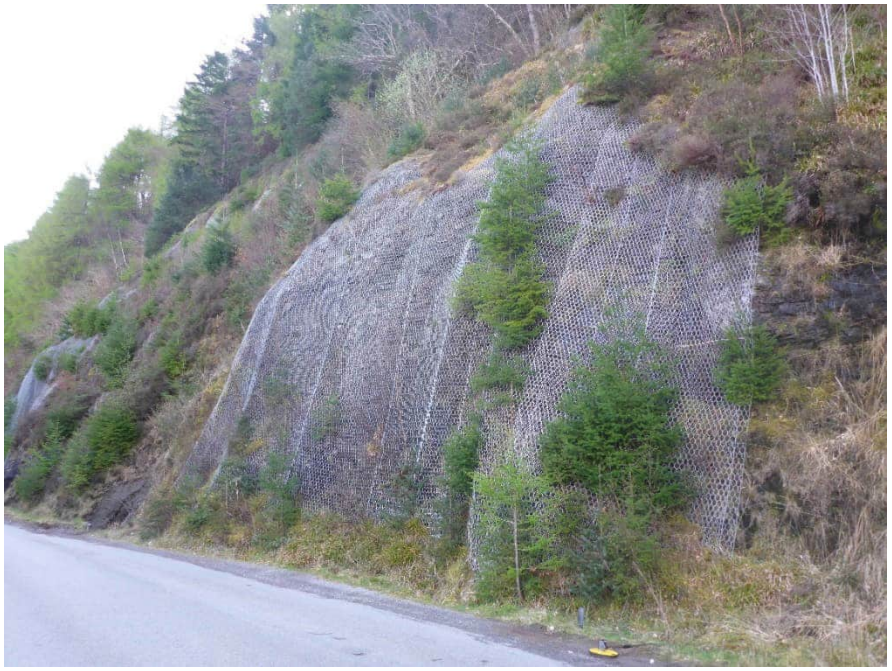
RISK RATING		**Comments**
Overall Hazard Rating =	1	Small scale ravelling only. Targeted remedial works were undertaken within AA1 in 2013 and 2015. Hazard rating reduced accordingly.
Pathway Rating =	2	1.5m verge, with ditch and bund along length of section. Most blocks not expected to reach the road.
Receptor Rating =	1.2	
Risk Value =	**2.4**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Monitor build-up of debris in ditch during monthly and annual inspections and undertake clearance works when required to maintain its capacity. - Monitor condition of dowels and netting system during annual inspections – recommended that a rope access inspection be carried out in 2026 to monitor corrosion. - Monitor build-up of debris (i.e. debris dams) in channels above AA1 and undertake clearance works when required.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.2 Slope Ref. AA2

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA2	**Chainage:**	0170 - 0335	**Start Grid Ref:**	NG 89166 35810	**End Grid Ref:**	NG 89213 35870	**Elevation:**	9m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:								
Dip (°): 74	Azimuth (°): 319	Height (m): 20	Length (m): 165	Vegetation Cover:	Ranges between 10-100% across the slope comprising of moss, heather and occasional fern. Small saplings becoming established. Trees along crest.	Ditch Details: 0.5m to 1.0m wide, 0.4m deep	Roughness: Rough	Verge Width (m): 0.8

Engineering Description of Rock:
Very strong thinly foliated dark grey fine to medium grained SCHIST (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2019	Throughout AA2	To inspect the top cable anchors of the drape netting systems.

THC Monthly Reports:		
Date	**Location**	**Comments**
October 2018	Ch. 300	2 new stones in ditch.
March 2019	Ch. 190	Stone found on road in morning inspection. Cleared away to verge;

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
Before AECOM involvement (i.e. pre 2012)	Netting system between Ch.170 to 202 and Ch. 230 to 292.	Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - c.5m anchor spacing (bottom anchor spacing typically 9m) and 25mm galvanised bars - Cable-anchor connection: galvanised eye nuts - 4 cable clamps - Netting lap connections using Spenax rings - No laps on anchors or vertical reinforcing	No significant changes to netting and components observed from road level.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
		2016 Inspection: Bottom cable noted to be corroded within up chainage section of passive rock fall netting **2019 Rope Access Inspection:** North-eastern terminal anchor exposed and noted to be in good condition. Top rope also in good condition with minor surface corrosion only. One mid-rope eyelet is stainless steel but insulated to avoid bi-metallic corrosion. Note: plastic mesh extends much higher than the Maccaferri netting and is largely buried beneath moss and grass. **2021 Inspection:** slight surface corrosion of bottom cable around Ch. 273.		
2013 – Phase 7 works	Trees felled and scaling undertaken at NG 89294 35905.			
2015 – Phase 8 works	Works include: - Damaged mesh replaced with Maccaferri double twist netting at Ch. 180. - Trees felled and light scaling undertaken.	**2021 Inspection:** Slight corrosion of Maccaferri netting and bottom cable around small waterfall.	No significant change	AA2-1
2021 – Phase 12 works	Works include: - Clearance of roadside ditch between Ch. 200 to 230, Ch. 256 and Ch. 310 to 335. - Drainage gully at Ch. 335 cleaned out at roadside.	**2022 Inspection:** Culvert at Ch. 335 would benefit from clearance again.	No significant change. Culvert at Ch. 335 is c.50% full.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 205	**2016 Inspection:** Trees at eastern edge of gully at crest of rock face are overhanging and at risk of falling and dislodging blocks.	No change noted during 2023 inspection. Less visible than in previous years due to increased vegetation growth on slope below.	AA2-2

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
	Whilst the trees themselves are unlikely to reach the road they may dislodge soil/rock as they fall.		
Ch. 205-230	**2019 Inspection:** No remedial measures over rock face in this area. Almost 70% vegetation cover including small coniferous saplings. Root jacking may become an issue - potential for small block fall <0.1m3. Keep under observation.	No change noted during 2023 inspection	
Ch. 232 to 237	-	**2023 Inspection:** Ditch width reduced due to vehicle over-run. Not significant issue due to drape netting in this area.	
Ch. 235	**2019 Inspection:** ca. 0.3m x 0.3m x 0.3m debris caught behind drape 1-2m above ditch demonstrating effectiveness of drape netting system.	No change noted during 2023 inspection	
Ch. 273	**2017 Inspection:** Debris continues to build up behind netting. Not currently loading system significantly. In 2021, it was noted that some of the material had fallen out of base of netting and into ditch below.	No change noted during 2023 inspection	AA2-3
Ch. 300-335	**2019 Inspection:** Vegetated rock slope with no remedial measures. No significant hazards observed.	No change noted during 2023 inspection	
Above AA2	**-**	**2023 Inspection:** Old Forest road above AA2 (disused/overgrown) c.20-25m above road level. Findings include: - Upslope box culvert/bridge spanning across small watercourse, slight debris accumulation under bridge (granular cobble/boulder size) at NG 89199 35816. - Downslope of forest road is steeply inclined with small waterfalls and localised accumulations of debris against branches and trees forming debris dams in water course. - Across slope are branches/fallen trees and there are some leaning trees in watercourse side walls.	AA2-4 AA2-5 AA2-6

RISK RATING		Comments
Overall Hazard Rating =	2	Decreased from 3 in 2023 due to changing end chainage of section
Pathway Rating =	2	Decreased from 4 in 2023 due to changing end chainage of section
Receptor Rating =	1.2	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Coppice trees at crest of slope at Ch. 205. - Clear culvert at Ch. 335. - Monitor build-up of debris (i.e. debris dams) in channels above AA2 and undertake clearance works when required.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.3 Slope Ref. AA2A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA2A	**Chainage:**	0335-0555	**Start Grid Ref:**	NG 89213 35870	**End Grid Ref:**	NG 89393 36104	**Elevation:**	9m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:												
Dip (°):	Between Ch. 335 to 477: 50-55 Between Ch. 477 to 555: 84	Azimuth (°):	290	Height (m):	25 (crags)	Length (m):	220	Vegetation Cover:	100% cover. Generally comprises moss, grass, saplings and bushes. Many tree stumps. Localised crags.	Ditch Details:	Between Ch. 335 to 477: 0.5m to 1m wide, 0.5m deep Between Ch. 477 to 555: 1.5m wide, 0.5 – 1m deep.	Roughness: Rough	Verge Width (m):	Between Ch. 335 to 477: 0.5-0.8m Between Ch. 477 to 555: 3.5m

Engineering Description of Rock:
Strong thinly foliated dark grey fine to medium grained SCHIST (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
February 2019	Ch. 350 and 400	A 0.3m x 0.2m block at Ch. 350 and a 0.1m x 0.1m block at Ch. 400.	
March 2019	Ch. 420	A 0.2m x 0.3m stone on verge.	
February 2023	Ch. 425	Small debris flow. A minor watercourse in this area – ditch has been cleared out.	AA2A-1

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2015 – Phase 8 works	Rock trap ditch cleared out and bund created		-	
2021 – Phase 12 works	Clearance of roadside ditch between Ch. 335 to 447.		No significant change, ditch remains effective	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Throughout AA2A	**2012 Inspection:** Potential for small scale ravelling/block falls up to 0.125m^3.	No change noted during 2023 inspection	
Ch. 340 to 447	**2016 Inspection:** Potential for root jacking identified (trees on outcrops adjacent to road). Recommend coppicing trees within 10m of road.	No change noted during 2023 inspection	
Ch. 350 to 370	**2019 Inspection:** ca. six 0.1m x 0.1m x 0.1m blocks in roadside ditch. These were not all recent, with spray paint noted on some blocks indicating they had been previously identified during THC monthly inspections (Feb 2019?). Source of blocks likely to be crags 20 to 25m upslope in forest (see Ch. 360 notes from 2018 inspection). Upslope crags re-inspected and no major stability issues were identified. Minor ravelling from root jacking was apparent and small blocks may continue to fail, however, ditch is currently considered effective	No change noted during 2023 inspection	
Ch. 360	**2018 Inspection:** Root jacking in crags ca. 25m above road level with the potential for dislodging of blocks.	No change noted during 2023 inspection	
Ch. 390	**-**	**2023 Inspection:** Several blocks up to 0.4m x 0.3m x 0.2m in ditch. Source not obvious, crags c.20-25m upslope.	AA2A-2
Ch. 395	**2018 Inspection:** Large blocks with fallen trees in front in a crevasse at ca. 15-20m above road level where the main discontinuity is at a 65 degree angle. Blocks currently keyed in.	No change noted during 2023 inspection	
Ch. 400	**2016 Inspection:** Large overhanging boulder 5m above road level. Weaker / more fractured material near the base of the boulder has preferentially weathered, leaving a 2.5m overhang. Dilated discontinuities within upper part of boulder form a distinct block (approx. 1.5m x 1.5m x 2.0m) above the overhang, which is at risk of failure due to loss of support and root jacking (trees growing on boulder have been coppiced in the past but were noted to be re-growing). Passing place beneath potential rock fall. If this block were to fail it would reach the road. In 2020 Inspection, it was noted that a few small blocks have spalled / ravelled from the southern side of the boulder.	No change noted during 2023 inspection	AA2A-3

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch.415	**2021 Inspection:** Two small blocks observed in the roadside ditch. No pre-existing paint marks so assumed to be recent. No obvious upslope source but within area where tree falls / root jacking poses a risk.	No change noted during 2023 inspection	AA2A-4
Above AA2A	**-**	**2023 Inspection:** Old Forest road above AA2A (disused/overgrown) c.20-25m above road level. To inspect source area of soil washout which occurred in Feb 2022. Findings include: - Source area at NG 89385 35998 c.40-50m above road level. At the crest of the slippage there remains a lobe of soil sitting on rock (c.4-5m length x 2m wide x 0.5m deep) that could wash out in the future. - Downslope of source area, the channel has been stripped down to bedrock which has a stepped profile. - A possible shallow soil slip was observed at NG 89324 35942.	AA2-5 AA2-6 AA2-7

RISK RATING		Comments
Overall Hazard Rating =	3	Increased from 2 in 2023 due to change in chainage marker boundary – identification of 4.5m³ failure at Ch.400. Elsewhere within AA2A the hazard rating is lower.
Pathway Rating =	4	Increased from 1 in 2023 due to change in chainage marker boundary. Presence of passing place beneath potential failure at Ch.400. Elsewhere within AA2A the pathway rating is lower.
Receptor Rating =	1.2	
Risk Value =	**14.4**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Heavy scaling / controlled removal of overhang on boulder at Ch. 400. Likely to require stitch drilling.	- Coppice trees within 10m of road between Ch. 340 to 447. - The build-up of debris within ditch should be monitored during monthly and annual inspections and clearance works undertaken as required to maintain its capacity. - Monitor build-up of debris (i.e. debris dams) in channels above AA2A and undertake clearance works when required. (Post-inspection update - THC has committed to contacting Forestry and Land Scotland to alert them to the issues identified in the water courses and under-track culverts beneath forest tracks).

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.4 Slope Ref. AA3

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA3	**Chainage:**	0560 - 0660	**Start Grid Ref:**	NG 89397 39107	**End Grid Ref:**	NG 89454 36200	**Elevation:**	14m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	317	Height (m):	16	Length (m):	100	Vegetation Cover:	20-30% cover. Moss and ground cover with occasional trees. Trees on ditch edge forming barrier partially obscuring view of rockface. Some trees overhanging at crest.
Ditch Details:	Ch. 605 to Ch. 660: 2.2m wide, 1.2m deep	Roughness:	Smooth	Verge Width (m):	Ch. 560 to Ch. 605 - 3.5m Ch. 605 to Ch. 660 -13m				

Engineering Description of Rock:
Medium strong thinly to narrowly foliated light pinkish grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:		
Date	**Location**	**Comments**
N/A		

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
N/A				

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 560 to 605	**2016 Inspection:** Potential for toppling/block fall up to 2m^3 originating from 5-8m above road level. There is a relatively flat 3.5m wide verge between the toe of the rock face and the edge of the road and blocks from previous failures (none recent) were located between the rock face and a deer fence	No change noted during 2023 inspection	AA3-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
	approx. 2m from the rock face. It is considered unlikely that blocks will reach road in event of a failure.		
Ch. 600	**2021 Inspection:** Large block / slab of rock with dilated fractures and potential for root jacking at crest of rock slope. No significant change since last inspection. Set well back from road with adequate rock trap so low risk to road.	No change noted during 2023 inspection	AA3-2
Ch. 605 to 660	**2012 Inspection:** Potential for very large toppling/block fall failures although presence of large ditch and very mean these do not pose a risk to the road.	No change noted during 2023 inspection	
NG 89467 36164 (Ch. 612)	**2016 Inspection:** Series of sub-parallel curved tension cracks in upper slope. Considered to represent ancient slope movements prior to road construction. Cracks vary from 1m to 3m wide and 1m to 3m deep and are located in a side-long slope length of approximately 30m to 40m. NE end terminates in area of historic failure (topographic 'bowl'-shape') above NG 89467 36164. **2017 Inspection:** Tension cracks were noted around 50m below main tree line, around 100 to 150m NE of watercourse and immediately above the AA3 rock face. No signs of recent movement were observed. Note that Ch. 612 places this above slope AA3, Ca. 20-30m above road level.	Not inspected during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	4	
Pathway Rating =	1	Presence of wide ditch/verge mean potential failures do not pose a risk to the road.
Receptor Rating =	N/A	Receptor rating only applicable when pathway rating is ≥2.
Risk Value =	**4.0**	**Re-assessed during the 2022 inspection following changes to receptor rating. Risk value reduced from 4.8.**
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Build-up of debris in rock trap ditch should be monitored during monthly and annual inspections and clearance works undertaken as required to maintain its capacity.

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
		- Tension cracks on slope above rock face at Ch. 612 to be kept under observation during annual inspection.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.5 Slope Ref. AA3A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA3A	**Chainage:**	0660 - 0745	**Start Grid Ref:**	NG 89454 36200	**End Grid Ref:**	NG 89508 36254	**Elevation:**	14m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:												
Dip (°):	35 to 45	Azimuth (°):	315	Height (m):	N/A (vegetated slope with isolated rock outcrops)	Length (m):	85	Vegetation Cover:	100%. Fully vegetated slopes (trees, grass and moss ground cover).	Ditch Details:	0.5m wide, 0.3m deep.	Roughness: Smooth	Verge Width (m): 0

Engineering Description of Rock:
Medium strong thinly to narrowly foliated light pinkish grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:		
Date	**Location**	**Comments**
N/A		

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
N/A			

Hazards Observed:		
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**
Ch. 690	**2019 Inspection:** Isolated rock outcrop ca. 30m above road level with ongoing ravelling / root jacking. Some blocks have reached deer fence 1-2m above road level.	No change noted during 2023 inspection
Ch. 690	**2019 Inspection:** Accumulation of small blocks on the upslope side of the deer fence. Fence post has fallen down here but appears to have rotted rather than been struck by a block. Debris not recent but scree present upslope with an isolated rock outcrop ~30m above road level. Failed blocks typically ca. 0.1m x 0.1m x 0.1m. Outcrop inspected to be flat bedded with failures a consequence of ravelling	No change noted during 2023 inspection

Hazards Observed:		
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**
	associated with ongoing root jacking. Evidence of roadside deer fence effectively arresting small blocks, however, potential for blocks to reach verge/edge of road exists.	

RISK RATING		**Comments**
Overall Hazard Rating =	1	Small scale ravelling / root jacking from isolated outcrops.
Pathway Rating =	2	Most of the failure debris is expected to come to rest on the slope between the outcrop and the road but there is potential for occasional blocks to reach road level.
Receptor Rating =	2.0	
Risk Value =	**2.0**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Build-up of debris at deer fence to be monitored

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.6 Slope Ref. AA4

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA4	**Chainage:**	0745–0855	**Start Grid Ref:**	NG 89508 36254	**End Grid Ref:**	NG 89572 36332	**Elevation:**	21m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	310	Height (m):	20	Length (m):	110	Vegetation Cover:	75-80% cover. Lots of ivy, grass/small shrubs and small saplings.
Ditch Details:	1.0m wide, 0.6m deep	Roughness:	Rough	Verge Width (m):	1m				

Engineering Description of Rock:
Very strong thinly foliated grey fine grained schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2016	Ch. 776	To inspect wedge of rock beneath overhang at crest. Findings - wedge noted as not loose and appears to be reasonably well-bedded in and is no longer a hazard.
2016	Ch. 788	To inspect overhanging block at crest of slope. Findings - it was apparent that a release joint was present and the block was only held in place by a partial overlap on the left hand side. Block marked with orange paint. A holly bush was located immediately to the left, obscuring the rock mass behind. Recommended works: scale / dowel overhanging block, coppice adjacent holly tree and inspect rock mass behind.
2019	Ch. 802	To inspect a block noted at crest of slope with potential pathway to road. Findings - there is not a block at crest of slope at this location. The feature observed from road level was a cut birch tree stump that has started to regrow. Overhanging portion was very rotten and was removed during the inspection and therefore, is no longer a hazard.
2021	Ch. 764	To inspect rock mass c.6 to 8m above road level with dilated fractures. Recommended works: Scaling was recommended and completed in 2021 Phase 12 works.
2021	Ch. 766	To determine source area of a recent failure. Findings - source was found to be located c.4 to 5m below crest of slope. Rock fall deemed as a chimney/wedge type failure. No other loose rocks in source area but indicative of the type / volume of failure that may occur in this section.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
June 2018	Ch. 830	New stone in drain (x2).	
August 2018	Ch. 830	More stone in ditch from same location.	
April 2021	Ch. 810	Minor soil slip occurred and was contained by verge/drain. Originated from c.8m upslope. Slight overhang of vegetation at crest of failure slope remains.	AA4-1

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2015 – Phase 8 works	2No. dowels installed at Ch. 775 and Ch. 790.		No significant changes to netting and components observed from road level.
2021 – Phase 12 works	Scaling of rock mass at Ch. 764.	Block c.1.5m x 0.5m x 0.4m was scaled.	No significant changes to netting and components observed from road level. Note that there is an accumulation of blocks from these scaling works in the roadside ditch (total 0.5m³).

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Whole slope	**2018 Inspection:** Vegetation is quite well established and trees which were previously coppiced are growing again. Keep under observation during future inspections as root jacking may become an issue.	No change noted during 2023 inspection	
Whole slope	**2019 Inspection:** Minor ravelling / root jacking potential. Ditch generally considered to be effective although occasional small block may reach edge of carriageway.	No change noted during 2023 inspection	
Ch. 745	**2018 Inspection:** Root jacking and fractured rock mass 8m above road level. Potential failure volume 1m³. Although most debris would rest on slope or in ditch there is potential for a small volume to reach the road. Scaling recommended to minimise risk.	No change noted during 2023 inspection	
Ch. 765	**2018 Inspection:** Evidence of minor ravelling with debris in ditch c.0.1m³ (max block size 0.2m x 0.2m x 0.1m).	No change noted during 2023 inspection	
Ch. 766	**2021 Inspection:** Recent failure observed as accumulation of blocks in ditch and on road verge. Total volume c.1m³. Block size c.0.3m x 0.2m x 0.1m and ditch c.1.5m wide x 0.5m deep. Rope access inspection was required to determine source which was found to be located c.4 to 5m below crest of slope. Rock fall deemed as a chimney/wedge type failure. No other loose rocks in source area but indicative of the type / volume of failure that may occur in this section.	No change noted during 2023 inspection	
Ch. 788	**2016 Inspection:** Overhanging block at crest of slope with release joint and only partial overlap keying block in place. Holly bush immediately to the left obscuring rock mass.	No change noted during 2023 inspection	AA4-2
Ch. 800	**2016 Inspection:** Small soil slip noted approximately 5m above road level (below tree stump). Debris from scar not likely to reach road.	No change noted during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 810	**2021 Inspection:** Soil wedge slipped and landed in roadside ditch in April 2021, leaving slight overhang of vegetation at crest of failure that could fail in future.	No change noted during 2023 inspection	
Ch. 830	-	**2023 Inspection:** A block 0.5m x 0.3m x 0.2m in ditch. Fallen from 1m above toe in area of high water flow. Ditch effective.	AA4-3
Ch. 842	-	**2023 Inspection:** Ditch would benefit from clearance	AA4-4

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1	
Risk Value =	**9.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Scale fractured rock mass at Ch. 745. - Scale / dowel overhanging block at Ch. 788, coppice adjacent holly tree and inspect rock mass behind.	- Clear out ditch at base of small watercourse at Ch. 842.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.7 Slope Ref. AA4 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA4 Upper	**Chainage:**	0855–0952	**Start Grid Ref:**	NG 89586 36352	**End Grid Ref:**	NG 89626 36422	**Elevation:**	m AOD

General Photo of Slope	**General Photo of Slope**
	

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
March 2021	Ch. 858	Three blocks have come to rest at deer fence. Appear to have originated from waterlogged slope ca. 8m above road. No imminent risk of further failures. **During 2023 Inspection:** c.25 to 30m upslope there are several uprooted trees with boulders in root balls – considered to be most likely source of blocks at fence.	AA4U-1

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	Boulder removed at NG 89631 36342			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
NG 89640 36335	**2016 Inspection:** Boulder 3.2m high x 1.6m wide x 1.3m deep sitting partially embedded in slope. No sign of imminent movement but should be monitored during future inspections.	Not inspected during 2023 inspection	
Boulder field above tree line	**2018 Inspection:** Boulder field above treeline inspected for first time. Approx. 75m wide and 200m high. Slope angles up to approx. 40 degrees. Numerous angular boulders, including some stacked boulders, of varying size (max. $2m^3$) and with isolated trees. Vast majority have a good covering of moss / lichen suggesting they have been in situ for hundreds of years, however, occasional fresher blocks were noted. Currently at angle of repose but should destabilising mechanism (e.g. deer, additional rock falls, root jacking) occur there is a risk of boulders impacting the road.	Not inspected during 2023 inspection	
Crags above boulder field	**2018 Inspection:** Crags above boulder field inspected for first time. Dilated joints and evidence of root jacking from sporadic trees. Spalling of small blocks from toe of crags was observed.	Not inspected during 2023 inspection	
Ch. 858	**2019 Inspection:** Block ca. 0.75m x 0.25m x 0.2m at edge of deer fence. Spray paint present, indicating it has been previously identified during THC monthly inspections. Source not obvious.	**2023 Inspection:** c.25 to 30m upslope there are several uprooted trees with boulders in root balls – considered to be most likely source of blocks at fence. Similar events could happen periodically	AA4U-2

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
NE of Ch. 925	**2020 Inspection:** Steep slope is well set back from road. 6m increasing to 20m. Steeper slope back to deer fence at large stream at Ch. 1035 but no observed hazards.	Not inspected during 2023 inspection	
NG 8982 3633	**2021 Inspection:** Soil/rock wash out c.10m below grid reference. Evidence of channelised spring line upslope. Area below springs showing signs of instability. Hummocky ground surface with saturated tension cracks. Around 300mm soil cover creeping downslope. Around 20m below spring line there is a vegetated lobe on slope that may represent previous failure at this location. No immediate risk to road. Potential for further failure/debris flow exists in high rainfall events but debris likely to come to rest on slope before reaching treeline.	Not inspected during 2023 inspection	
Roadside slope	**2021 Inspection:** Roadside slope is fully vegetated with trees. Steep slope (typically ca. 40 degrees, locally steeper) was often observed to be waterlogged with numerous fallen trees. Specific observations: - NG 8970 3641: Spring located at top of treeline. Steep slope (ca. 40 degrees) below is waterlogged and hummocky with numerous trees down on slope. - NG 8967 3640: Gravel and cobble sized rock debris on slope adjacent to surface water flow. Risk of downslope movement in high rainfall, however, toe of slope is set back from road so not a significant risk. - NG 8963 3630: Numerous fallen trees on slope.	Not inspected during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1	
Risk Value =	**9.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install rock fall catch fence along toe of slope.	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.8 Slope Ref. AA5

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA5	**Chainage:**	1285–1383	**Start Grid Ref:**	NG 89799 36709	**End Grid Ref:**	NG 89864 36775	**Elevation:**	19m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	320	Height (m):	70	Length (m):	98	Vegetation Cover:	90% cover lower lope, 60% cover upper slope. Moss and bracken. Moss is up to 0.15 to 2.0m thick. Numerous deciduous trees upslope with large saplings down slope.
Ditch Details:	1m wide, 0.5m deep	Roughness:	Rough	Verge Width (m):	2m				

Engineering Description of Rock:
Strong to very strong thinly foliated pinkish grey medium grained schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2021	Ch. 1370	To inspect a fallen tree c.10m above road level. Findings - the fallen tree and rock mass above do not pose a significant risk to the road.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
February 2019	Ch. 1330	A 0.4m x 0.3m block 10m above deer fence.	
November 2019	Ch. 1350	A 0.5m x 0.3m rock has pierced fence and is in the roadside drain. This could have happened previously but only now visible due to vegetation die back.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2021 – Phase 12 works	Works include: - Drainage pipe between AA5/AA5A was repaired and debris cleared out from sump. - Debris cleared from ditch at base of gully between Ch. 1378 and 1382. - Scaling and coppicing carried out between Ch. 1365 to 1370.		Ch. 1360 - There is an accumulation of blocks from the scaling works behind the deer fence.	AA5-3

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Throughout section	**2012 Inspection:** Large number of small scale potential block falls identified approximately 25-45m above road (typically <0.1m3).	No change noted during 2023 inspection	
Throughout section	**2016 Inspection:** Presence of trees on/adjacent to isolated rock outcrops may lead to root jacking.	No change noted during 2023 inspection	
NG 89808 36661	**2016 Inspection:** Outcrop of fractured rock approximately 40m above road level	No change noted during 2023 inspection	
NG 89828 36663	**2016 Inspection:** Outcrop with detached block (~1m^3) with potential for additional blocks to fail.	No change noted during 2023 inspection	
Ch. 1285	**2020 Inspection:** Large (0.75m x 0.5m x 0.4m) and smaller block in ditch where it has burst through fence	No change noted during 2023 inspection	AA5-1
Ch. 1300	**2018 Inspection:** Numerous small blocks on slope and resting against deer fence (largest 0.4m x 0.3m x 0.2m).	No change noted during 2023 inspection	
Ch. 1323	**2016 Inspection:** Several small blocks (max. 0.2m x 0.2m x 0.2m) had accumulated at the edge of the deer fence, approx. 1m above road level. Numerous blocks of a similar size noted on slope above. The source of the blocks was investigated and identified as fractured rock within the root balls of upturned trees.	No change noted during 2023 inspection	
Ch. 1328	**2018 Inspection:** Several large blocks in roadside ditch (largest 0.4m x 0.3m x 0.25m). One block has burst through deer fence and landed in ditch, but other blocks may have landed on road before being moved. Total failure volume is 0.25 - 0.5m^3 . Source is not immediately obvious from road level but following inspection of upper slope crags were identified at ca. 50m above road level. The slope below has an overall angle of 55 degrees and comprises a broad gully containing lots of scree (numerous blocks of up to 0.4m diameter) and fallen trees (possible debris flow type failure).	No change noted during 2023 inspection	AA5-2

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 1360	**2017 Inspection:** Small accumulation of blocks behind deer fence originating from outcrop 5-6m above road level. Seepage and root jacking noted on rock slope with small blocks being washed out.	**2023 Inspection:** Greater accumulation of blocks behind fence as a result of 2021 scaling.	AA5-3

RISK RATING		**Comments**
Overall Hazard Rating =	3	Reduced from 4 in 2018 following re-assessment of potential failure size.
Pathway Rating =	4	Increased from 2 in 2018 to reflect probability of a failure impacting the road.
Receptor Rating =	1	
Risk Value =	**12.0**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install rock fall catch fence along toe of slope.	- Light scale outcrops at NG 89808 36661 and NG 89828 36663. (Only required if catch fence not installed.)	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.9 Slope Ref. AA5A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA5A	**Chainage:**	1383 - 1446	**Start Grid Ref:**	NG 89864 36775	**End Grid Ref:**	NG 89902 36818	**Elevation:**	19m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	320	Height (m):	70 – almost completely vegetated slope with isolated outcrops.	Length (m):	83	Vegetation Cover:	90% cover lower lope, 70% cover upper slope. Moss and bracken. Numerous deciduous trees upslope with large saplings down slope.
Ditch Details:	0.5m wide, 0.3 deep	Roughness:	Rough	Verge Width (m):	0.8m				

Engineering Description of Rock:
Strong to very strong thinly foliated pinkish grey medium grained schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2018	Ch. 1388 to 1450	To refine risk assessment and requirement for remedial works. Findings - There were numerous fallen trees with lots of dilated root-jacked moss covered on slope. Scree may be upturned and there is the potential for some to reach road.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
N/A			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Across slope	**2017 Inspection:** Numerous fallen and leaning silver birch trees with lots of dilated root-jacked rocks on slope. Scree may be upturned and there is the potential for some to reach road.	No change noted during 2023 inspection	
Ch. 1432	**2017 Inspection:** Fractured rock in upper section of slope with potential root jacking.	No change noted during 2023 inspection	
Ch. 1440	**2017 Inspection:** Fractured rock with potential root jacking 20m above road level.	No change noted during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	3	
Pathway Rating =	2	
Receptor Rating =	1	
Risk Value =	**6.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install roadside rock fall catch fence.	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.10 Slope Ref. AA6

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA6	**Chainage:**	1446 – 1503	**Start Grid Ref:**	NG 89902 36818	**End Grid Ref:**	NG 89936 36862	**Elevation:**	10m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	71	Azimuth (°):	310	Height (m):	35	Length (m):	57	Vegetation Cover:	Ranges between 40-100%. Generally comprises ground cover and saplings.
Ditch Details:	Widest section 0.8m deep, 2.3m wide (no ditch where rock slope close to road between Ch. 1446 to 1452).	Roughness:	Rough	Verge Width (m):	0.8 – 1.5				

Engineering Description of Rock:
Very strong thinly foliated dark grey fine to medium grained schist (PSAMMITE).

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose	Photo Reference
2023	Ch. 1485	To inspect the potential for planar failure and root jacking. Findings - Steep planes dipping into slope are dominant. No signification planar failure risk. There are overhangs of up to 2m but basal plane is dominant and these are 'keyed in' to slope. Potential for occasional small blocks to weather out of slope and this will be accelerated by root jacking (locally dilated fractures with heather growth), but presence of vegetated slope at base of rock sloped reduces risk of these reaching road.	AA6-1

THC Monthly Reports:

Date	Location	Comments	Photo Reference
N/A			

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2023 Inspection Observations
Before AECOM involvement (i.e. pre 2012)	Netting system on upper part of slope.	Details of netting system include: - Double twist netting - Top cable 16mm galvanised - c.5m anchor spacing and 25mm galvanised bars	No significant change noted to netting.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		- Cable-anchor connection: galvanised eye nuts - 3 cable clamps - Netting lap connections using Spenax rings - No laps on anchors or vertical reinforcing Note: in 2015, bottom anchors were installed. **2022 Inspection**: netting in good condition	
2015 – Phase 8 works	Bottom anchors installed to pre-existing netting system		No significant change noted.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Entire slope	**2019 Inspection:** No significant hazards observed. Potential failures limited to minor ravelling / root jacking. e.g. in May 2021 a small failure was observed at Ch. 1502, with debris in roadside ditch.	No change noted during 2023 inspection	
Ch. 1470 – 1500	**2020 Inspection:** Potential for Planar failure and root jacking. Targeted inspection at height recommended.	Targeted rope inspection completed in 2023. See comments above.	
Ch. 1502	**2021 Inspection:** ca. 0.25m³ of vegetation, soil and blocks in roadside ditch. Appear to originate from minor slip ca. 6m above road level. Potential for similar minor soil / rock slippages in this area but unlikely to pose a significant risk to road.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	1	
Pathway Rating =	2	Pathway rating reduced in 2019 following reassessment of potential failure pathways.
Receptor Rating =	1	
Risk Value =	**2.0**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- The build-up of debris should be monitored and clearance works undertaken as required to maintain its capacity.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.11 Slope Ref. AA6A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA6A	**Chainage:**	1503 – 1606	**Start Grid Ref:**	NG 89936 36862	**End Grid Ref:**	NG 89995 36943	**Elevation:**	76m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	300	Height (m):	35	Length (m):	103	Vegetation Cover:	Fully vegetated slope (trees and ground cover) with occasional rock outcrops.
Ditch Details:	Ch.1503-1530 0.8m wide, 0.3m deep. Ch. 1530-1606 2m wide, 0.75m deep with bund 1m wide, 0.45m high	Roughness:	Rough	Verge Width (m):	Ch. 1503-1530 0.5m wide Ch.1530-1606 0.8m wide				

Engineering Description of Rock:
Strong very narrowly banded dark grey crystalline medium grained schist (PSAMMITE/SCHIST). Well defined foliation with schistosity.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2018	Upper crags	To inspect conditions of upper crags. Findings - Large buttress (1.5m x 1.5m x 7m) at ca. 50-60m above road level with large, dilated fracture behind. The rock is thinly bedded and lightly folded with beds also dilated. To the left of this is a broken, dilated, rock mass siting on a daylighting discontinuity, which is only keyed in at left hand side of the base. Down slope from this there is another buttress which has moved historically of ca. 7m x 2m x 1.5m size, where the key stone in the rock mass is observed to have been pushed out. Potential for significant failure, with buttress breaking up and falling down gully. Recommendations - Catch fences in gully below have retained debris in past but have been damaged. Uppermost catch fence should be replaced with a higher capacity catch fence. Risk mitigated by installation of catch fence during Phase 12 (2021) works.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
Before AECOM involvement (i.e. pre 2012)	Catch fences in gully and rock buttress at Ch. 1511.	Note: in 2021 new catch fences were installed.		
2021 – Phase 12 works	Installation of new upslope debris flow catch fence at Ch. 1511.	Catch Fence is 6m wide x 6m height situated in gull c.25m above road level.	**2023 Inspection:** New catch fence in gully assessed and noted to be in good condition. Three blocks (up to 0.4m x 0.4m x 0.3m) thought to be recent failures were retained by older upslope catch fence which has punctures in it.	AA6A-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 1505	-	**2023 Inspection:** Accumulation of blocks at roadside deer fence ca.3m above road level, along 5m length of slope. Debris height ca. 0.4m. Generally 0.1 x 0.1 x 0.1m blocks but maximum 0.3 x 0.3 x 0.3m. Directly downslope of catch fence but there is a scree slope between catch fence and deer fence so scree has possibly washed down slope. Clearance recommended as the deer fence is not designed to retain material.	AA6A-2
Ch. 1510	**2029 Inspection:** Two small 0.15m x 0.1m x 0.1m blocks in ditch. To have landed in ditch they possibly cleared the deer fence though, perhaps reaching the road.	No change noted during 2023 inspection	
Ch. 1579	**2027 Inspection:** Accumulation of blocks behind deer fence (approx. 0.3m x 0.3m x 0.3m)	No change noted during 2023 inspection	
NG 90013 36911	**2026 Inspection:** Crags exhibit naturally dilated joints, with signs of historical movement. However, rock mass structure is favourable (foliation dipping into slope) and only minor issues associated with small overhangs and root jacking were observed.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	4	Increased from 2 in 2018 due to identification of buttresses which have the potential to break out and fall down gully.
Pathway Rating =	2	Decreased from 4.5 in 2022 due to construction of catch fence in gully.
Receptor Rating =	1	Reduce from 1.2 in 2018 following confirmation of sightline beneath potential failures.
Risk Value =	**8.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install roadside rock fall catch fence.	N/A	- Clearance of blocks retained behind deer fence

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.12 Slope Ref. AA6B

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA6B	**Chainage:**	1606-1752	**Start Grid Ref:**	NG 89995 36943	**End Grid Ref:**	NG 90124 36990	**Elevation:**	100m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	300	Height (m):	35	Length (m):	146	Vegetation Cover:	100% - No rock outcrops noted and slope is covered in vegetation
Ditch Details:	N/A	Roughness:	N/A	Verge Width (m):	N/A				

Engineering Description of Rock:
Isolated outcrops only. Very strong thinly foliated dark grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
N/A			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Whole slope	**2014 Inspection:** No significant hazards observed. Boulders present on slope and in drainage gulley. No destabilising mechanism identified but likely to be from upturned root balls.	No change noted during 2023 inspection	
Ch.1654	**2022 Inspection:** Fallen tree. Does not present risk to road.	No change noted during 2023 inspection	
Ch.1708	**2020 Inspection:** Two trees down c.10m upslope. Loose rock behind root ball on slope but not posing risk to road.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	2	Increased from 1 in 2018 following identification of failed blocks at roadside.
Pathway Rating =	2	
Receptor Rating =	1.2	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.13 Slope Ref. AA7

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA7	**Chainage:**	1752 - 1880	**Start Grid Ref:**	NG 90124 36990	**End Grid Ref:**	NG 90213 37019	**Elevation:**	13m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	75 - 80	Azimuth (°):	336	Height (m):	30	Length (m):	128	Vegetation Cover:	60-70% cover. Lots of saplings established on slope.
Ditch Details:	1m wide, 0.75 deep. Bund 0.6m wide, 0.3m high	Roughness:	Rough	Verge Width (m):	None				

Engineering Description of Rock:
Very strong thinly foliated dark grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2021	Ch. 1770	To inspect dilated block towards crest of crag c.30m above road level. Findings - Block is keyed in and not at risk of failure.
2021	Ch. 1775	To inspect gully between AA6B and AA7. Findings - Material at failure scar noted to be very loose and fractured with potential for blocks to weather out / become dislodged and move downslope. Recommendations - Although set well back from road there is a risk some blocks could roll downslope for a significant distance so light scaling of the failure scar is recommended (Completed during 2021 Phase 12 works).

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
February 2019	Ch. 1775	Four 0.3m x 0.3m blocks in culvert catch pit area.	
March 2019	Ch. 1800	A 0.5m x 0.4m block 7m up.	
September 2020	Ch. 1825	After prolonged heavy rain a slip occurred on 13/09/20. A root ball came down, bringing with it detritus, rocks and mud. The slip was some 2-3 tonnes and mostly came to rest in ditch verge, with slight overspill to road. Slip originated from ca. 5m above road and came down watercourse. Ditch and culvert cleared 14/09/20.	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2015 – Phase 8 works	Block at Ch. 1780 c.20m above road level removed by heavy scaling		
2021 – Phase 12 works	- Scaling of loose / fractured rock between Ch. 1770 to 1775. - Gully cleared of debris at Ch. 1828		

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 1775	**2018 Inspection:** Two blocks in drainage gully which had passed beneath deer fence above. Additional block resting against deer fence. Source not obvious but given 2014 observation of no rock outcrops likely to be from upturned root ball. Drain not currently blocked but keep under observation.	No change noted during 2023 inspection	
Ch. 1803	**2018 Inspection:** Dilated fractures observed c. 15m above road level but no obvious fractures at base of block and chances of reaching road level if it does failure are low due to large ditch.	No change noted during 2023 inspection	AA7-1
Ch. 1820	**2019 Inspection:** Fractured rock on right hand side of previous washout, low risk due to verge and ditch	No change noted during 2023 inspection	AA7-2
Ch. 1820 to 1826	**2018 Inspection:** Washout of soil from gulley around a third of the way up slope (mixture of angular blocks and topsoil). Overhanging soil/rock mass above failure but unlikely to reach road in event of failure.	No change noted during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	2	Increased from 1 in 2018 to reflect potential failure volume.
Pathway Rating =	2	Reduced from 3 in 2018 due to decreased likelihood of failure reaching road.
Receptor Rating =	1.2	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.14 Slope Ref. AA8

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA8	**Chainage:**	1880-1940	**Start Grid Ref:**	NG 90243 37019	**End Grid Ref:**	NG 90299 37045	**Elevation:**	20m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	75 - 80	Azimuth (°):	326	Height (m):	25 - 30	Length (m):	63	Vegetation Cover:	Up to 60% cover comprising lots of ivy, grass and small saplings.
Ditch Details:	0.5-1m deep; 2-5m wide Bund: 0.5m high, 0-4m wide	Roughness:	Rough	Verge Width (m):	0-1m				

Engineering Description of Rock:
Very strong thinly foliated dark grey schist. Contains occasional thin quartz foliations (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
May 2018	Ch. 1850	Large stones in drain (x2)	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting between Ch. 1895 and 1932.	Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - c.7m anchor spacing - Bottom anchors are stainless steel - Cable-anchor connection: stainless steel eye nuts and shackles at bottom - Netting lap connections using Spenax rings - No laps on anchors or vertical reinforcing Bimetallic corrosion protection present at bottom anchors but not in full contact. **2021 Inspection**: Netting generally in good condition, although bottom cable is locally slightly corroded. Bottom anchors and	No significant change to netting conditions observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		shackles are stainless steel. There is a plastic sheathing, however, locally the shackles are in contact with the galvanised cable. PVC coating cracking locally; no corrosion of wire where visible.	
2015 – Phase 8 works	- Large pillar of rock at Ch. 1920 at risk of toppling removed by heavy scaling, The ditch was cleared and roadside bund created. - Tree coppicing and light scaling carried out near crest of rock face.		

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 1880	**2021 Inspection:** Minor accumulations of gravel sized rock at base of gully but still plenty of capacity in ditch.	No change noted during 2023 inspection	
Ch. 1880 to 1895	**2019 Inspection:** No netting. Vegetated. Root jacking potential but large ditch below.	No change noted during 2023 inspection	
Ch. 1892 to 1896	**2022 Inspection:** Soil slip/wash-out from 8m above ground level. There is a large ditch below with sufficient capacity.	No change noted during 2023 inspection	
Ch.1895 to Ch.1932	**2020 Inspection:** Vegetation well established and obscuring parts of the slope.	No change noted during 2023 inspection	
Ch. 1930	**2018 Inspection:** Ongoing failure of small blocks from crest. Debris successfully contained by rock trap ditch/bund. Area should be kept under observation in future inspections.	No change noted during 2023 inspection	
Ch. 1940	**2021 Inspection:** A lot of overhangs towards crest. Vegetation cover c.40 to 50% and dilated fractures evident. Some accumulation of gravel to cobble sized rock debris at base of watercourse within a 1 to 2m wide x 1m deep ditch with roadside bund. Still capacity and so does not require clearance.	No change noted during 2023 inspection	AA8-1

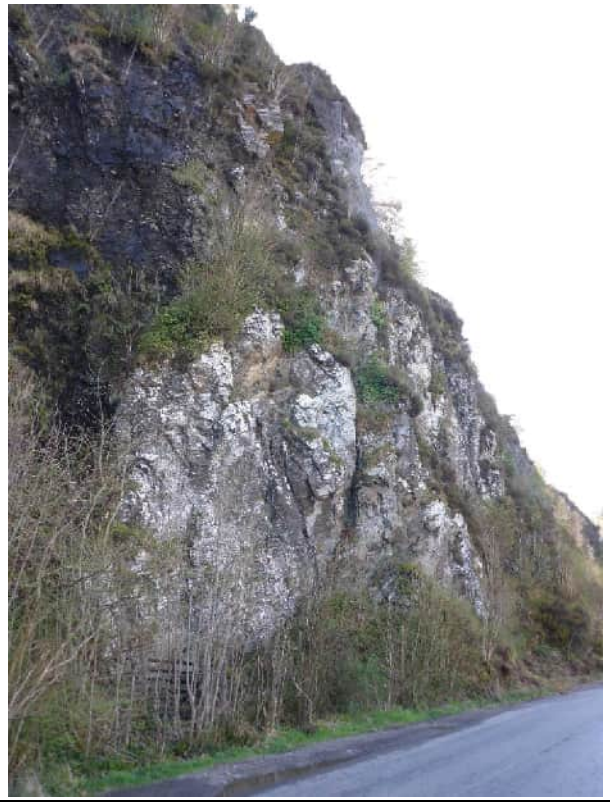
RISK RATING		Comments
Overall Hazard Rating =	2	
Pathway Rating =	2	
Receptor Rating =	1	
Risk Value =	**4.0**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- De-vegetation / coppicing of entire slope - The build-up of debris within ditch should be monitored and clearance works undertaken as required to maintain its capacity - Potential for bimetallic corrosion of bottom cable at anchor points – keep under observation.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.15 Slope Ref. AA9

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA9	**Chainage:**	1940-1985	**Start Grid Ref:**	NG 90299 37045	**End Grid Ref:**	NG 90338 37061	**Elevation:**	12m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	82	Azimuth (°):	350	Height (m):	30	Length (m):	45	Vegetation Cover:	30-40% and locally >75% cover. Generally comprises grass and saplings.
Ditch Details:	Between Ch.1973 to 1988 – 1m wide, 0.5m deep ditch rock face more set back	Roughness:	Rough	Verge Width (m):	1.4m				

Engineering Description of Rock:
Strong thinly foliated dark grey medium schist. Some foliations are mica rich. Small ‘z’ folds were noted. (PSAMMITE).

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose
2021	Ch. 1978	To inspect overhanging square blocks near crest with dilated joint at rear. Findings - Block c.2m x 1m x 0.5m and appears to have dilated fracture at right hand side. Overall appears keyed in but vegetation growth around block could lead to root jacking. Recommendations: Recommend future inspection at height.

THC Monthly Reports:

Date	Location	Comments	Photo Reference
N/A			

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2023 Inspection Observations
Before AECOM involvement (i.e. pre 2012)	Netting between Ch. 1965 to 1975. No netting on lower 15m of slope.	Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - c.5m(?) anchor spacing and 25mm stainless steel bars - Cable-anchor connection: stainless steel eye nuts - 4 cable clamps (possibly others not identified) - Netting lap connections using Spenax rings	No significant changes to condition of netting observed

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		- No laps on anchors or vertical reinforcing - A 0.2m to 0.3m gap between bottom cable and rock face. **2022 Inspection:** Bottom cable showing early signs of corrosion.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Whole slope	**2012 Inspection:** Potential for ravelling and small block falls	No change noted during 2023 inspection	
Ch. 1965-1975	**2016 Inspection:** Netting noted to be gaping at sides and bottom. Potential for blocks up to 0.5m^3 to fall out either side or bottom and onto road below.	No change noted during 2023 inspection	
Ch.1978	**2020 Inspection:** Overhanging square blocks near crest with dilated joint at rear observed. Rope access inspection completed in 2021.	No change noted during 2023 inspection	AA9-1

RISK RATING		Comments
Overall Hazard Rating =	2	
Pathway Rating =	3	
Receptor Rating =	1	
Risk Value =	**6.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	Improve netting system between Ch. 1965 and 1975. - Install vertical cables down either side of netting (25m each side) with additional anchors installed to secure in place (6 No. each side). - Install 2 No. lateral cables to profile netting (10m long). - Install 1 No. additional bottom anchor.

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
		- Future rope access inspection recommended to further inspect the overhanging block at Ch. 1978.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.16 Slope Ref. AA10

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA10	**Chainage:**	1985-2297	**Start Grid Ref:**	NG 90338 37061	**End Grid Ref:**	NG 90610 37206	**Elevation:**	15m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	85	Azimuth (°):	332	Height (m):	40	Length (m):	312	Vegetation Cover:	70% cover. Generally comprises grass and small to medium sized trees, with occasional large trees.
Ditch Details:	Ch. 1985-2010 only. Width 1.7, Depth 0.4	Roughness:	Rough	Verge Width (m):	Generally 10m, but 1m minimum.				

Engineering Description of Rock:
Very strong thinly foliated dark grey and white fine to medium schist. Contains thin laminations of quartz. (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2018	Ch. 2130	To inspect wedge c.15m above road level with trees growing above to left of block with potential for root jacking.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
April 2013		Falling tree dislodged soil and rock with isolated block landing in road. Note: source of failure inspected in 2014 – no significant hazard identified.	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
N/A			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 1995	-	**2023 Inspection**: Small soil slip has come to rest on slope before deer fence (c.5m above toe of slope)	AA10-1
Ch. 1997	**2019 Inspection**: Potential root jacking of column of rock ca. 5 to 8m above toe. 3-4m verge so low risk.	Obscured by vegetation during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2000	**2012 Inspection**: Large scale potential wedge failure. Is c.10m wide x 10m high feature at the crest of the rock slope. No evidence of dilated fractures here and mass failure considered unlikely.	No change noted during 2023 inspection	AA10-2
Ch. 2033-2188	**2016 Inspection**: Noted that slope is well vegetated in this area with uprooted trees. Root jacking evident, with potential to dislodge blocks. Recent failures evident. Specific hazards identified at Ch. 2068 and Ch.2130.	No change noted during 2023 inspection	
Ch. 2075	**2012 Inspection**: Potential wedge failure with root jacking identified.	No change noted during 2023 inspection	
Ch. 2110	**2017 Inspection**: Tree down c.8m above road level. Root ball has soil and rock weathering out but unlikely to be a risk to the road.	No change noted during 2023 inspection	
Ch. 2130	**2018 Inspection**: Potential wedge failure observed ~15m above road level. Potential for root jacking and release joints observed. The trajectory of a potential failure is difficult to predict, with the probable pathway to the left of the roadside outcrop. Potential failure volume is large enough to burst through the deer fence and may either come to rest in the ditch or at the edge of the road.	No change noted during 2023 inspection	AA10-3
Ch. 2185	**2021 Inspection**: Small accumulation of gravel to cobble sized blocks at fence transported by intermittent waterflow in gully. No rocks past fence and at roadside so risk not considered to be significant	No change noted during 2023 inspection	
Ch. 2188 to 2295	**2016 Inspection**: Rock face set further back here and it is considered that most failures within this section would be contained by the existing ditch and verge at the toe of the slope.	No change noted during 2023 inspection	
Ch. 2240	**2022 Inspection**: At crest of slope there are a number of trees leaning towards the road. If these fall there is potential for root balls to dislodge blocks, however, these are unlikely to impact the road as slope is set-back from road.	No change noted during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	3	Reduced from 4 in 2018 due to detailed rope access inspection of wedge failure and accurate determination of potential failure volume.
Pathway Rating =	3	Increased from 2 in 2018 due to inspection of failure trajectory.
Receptor Rating =	1	
Risk Value =	**9.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install targeted combination of roadside rock fall catch fences and netting.	- Scale potential wedge failure at Ch. 2130.	- Targeted coppicing of trees growing in rock exposures and light scaling of broken/unstable rock.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.17 Frenchman's Burn

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	Frenchman's Burn	**Chainage:**	2315	**Start Grid Ref:**	NG 90613 37210	**End Grid Ref:**	-	**Elevation:**	-

Upper Basin	**Lower Basin**
	

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
November 2020	Ch. 2345	Rock slip ca. 50m east of Frenchman's Burn. Failure occurred ca. 8m above road level in outcrop set back from road behind deer fence.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
Before AECOM involvement (i.e. pre 2012)	Formation of debris catch basins			
2020	Catch basins were cleared out by THC in late 2020			
2021	THC cleared debris from catch basins in summer 2021			

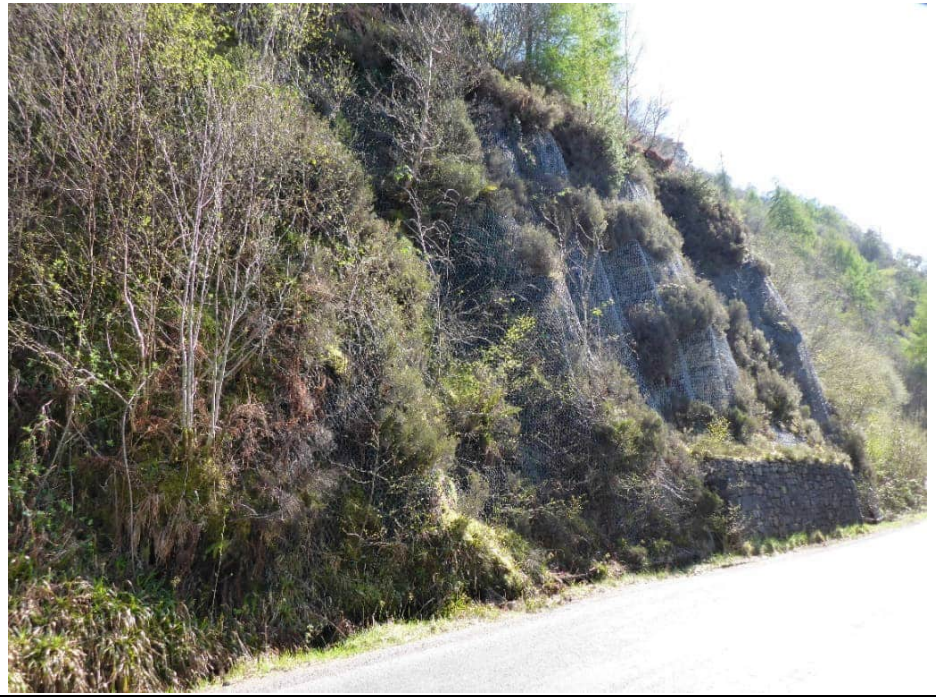
Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2345	**2020 Inspection:** Failure reported by THC (between Frenchman's Burn and AA11) inspected. Minor root jacking on face ca. 10m back from road edge. Potential for additional material to fail (ca. 1m³) but not posing risk to road due to verge width.	No change noted during 2023 inspection	
Ch. 2315	**2021 Inspection:** Water levels are low. Both the lower and upper catch pits have good capacity.	No change noted during 2023 inspection	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Clear debris from basins as required to maintain capacity

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.18 Slope Ref. AA11

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA11	**Chainage:**	2360-2399	**Start Grid Ref:**	NG 90657 37232	**End Grid Ref:**	NG 90698 37266	**Elevation:**	10m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	332	Height (m):	20	Length (m):	39	Vegetation Cover:	0 to 60% cover comprising heather, grass and some sapling trees.
Ditch Details:	0.4m deep, 0.6-1m wide	Roughness:	Rough	Verge Width (m):	0-0.3m				

Engineering Description of Rock:
Extremely strong thinly foliated dark grey and white SCHIST. Foliations comprise quartz. Approximately the same quantity of dark grey and white foliations. (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)		Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - c.5-6m anchor spacing (bottom anchors up to 11m) and 25mm galvanised bars (2 No. platypus anchors) - Cable-anchor connection: stainless eye nuts (M20 thread) - 4 cable clamps - Netting lap connections using 2 staggered rows of Spenax rings every aperture - No laps on anchors or vertical reinforcing - No bimetallic corrosion protection between cable and eye nuts. Bottom cable corroded. Top cable secured with combination of direct anchors and corroded dropper cables attached to platypus anchors. **2020 Inspection:** Damaged intermediate bottom anchor (mesh caught and torn by grass cutter, pulling <1m long corroded anchor from face) at Ch. 2386.	No significant change to netting conditions observed.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2364	**2018 Inspection:** Wedge failure identified, comprising an overhanging column of rock ca. 6-8m above road level. Wedge of rock below has previously failed, possibly during construction but joints are tight and overhang. Not at imminent risk of failure.	No change noted during 2023 inspection	
Ch. 2377	**2018 Inspection:** Overhang noted ca. 8m above road level at up chainage end of buttress. Overhang ca. 1m. Dilated fractures and potential for small blocks to free fall ca. 2-3m before impacting mesh. Maximum block size ca. 0.4m x 0.4m x 0.4m so likely to be retained by existing netting.	No change noted during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	2	
Pathway Rating =	2	
Receptor Rating =	1.4	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Install bimetallic corrosion protection between existing galvanised cable and stainless steel eye nuts. - Replace bottom cable and install additional bottom anchors. - Replace dropper cables (allow 10No. 10m long) and install additional anchors (allow 6No.).

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.19 Slope Ref. AA12

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA12	**Chainage:**	2399 - 2467	**Start Grid Ref:**	NG 90698 37266	**End Grid Ref:**	NG 90740 37326	**Elevation:**	20m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	306	Height (m):	20	Length (m):	98	Vegetation Cover:	20-60% ground cover (gorse, heather, ferns) and small to medium trees.
Ditch Details:	None between Ch. 2399 to 2426, otherwise: 1.1m deep, 2.8m wide	Roughness:	Rough	Verge Width (m):	0.4m between Ch. 2399 to 2426				

Engineering Description of Rock:
Very strong dark to light grey very narrowly banded crystalline coarse to medium grained SCHIST.

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose/Findings	Photo Reference
2023	Ch. 2428	To inspect area where rock fall occurred and to determine if potential for further rock falls. Findings - Block keyed in at right hand side. Large, dilated fracture at back (block sticking out obliquely). To left of block there is another block of concern which was loose and removed/scaled during the rope access inspection. Rest of area is not at imminent risk of failure. Recommendations - Keep under observation during monthly/annual inspections.	AA12-1 AA12-2

THC Monthly Reports:

Date	Location	Comments	Photo Reference
March 2023	Ch.2480	Rock fall event occurred on 10/03/2023. Note - THC record this within AA13/14 Upper however, the chainage is out-with AA13/14 Upper start and end chainage.	

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2023 Inspection Observations
2015 – Phase 8 works	7No. dowels installed at Ch. 2410, Ch. 2413 and Ch. 2423.		

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2017 – Phase 9 works	- TECCO netting system installed between Ch. 2411 to 2427. - Spider netting system installed at Ch. 2462. - De-vegetation and light scaling.	**2020 Inspection:** TECCO netting locally has slight light coloured coating.	No significant change to netting condition observed.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
NG 90790 37253	**2018 Inspection:** Large gully ca. 15m wide and 4m deep with watercourse above boundary between AA12/AA13. There is watercourse at risk of being washed out below. On upper slope there are small blocks (up to 0.3m diameter) presumably dislodged in root balls, and there is limited rock exposure.	No change noted during 2023 inspection	
Ch. 2399 to 2411	**2021 Inspection:** Vegetation well established on slope without netting (ca. 40% gorse cover). Potential for root jacking to cause small scale ravelling.	No change noted during 2023 inspection	
Ch. 2428	-	**2023 Inspection:** Several blocks in verge (up to 0.3m x 0.2m x 0.15m). Cumulatively around x10 blocks. Some blocks have come from c.10m up and have left overhang. Other tabular blocks have possibly come from beneath doweled overhanging block? Additionally, small block in rail boundary c. 0.25m x 0.1m x 0.2m. No fence damage and slope height here means unlikely block would have cleared fence. Most likely that block impacted road/roadside and someone has placed it within the railway boundary when clearing it away from the road.	AA12-3 AA12-4

RISK RATING		Comments
Overall Hazard Rating =	1	
Pathway Rating =	2	Pathway rating increased from 1 in 2019 following re-assessment.
Receptor Rating =	1	
Risk Value =	**2**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.20 Slope Ref. AA13

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA13	**Chainage:**	2467-2562	**Start Grid Ref:**	NG 90740 37326	**End Grid Ref:**	NG 90796 37399	**Elevation:**	12m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:													
Dip (°):	70 to 80	Azimuth (°):	301	Height (m):	25 to 30	Length (m):	95	Vegetation Cover:	40-50% cover comprising a lot of gorse and saplings	Ditch Details:	Locally no ditch. Where present 0.5m deep, 1.5m wide. Bund half way along.	Roughness:	Rough
Verge Width (m):	0-4m												

Engineering Description of Rock:
Very strong thickly foliated GNEISS with quartz rich bands

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
Before AECOM involvement (i.e. pre 2012)	Netting installed	Details of netting system include: - PVC coated double twist - Top cable 12mm galvanised - c.5.5m anchor spacing and 25mm stainless steel bars - Cable-anchor connection: stainless steel eye nuts - 3 cable clamps - Netting lap connections using 3 rows of Spenax rings every third aperture. - No laps on anchors - Vertical Reinforcing: 8mm cable at 1m centres	No significant changes to netting observed.	AA13-1

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
		Not all of the face is netted. The following faults have been identified with the netting system: small scale puncturing of mesh; wide spacing of spenax rings joining vertical reinforcing cables; slack cables; and corroded cable clamps. **2022 Inspection**: Netting has been torn, potentially by grass cutter at Ch. 2518.		
2015 – Phase 8 works	- Passive netting system extended across slope between Ch. 2552 to 2562.		No significant changes to netting observed.	
2017 - Phase 9 works	- Damaged netting repaired and slope re-profiled. - Dowel installation - Profiling cable installation - De-vegetation		No significant changes to netting observed.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2535	**2021 Inspection:** Overhanging area c.12 to 15m above toe with gaping mesh below. Potentially some dilated fractures around base of overhang. Large verge and ditch at toe mean low risk to road.	No change noted during 2023 inspection	AA13-2
Ch.2545	-	**2023 Inspection:** Blocks behind netting c.1.5m above toe, source c.5m above toe (0.5m x 0.3m x 0.1m). Not extensively straining/deforming netting. No action required.	AA13-3
Ch. 2558	**2019 Inspection:** Continued accumulation of gravel to cobble sized debris at base of watercourse. Not blocking ditch and so no clearance work required. Keep under observation.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	1	
Pathway Rating =	2	Pathway rating increased in 2019 following re-assessment.
Receptor Rating =	1.2	
Risk Value =	**2.4**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Replace corroded cable clamps, re-tension and install additional spenax rings on vertical reinforcing cables between Ch. 2513 and 2528.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.21 Slope Ref. AA13/14 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA13/14 Upper	**Chainage:**	2505–2650	**Start Grid Ref:**	NG 90830 37319	**End Grid Ref:**	NG 90904 37388	**Elevation:**	m AOD

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	Boulder removed at NG 89631 36342			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2016 Inspection:** Main risk on this slope is associated with the uprooting of trees and boulders falling from their root balls. As many trees have fallen as are left standing and those that remain are leaning. A potential solution could be to fell the remaining trees leaving a 1-2m high stump and allowing the tree trunks to fall in line with / along the slope. This would form an interlocking barrier that will help to retain boulders on the slope and remove the risk of trees uprooting and exposing/releasing blocks in root balls. As a minimum, area should be surveyed annually by aerial drone, with topographic and photographic surveys to monitor condition of trees and frequency of tree falls.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
NG 90850 37349	**2012 Inspection:** Potential for blocks up to approximately 7m³ to fail .	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
	2013 Inspection: A tabular boulder 0.9m x 0.7m x 0.2m lodged between two trees; large tabular boulder 1.7m x 1.2 x 0.35m undercut by approximately two thirds with boulders resting on top; occasional blocks on rock face at risk of toppling (up to 0.6m x 0.4m x 0.25m).	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
NG 90846 37351	**2016 Inspection:** Detached tabular boulder (1.6m x 1.0m x 1.0m). Not currently at risk of moving downslope, but if adjacent tree uproots this could destabilise it.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
NG 90900 37380	**2016 Inspection:** Potentially unstable block located 20m above this location on an outcrop beneath a fallen tree. Estimated to be 2m x 1m x 1m.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
NG 90807 37277	**2018 Inspection:** Risk of fallen trees with upturned root balls dislodging blocks remains high.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
NG 90840 37318	**2018 Inspection:** At ca. 100m above road level tree has slid down slope root ball first dislodging blocks in root ball and underlying crag. It appear the debris has all be caught by fallen trees on the slope below.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
0-20m NW of above	**2018 Inspection:** Risk of wedge failure from wedge with tree growing out of top. Blocks beneath are observed to have been dislodged by around 20mm. Blocks which fail would free fall and tumble down slope below, but due to fallen trees would be unlikely to reach road.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	
20m NW of above	**2018 Inspection:** Large block (3m long x 1.5m deep x 2.5m wide) with dilated fracture behind, which has been root jacked from the tree growing above. There is risk that the block could topple out but it is unlikely to reach the road due to the presence of fallen trees on the slope below.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1.2	
Risk Value =	**10.8**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Controlled removal or retention of unstable blocks.	- Risk to be better quantified and managed by photographic and topographic surveying and monitoring by aerial drone to assess the area affected, number of trees standing/fallen, with the area resurveyed annually to assess any changes, frequency of failures etc. - Fell trees. - Consider felling trees to fall along slope and leave stump 1-2m high to form barrier to down slope movement.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.22 Slope Ref. AA14E

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA14E	**Chainage:**	2630 - 2664	**Start Grid Ref:**	NG 90846 37438	**End Grid Ref:**	NG 90871 37455	**Elevation:**	11m AOD

Photo	
	

Rock Slope Characteristics:									
Dip (°):	86	Azimuth (°):	347	Height (m):	30	Length (m):	33	Vegetation Cover:	Rock slope ca. 10 – 20% cover. Some grass with occasional sapling and gorse at crest of rock slope.
Ditch Details:	Width 1.0-1.2 Depth 0.8	Roughness:	Rough	Verge Width (m):	0-0.8m at roadside 20m to toe of rock slope				

Engineering Description of Rock:
Strong thinly foliated dark grey fine to medium grained SCHIST. Contains occasional thin foliations of quartz. Some laminations were noted to be mica rich. (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose/Findings**
2017	Ch. 2620	To inspect crest of rock face where potential failures may occur (existing catch fence my not prevent these reaching road). Findings - It was noted that there were overhangs with dilated joint sets at the crest of the rock slope behind low catch fence with green posts. If failure were to occur it would likely exceed capacity of catch fence: fence is only 1.5m height with no break rings. Recommendations - Recommend TECCO netting with face pattern bolts on upper half of rock face and TECCO drape on lower half of rock face. Alternatively, an appropriately designed catch fence could be considered.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Mid-slope catch fence 1.5m high	Posts at 6m centres (140mm diameter, 8mm thick steel tubes). Fence constructed from double twist netting with 16mm horizontal stainless steel reinforcing cables at 0.4m vertical spacing. No brake rings.	Catch fence not assessed during inspection.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Crest of slope	**2012 Inspection:** Large overhang with dilated joints and potential for failures to exceed catch fence capacity/height.	No change noted during 2023 inspection	

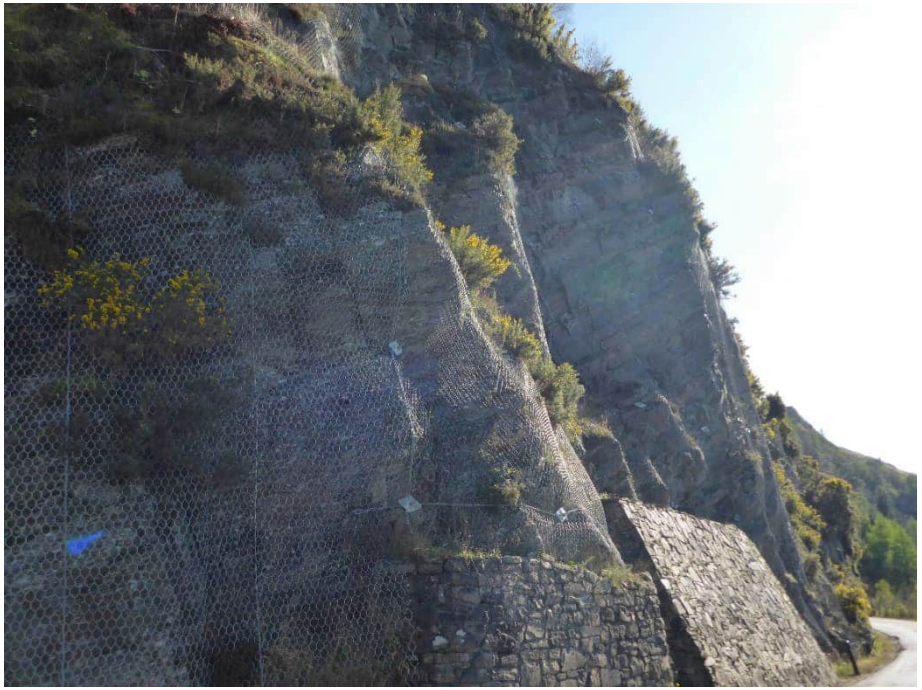
RISK RATING		**Comments**
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1.4	
Risk Value =	**12.6**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install TECCO netting with face pattern bolts on upper half of slope with TECCO drape on lower half; or install appropriately designed catch fence.	N/A	- Accumulation of debris behind existing catch fence to be monitored and clearance works undertaken in the event of a failure.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.23 Slope Ref. AA14W

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA14W	**Chainage:**	2562-2630	**Start Grid Ref:**	NG 90796 37399	**End Grid Ref:**	NG 90846 37438	**Elevation:**	12m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:							
Dip (°): 75	Azimuth (°): 324	Height (m): 15	Length (m): 85	Vegetation Cover: 100% on upper half of slope in places; c.10% on remaining slope. Predominantly comprising gorse bushes.	Ditch Details: Width 1.0 Depth 0.3	Roughness: Rough	Verge Width (m): 0.4m

Engineering Description of Rock:
Extremely strong to very strong grey and pink medium banded crystalline coarse grained GNEISS.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2017	Ch. 2615 to 2625	To inspect area (above buttress). This area has since been remediated in 2019.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Maccaferri Netting	Details of netting system include: - PVC coated double twist - Top cable 12mm galvanised - Up to 15m anchor spacing and 15mm bars - Cable-anchor connection: D shackle (connected with locking nuts on one side only)/Threaded eye nuts - 3/4 cable clamps - Netting lap connections using 2 row of cable twist connections every fourth aperture - No laps on anchors or vertical reinforcing **Note:** in 2013 new top cable and anchors were installed.	No significant change to netting observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2013 – Phase 7 works	New top cable and anchors installed between Ch. 2566 to 2576 and Ch. 2622 to 2627.	Anchor Type: 25mm GEWI bars	No significant change to netting components observed.
2019 – Phase 11 works	Active TECCO netting system installed between Ch. 2576 and 2633 to replace Maccaferri drape	**2021 Inspection:** TECCO netting in good condition. No defects observed other than very minor corrosion of some cut end bars.	No significant change to netting observed.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	-	**2023 Inspection:** Localised small blocks (ravelling) behind TECCO c.15-20m upslope above buttress. No action required.	

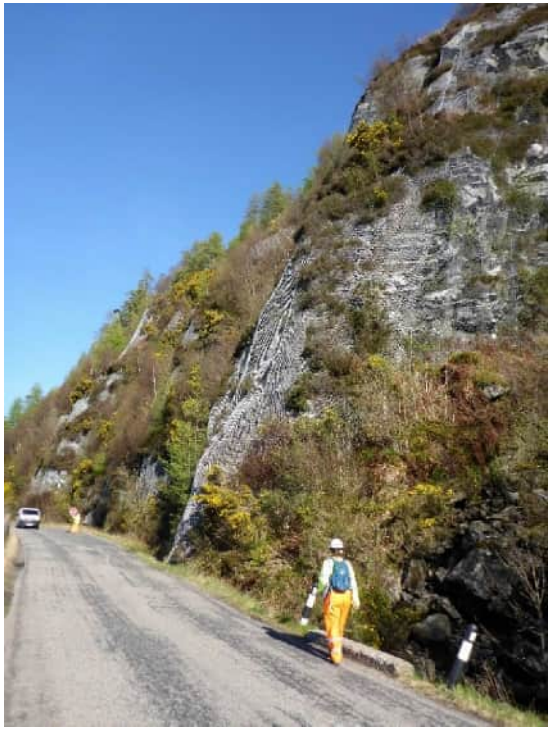
RISK RATING		Comments
Overall Hazard Rating =	2	
Pathway Rating =	1	
Receptor Rating =	N/A	Receptor rating only applicable when pathway rating is ≥2.
Risk Value =	**2**	- Formerly very high risk. Re-assessed following Phase 11 works and hazard and pathway ratings reduced. - Re-assessed during the 2022 inspection following changes to receptor rating. Risk value reduced from 2.4.
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.24 Slope Ref. AA15

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA15	**Chainage:**	2664-2851	**Start Grid Ref:**	NG 90871 37455	**End Grid Ref:**	NG 91005 37551	**Elevation:**	18m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	75	Azimuth (°):	335	Height (m):	25 - 30	Length (m):	171	Vegetation Cover:	50-60% cover; up to 75% locally: a lot of saplings, gorse bushes and heather.
Ditch Details:	Ch. 2690-2698: No Ditch Ch. 2695-2705: 2m wide, 0.3m deep Ch2705-2800: 2m wide, 0.5m deep.	Roughness:	Rough	Verge Width (m):	0.5 – 2.0m				

Engineering Description of Rock:
Very strong thickly foliated dark GNEISS with pinkish quartz bands.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting installed.	Details of netting system include: - PVC coated double twist - Top cable 12mm galvanised - 4 – 7m anchor spacing at crest (but only terminal anchors at toe) and 25mm(?) stainless bars and occasional platypus anchors (6mm stainless steel cable) - Cable-anchor connection: Stainless eye nuts (bar machined to M20 thread) and 150mm stainless faceplates - 3 cable clamps	No significant changes to netting observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		- Netting lap connections using 2 rows of spenax rings - No laps on anchors - 8mm cable at 1m spacing (3 cable clamps) **2016 Inspection:** Noted that there are only bottom anchors at either end of the passive rock fall netting system (true drape). Presence of 2-3m wide verge with ditch between Ch. 2713 and 2774 means debris is unlikely to reach road in this section but there is a potential for debris to reach road between Ch. 2663 and 2713. Top anchors noted to be infrequent and those that are visible are platypus type soil anchors.	
2015 – Phase 8 works	- Passive netting extended so now present between Ch. 2664 to 2773. - Active high strength netting (SPIDER mesh) installed over potential failure at Ch.2680		No significant changes to netting observed.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2790	**2016 Inspection:** Root jacking recorded beyond end of netting approximately 10m above road level and may have associated hazards.	No change noted during 2023 inspection	
Ch. 2807-2810	**2018 Inspection:** Numerous blocks in roadside ditch originating from failure ca. 4-5m above road level, the largest is 0.5 x 0.4 x 0.2m. Total failure volume of ca. 0.5-0.75m³. Root jacking is evident as the cause. Dilated fracture observed to left hand side of failure scar with the potential for similar size failures to occur in the future but the 2m wide x 0.3m deep ditch/verge should contain these failures. No remedial measures determined to be required.	No change noted during 2023 inspection	
Ch. 2817	**2017 Inspection:** Large block approximately 0.5m³ was noted on the verge. Block appears to be recent. The source of the block has not been confirmed but an uprooted tree 20m above road noted as a possible source.	No change noted during 2023 inspection	
Ch. 2820	**2019 Inspection:** Two broken posts observed on post and wire fence between road and railway. Appear to have been struck by vehicle.	No change noted during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2016 Inspection:** Vegetation (particularly gorse) becoming well established on rock slope obscuring rock mass and introducing potential for root jacking.	No change noted during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	3	Increased from 2 in 2021 to reflect increased root jacking risk,
Pathway Rating =	2	Reduced from 3 in 2018 following re-assessment of potential for failures to reach road.
Receptor Rating =	1.2	
Risk Value =	**7.2**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- De-vegetate rock face within existing passive rock fall netting (approx. 60% cover, 25m high slope). - Coppice trees towards crest of slope out with existing passive rock fall netting system from Ch. 2790 to 2851. - Install additional bottom anchors at max. 5m spacing between Ch. 2690 and 2700. - Replace top cable and install additional top anchors at maximum 5m spacing.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.25 Slope Ref. AA15 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA15 Upper	**Chainage:**	2710–2733	**Start Grid Ref:**	NG 90955 37420	**End Grid Ref:**	NG 90971 37437	**Elevation:**	m AOD

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose/Findings**
2018	20m upslope from NG 90969 37395	To inspect condition of slope. Findings - Upper crag with large wedge sticking out ca . 85m above road level. No obvious dilation of joints but if failure were to occur may move significant distance downslope. Keep under observation for evidence of dilation. All elements of the strapping and cabling of the boulder undertaken as part of the Phase 7 works in 2013 are in a good condition.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	Block 100m above road level was strapped in place	**2018 Inspection:** All elements of the strapping and cabling are in a good condition. **2021 Inspection:** All elements of the strapping and cabling are good conditions, slight surface corrosion on cable only.		Not inspected during 2023 inspection.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2021 Inspection:** Two or three protrusions of rock sticking out but look to be well wedged into rock mass. Small trees are giving the potential for root jacking but nothing is dilated or showing signs of imminent failure.	Not inspected by foot during 2023 Inspection – please refer to drone survey review within section 4 of the report.	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1.2	
Risk Value =	**10.8**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Risk would be better quantified and managed by photographic and topographic surveying and monitoring by aerial drone to assess the area affected, number of trees standing/fallen, with the area resurveyed annually to assess any changes, frequency of failures etc. - Fell trees. - Consider felling trees to fall along slope and leave stump 1-2m high to form barrier to down slope movement.

Assessed in field by:	MT/JG	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.26 Slope Ref. AA16

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA16	**Chainage:**	2851-2923	**Start Grid Ref:**	NG 91005 37551	**End Grid Ref:**	NG 91069 37601	**Elevation:**	18m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:													
Dip (°):	60 - 75	Azimuth (°):	332	Height (m):	15 - 20	Length (m):	72	Vegetation Cover:	60 to 70% cover. Generally comprised ground gorse, grass, etc.	Ditch Details:	Only between Ch. 2890-2920. 2m wide, 1m deep.	Roughness:	Rough	Verge Width (m):	1

Engineering Description of Rock:
Very strong thinly foliated dark grey schist. (PSAMMITE)

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose
2017	Ch. 2910	To inspect overhanging area of rock between 10 to 15m above road level. Findings - Overhanging blocks at crest of slope are generally keyed in with the exception of some small blocks. Joint sets were not noted to be dilated. A verge of 1.5m and ditch (2m wide and 0.5m deep) was recorded at roadside and considered adequate to contain small failures. Ditch capacity increased during Phase 12 works.

THC Monthly Reports:

Date	Location	Comments	Photo Reference
August 2018		New stones in drain (x4)	
March 2020	Ch. 2890	Large rock in drain	
July 2020	Ch. 2860	Large rock in ditch (ca. 0.5 x 0.4 x 0.3m). First observed 03/07/20. Originated from ca. 3m upslope.	

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2023 Inspection Observations
Before AECOM involvement (i.e. pre 2012)	Netting present between Ch. 2872 to 2899.	Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - 4 – 5m anchor spacing and 25mm galvanised bars - Cable-anchor connection: Galvanised eye nuts - 3 cable clamps	No significant change to netting observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		- Netting lap connections using 3 rows of galvanised spenax rings - No laps on anchors and possibly no vertical reinforcing At each top anchor on the top cable an additional dowel is located approximately 2m above and connected to the main cable with a 16mm dropper cable.	
2021 – Phase 12 works	Capacity of ditch at Ch. 2890 to 2920 has been increased.		No change – ditch remains effective.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2851 to 2872	-	**2023 Inspection:** Vegetation very well established (gorse, grass, large saplings). No netting, no ditch. Slope set back from road edge c.0.5-0.8m. Some dilated fractures evident but slope largely obscured. Potential for root jacking to cause block falls up to 1m x 0.4m x 0.4m. Most expected to reach road.	AA16-1
Ch. 2888	**2016 Inspection:** Broken section of rock mass 5-10m above road level with potential to fail if root jacking continues. Block size typically ~0.1m³ but total failure volume could be 2-3m³. May exceed capacity of mesh if all fails at same time. Verge quite narrow so could reach road.	No change noted during 2023 inspection	
Ch. 2910	**2016 Inspection:** Overhang noted at the crest of the slope, however, 2017 rope access inspection indicated generally keyed in with no obvious dilation of joints. Area to be kept under observation in future inspections for signs of deterioration.	No change noted during 2023 inspection	AA16-2
Ch. 2922	**-**	**2023 Inspection:** 3x small blocks in verge (0.25m x 0.15m x 0.15m) – reported by THC to have occurred within 'the last few days'. Not known if landed here or moved here. Source not apparent from road level. Vegetated rock slope above but no fresh surfaces. Doesn't appear to have originated from roadside rockface. Upslope inspection carried out. AA16-17 Upper crags directly above but no evidence of recent rock fall. Blocks	AA16-3

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
		observed to be resting on slope and against trees with lots of evidence of deer activity. Possible that block was dislodged by a deer.	

RISK RATING		**Comments**
Overall Hazard Rating =	3	Increased form 2 in 2021 to reflect increased root jacking risk.
Pathway Rating =	2	
Receptor Rating =	1	
Risk Value =	**6.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Coppice tree growing within broken rock mass at Ch. 2888.	- Vegetation clearance / tree coppicing across slope. - Build-up of debris in ditch should be monitored and clearance works undertaken as required to maintain its capacity.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.27 Slope Ref. AA16-17-18 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA16-17-18 Upper	**Chainage:**	2766 - 3050	**Start Grid Ref:**	NG 91016 37460	**End Grid Ref:**	NG 91199 37660	**Elevation:**	m AOD

General Photo of Slope	General Photo of Slope
	

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose/Findings**
2013		Rope access inspections identified numerous potentially unstable blocks, including: NG 91021 37422 - potential toppling failure 2m x 1m x 0.5m; NG 91050 37453 - potential toppling failure 1.9m x 1.2m x 0.25m; NG 91063 37514 - 3 No. potential planar failures (2m x 2m x 0.5m) with dilated release joints. Unstable blocks were removed/ strapped during Phase 7 works (2013).

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	Unstable blocks removed and some strapped which were at risk of toppling 60-100m above road level at NG 91054 37487	Total estimated failure volume 3m³.	Not assessed during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2014 Inspection:** A number of blocks have been removed or strapped. However a large number of potentially loose blocks remain on small rock outcrops or within the root balls of uprooted trees.	No change noted during 2023 inspection	
General	**2016 Inspection:** The main risk is associated with fallen trees dislodging small boulders. Larger scale failures from the natural rock outcrops are likely to be infrequent (every 20-30 years)	No change noted during 2023 inspection	
High above AA16/17	**2018 Inspection:** Crags with fallen trees, including a large fallen tree at crest, and blocks which have been dislodged, including one 0.75m³	No change noted during 2023 inspection.	AA16/17U-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
	block that has come to rest on fallen trees below where the slope is at a 45 degree angle. Crags centred around NG 91040 37525 and extending to NG 91131 37596.	A further example of this hazard was noted at NGR NG 91103 37585 ±5m, alt. 50 ±5m. Block is 1.0m x 0.5m x 0.5m and resting against fallen tree trunk.	
General	**2021 Inspection:** Lower cliffs/crags are quite slabby in nature - not much is obviously as an immediate risk. Possibly one wedge c.1m³ at south-west end near crest warrants further inspection. Upper crags are fairly massive structure and no obvious blocks that could fail. Smoothish profile, >50m high. To fully assess a drone survey inspection is recommended as terrain means that safe access to crest is not possible.	No change noted during 2023 inspection	
General	**-**	**2023 Inspection:** Lots of evidence of deer – potential cause of rock fall observed at road level Ch. 2922 (AA16).	
General	**-**	**2023 Inspection:** No evidence of source of block recently reported by THC but general condition of upper slope is poor with frequent fallen trees and blocks resting on slope and against tree trunks.	
High above AA18 at NGR NG 91189 37608	**-**	**2023 Inspection:** Hazards noted in this area include: -Loose block lying on ground amongst fallen long tree trunks. Block elongate and 1.2m max dimension. - Debris 'dams' of blocks and branches in water course that flows into AA18/19 – Likely source of some block falls. - Scree area cleared in September 2022 emergency works – scree is re-accumulating – needs to be cleared again.	AA18U-1 AA18U-2 AA18U-3
High above AA18 at NGR NG 91206 37613	-	**2023 Inspection:** Hazards noted in this area include: - A 0.7x0.5x1.2m boulder on slope	AA18U-4 AA18U-5

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
		- There are several fallen trees with elevated root balls containing blocks/hanging blocks - A very tall tree leaning at 20° (bearing 290° from NGR location, ca. 30 – 35m away) at risk of falling.	

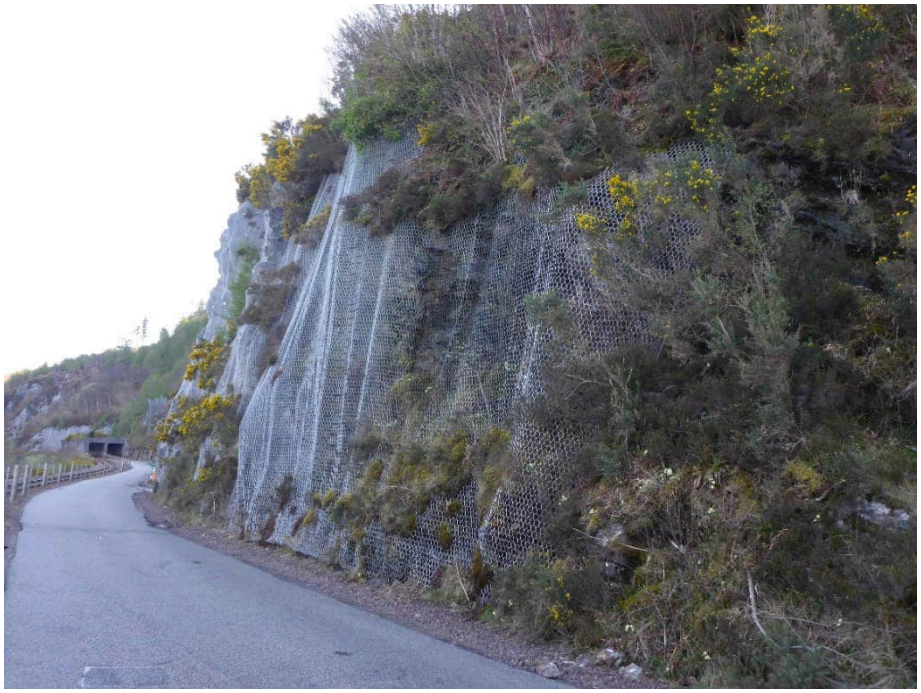
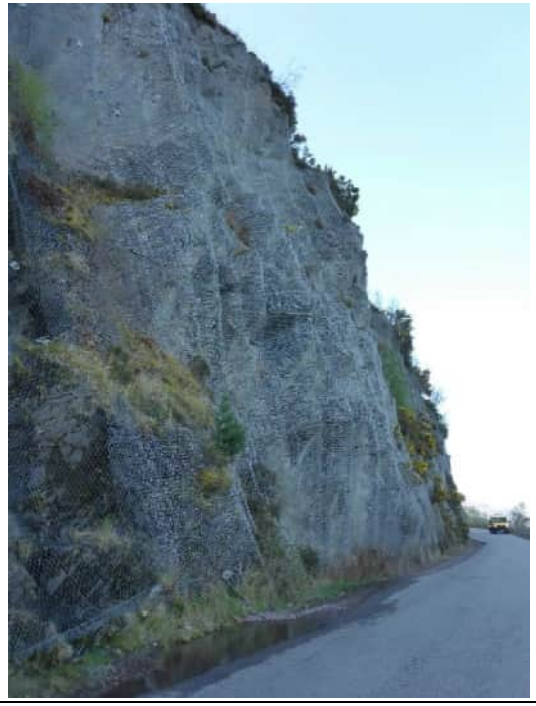
RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1.2	
Risk Value =	**10.8**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install rock fall catch fence along crest of roadside rock face.	N/A	- Risk be better quantified and managed by photographic and topographic surveying and monitoring by aerial drone to assess the area affected, number of trees standing/fallen, with the area resurveyed annually to assess any changes, frequency of failures etc. - Consider felling trees to fall along slope and leave stump 1-2m high to form barrier to down slope movement.

Assessed in field by:	PLM/CR	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/2023

5.2.28 Slope Ref. AA17

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA17	**Chainage:**	2923-2987	**Start Grid Ref:**	NG 91069 37601	**End Grid Ref:**	NG 91123 37630	**Elevation:**	11m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	322	Height (m):	20	Length (m):	64	Vegetation Cover:	20% cover: moss, ferns, heather, gorse and saplings.
Ditch Details:	No ditch	Roughness:	Rough	Verge Width (m):	1 - 3				

Engineering Description of Rock:
Extremely strong to very strong dark grey narrowly banded crystalline medium grained GNEISS.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2017	Ch. 2935	To inspect area of potential wedge failure and netting. Findings - Area noted to be very blast damaged between Ch. 2933 and Ch. 2946. Joint sets are noted to be very dilated with failure potential that could exceed capacity of Maccaferri (with 1 and locally two layers of chain link below). Rock mass is very broken and therefore an active netting system (e.g. TECCO) is not considered to be an appropriate option as drilling pattern bolts would dislodge material. Recommendations -Recommend opening mesh and scaling area before re-assessing. Existing mesh to be re-instated on completion.
2017	Ch. 2965	To inspect large wedge approximately 10m above road level. Findings – blocks are keyed in but condition should be monitored during future inspections.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting installed	Details of netting system include: - PVC coated double twist - Top cable 16-20mm galvanised - 2.5m anchor spacing at crest (but up to 12m at toe) and 25mm galvanised bars - Cable-anchor connection: None - 2 cable clamps - Netting lap connections: Netting joined with cable twists and lacing wire, with additional Spenax rings installed in 2015 - No laps on anchors and no vertical reinforcing (but numerous lateral/diagonal reinforcing cables - note that many of the anchors for these appear corroded).	No significant change to netting observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		Note: in 2015 top cable, anchors and additional spenax jointing were installed. **2016 Inspection:** Inspection of existing passive rock fall netting system identified the following faults: - Bottom anchors at a spacing of 8-12m between Ch. 2894 and 2935. Up chainage of this the bottom of the mesh is buried by coarse gravel in ditch, but appears to be well secured. - Many of the anchors for the reinforcing cables in the upper portion of the slope are corroded. **2017 Inspection:** Wide spacing of bottom anchors (up to 12m) with partially buried mesh and corroded eyelets observed **2022 Inspection**: Some localised corrosion on bottom cable noted	
2015 – Phase 8 works	New top cable, anchors and additional spenax jointing installed		No significant change to netting components observed.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 2933-2946	**2017 Inspection:** Large area of blast damaged rock mass with potential to exceed capacity of mesh in event of failure.	No change noted during 2023 inspection	
Ch. 2965	**2017 Inspection:** Large wedge approximately 10m above road level, with smaller wedge above. Rope access inspection in 2017 confirmed blocks are currently keyed in but condition should be monitored during future inspections.	No change noted during 2023 inspection	AA17-1
General	**2020 Inspection:** Trees becoming well established at crest, with gorse present on cutting face.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	2	Reduced from 3 to 2 in 2023 following re-assessment of pathway. Most blocks not expected to reach road due to netting system.
Receptor Rating =	1.2	
Risk Value =	**7.2**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Ch. 2933-2946: Open up Maccaferri netting and carry out scaling before re-assessing. Netting to be reinstated on completion.	- Replace corroded anchor points on reinforcing cables.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/2023

5.2.29 Slope Ref. AA18

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA18	**Chainage:**	2987-3059	**Start Grid Ref:**	NG 91123 37630	**End Grid Ref:**	NG 91186 37649	**Elevation:**	10m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	76	Azimuth (°):	346	Height (m):	15	Length (m):	72	Vegetation Cover:	10%-15% cover. Generally comprised grass, moss and heather
Ditch Details:	No ditch	Roughness:	Rough	Verge Width (m):	1.2				

Engineering Description of Rock:
Extremely strong thinly foliated dark grey SCHIST. Contains occasional thin foliations of quartz.

Rope Access Inspections:			
Year of Rope Access Inspection	**Location**	**Purpose**	**Photo Reference**
2023	Ch. 2990	To inspect condition of the netting/spike plates in waterfall area. Findings – TECCO netting is in good condition	AA18-1

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2013 – Phase 7 works	A block removed (was caught in top of netting where it spans a small gully) and netting repaired		
2018 – Phase 10 works	- Maccaferri drape netting removed and replaced by active TECCO netting system - Installation of spot dowels - De-vegetation and scaling - A sprayed concrete buttress installed	Netting system in good condition but installation of incorrect spike plate / nut combination has not been resolved. **2020 Inspection:** At Ch. 2990 (waterfall area), TECCO showing greenish discolouration. Spike plate grey discoloured. **2022 Inspection:** Potential corrosion of netting mid-slope, mid-slope profiling cable and bottom cable observed at Ch. 3032.	Rope access inspection completed to assess netting condition – netting is in good condition.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2013 Inspection:** Many uprooted trees and associated boulders were present upslope of the rock face.	No change noted during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch.2995	**2021 Inspection:** Some loose blocks behind netting near crest. One block c.0.15m x 0.15m x 0.15m caught behind netting and pulling netting out slightly from slope. Several smaller blocks resting on slope adjacent to spike plate. Would be beneficial to move block down behind the netting. Source is likely to be the slight overhang at crest. Keep under observation for additional debris.	No change noted during 2023 inspection	AA18-2
Ch.3012	**2021 Inspection:** A few small blocks sitting on ledge of rock face c.7m from toe. Not straining or deforming mesh so removal not required.	No change noted during 2023 inspection	

RISK RATING		**Comments**
Overall Hazard Rating =	1	
Pathway Rating =	1	
Receptor Rating =	N/A	Receptor rating only applicable when pathway rating is ≥2.
Risk Value =	**1**	- Rating reduced to 1.2 following Phase 10 Remedial Works (2018). Previously very high risk. - Re-assessed during the 2022 inspection following changes to receptor rating. Risk value reduced from 1.2.
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/JG/PLM/CR	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.30 Slope Ref. AA18/AA19

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA18/AA19	**Chainage:**	3059-3070	**Start Grid Ref:**	NG 91186 37649	**End Grid Ref:**	NG 91199 37660	**Elevation:**	10m AOD

Photo	
	

Rock Slope Characteristics:									
Dip (°):	76	Azimuth (°):	346	Height (m):	15	Length (m):	11	Vegetation Cover:	60% cover. Generally comprised grass.
Ditch Details:	Bund: 2-3m wide, 0.5-1.5m high on road side; Ditch: 1-6m wide, 1.5-2m deep on slope side.	Roughness:	Rough	Verge Width (m):	2-4				

Engineering Description of Rock:
Strong thinly foliated dark grey SCHIST.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
May 2018		Small washout of stones on road and verge from natural crag above AA18 & AA19. July 2018 - More small stones washed out.	
May 2022	Ch. 3065	Rock fall impacting road and railway at AA18/AA19 on 25/05/2022. Block originated from AA19 Upper and travelled down AA18/19 passing over the drape netting system. This has caused some minor damage, with several tears up to 0.2m observed. This damage is not considered to pose a significantly increased risk. An emergency inspection was carried out by AECOM on 27 May 2022 after a rock fall originating from the upper crags within AA19 Upper occurred on the 25 May 2022. The inspection concluded that whilst no imminent risk of further failure was observed, there is potential of future failure from the ongoing weathering and degradation of the material, particularly during and/or following periods of inclement weather. Scaling works were recommended to be completed as soon as possible. Works completed late 2022.	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2014	Maccaferri netting installed as emergency works following failure.	Details of netting system include: - PVC coated Maccaferri double twist - Top cable 16mm galvanised - 2m top and bottom anchor spacing and 25mm GEWI bars - Cable-anchor connection: galvanised eye nuts - 4 cable clamps - Netting lap connections: 3 rows of Spenax rings - No laps on anchors or vertical reinforcing **2016 Inspection:** It was noted that the cable clamps on the boundary ropes were corroded, although the non-threaded parts were not. The specification for the 2014 emergency works required the whole clamp system to be hot dip galvanised, but it appears the ones installed were not. **2017 Inspection:** It was noted that the non-threaded parts of cable clamps were also now corroded. **2020 Inspection:** Cable clamps well corroded and cables beginning to exhibit surface corrosion, particularly in waterfall. **2022 Inspection:** A rock fall in May 2022 has caused some minor damage to netting, with several tears up to 0.2m observed.	Netting locally damaged by rock falls from upper slope. c.5-10 torn holes (max 10 apertures tall x 5 wide). Recommend patch netting at tears.
September 2022 Urgent Works	Clearing out the roadside catch pit and increasing its capacity; and, Light scaling to remove loose material from the source area and accumulation scree.		Scree is accumulating on mid-slope ledge – needs to be cleared again.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
	2018 Inspection: Minor debris accumulation at bottom right of mesh but not loading system.	No change noted during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2019 Inspection:** Slope continues to weather and ravel but debris retained by mesh – monitor build up.	No change noted during 2023 inspection	
Ch.3052	**2021 Inspection:** In waterfall areas there is a slab of rock c.0.75m x 0.75m x 0.2m. Source not immediately clear but possibly from the rock slope west of the gully.	No change noted during 2023 inspection	

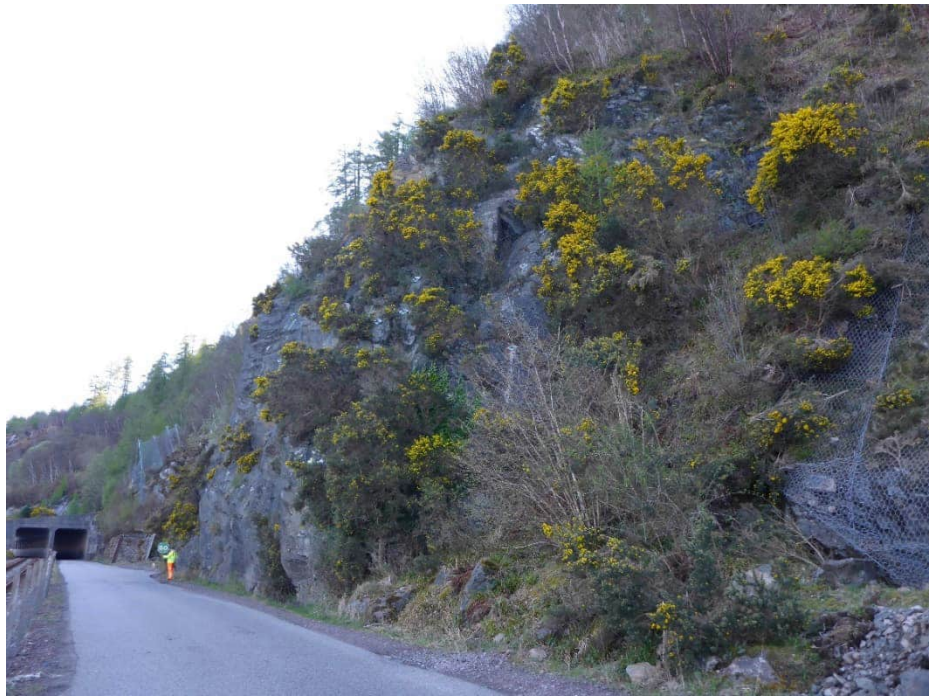
RISK RATING		Comments
Overall Hazard Rating =	1	
Pathway Rating =	1	
Receptor Rating =	N/A	Receptor rating only applicable when pathway rating is ≥2.
Risk Value =	**1**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Replace corroded components of netting system (c.80 clamps) with appropriate, suitably galvanised replacements. - Tears in netting from rock falls to be repaired. - Scree area cleared in September 2022 urgent works is refilling – needs to be cleared again.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/2023

5.2.31 Slope Ref. AA19

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA19	**Chainage:**	3070 – 3157	**Start Grid Ref:**	NG 91199 37660	**End Grid Ref:**	NG 91274 37698	**Elevation:**	10m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:							
Dip (°): 74	Azimuth (°): 341	Height (m): 25	Length (m): 87	Vegetation Cover: 10 to 20% cover. Grass, gorse, etc.	Ditch Details: Width 0.9m Depth 0.4m (clear with some standing water)	Roughness: Rough	Verge Width (m): 0

Engineering Description of Rock:
Very strong thinly foliated dark grey fine to medium grained SCHIST. Contains occasional thin foliations of quartz. (PSAMMITE).

Rope Access Inspections:			
Year of Rope Access Inspection	**Location**	**Purpose**	**Photo Reference**
N/A			

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
March 2023	Ch.3100	Rock fall (c.0.25m³) originating from AA19 Upper and impacting road at AA19 on 02/03/2023.	March 2023
March 2023	Ch.3100	Rock fall (c.0.1m³) originating from AA19 Upper and impacting road at AA19 on 29/03/2023.	March 2023

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2012	TECCO netting installed as emergency works following failure.	Details of netting system include: - TECCO - Top cable 12mm galvanised - 2.5-3.5m anchor spacing and 25/28mm solid galvanised and 32mm hollow galvanised bars - Cable-anchor connection: eye nuts - 4 cable clamps - Netting lap connections using T3 clips - No laps on anchors	TECCO in good condition. Gabions - parts of mesh are damaged. Would be beneficial to clear out debris behind the gabions.	AA19-1

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
		- Vertical and diagonal reinforcing/profiling cables (12mm galvanised) - 37 No. dowels also installed. **2019 Inspection:** Very localised corrosion of TECCO where touching old, corroded anchor installation. No other defects observed. **2022 Inspection:** Some of the cable clamps on the bottom cable are showing early signs of corrosion at Ch. 3100. Otherwise netting is in good condition.		

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch.3100	**2018 Inspection:** Failure of ca. 0.25m³ observed 6-8m above road level and has been retained by mesh. Fractured overhanging block of ca. 0.5m³ could also fail in future but would be retained by mesh. Debris is not currently overloading the system so no remedial works are required at this stage. Keep under observation during future inspections.	No change noted during 2023 inspection	AA19-2
Ch. 3145 (above gabions and TECCO netting)	-	**2023 Inspection** – Rope access identified sporadic areas of rock exposure with occasional dilated joints and root jacking potential. Risk of occasional block falling (max. 0.5 x 0.5 x 0.5m).	

RISK RATING		**Comments**
Overall Hazard Rating =	2	Increased from 1 in 2018 following observed failure being retained by mesh.
Pathway Rating =	1	
Receptor Rating =	N/A	Receptor rating only applicable when pathway rating is ≥2.
Risk Value =	**2**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Clear debris behind gabions.

Assessed in field by:	MT/JG/PLM/CR	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.32 Slope Ref. AA19 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA19U	**Chainage:**	3050 – 3157	**Start Grid Ref:**	NG 91199 37660	**End Grid Ref:**	NG 91274 37698	**Elevation:**	m AOD

Photo	
	

Rope Access Inspections:			
Year of Rope Access Inspection	**Location**	**Purpose**	**Photo Reference**
2022	Ch. 3100	Emergency rope access inspection to assess source area of rock fall after 02/03/2023 event. Inspection found scree on mid-slope ledge which was cleared in the September 2022 urgent works.	
2023	Ch. 3145 (above gabions)	To inspect area above TECCO netting. Findings - sporadic areas of rock exposure with occasional dilated joints and root jacking potential. Risk of occasional block falling.	AA19U-1
2023	Drop 1	To inspect condition of upper crags. Findings: - NG 91280 37656 ±5m, alt. 56.5AOD ±3m – possible source of large block on road beside gabions. - Generally upper area affected by root jacking. - Upper crags generally massive but there are areas where exposed faces have dilated joints and blocks could be released. Evidence of blocks lying on slope.	AA19U-2 AA19U-3 AA19U-4
2023	Drop 2	To inspect condition of upper crags. Findings: - NG 91273 37654 ±6m, alt. 43 ±5m – area of Maccaferri mesh strapped around rock protrusion 2m high and 4m wide secured by two cables. - Missing block and fresh surface at top of the Maccaferri mesh – again possible source of block at road. - Loose blocks noted in area around Maccaferri mesh and cables which are at risk of falling (currently only held in place by cables).	AA19U-5 AA19U-6 AA19U-7

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
May 2022	Ch. 3065	Rock fall impacting road and railway at AA18/AA19 on 25/05/2022. An emergency inspection was carried out by AECOM on 27 May 2022 after a rock fall originating from the upper crags within AA19 Upper occurred on the 25 May 2022. The inspection concluded that whilst no imminent risk of further failure was observed, there is potential of future failure from the ongoing weathering and degradation of the material, particularly during and/or following periods of inclement weather. Scaling works were recommended to be completed as soon as possible. Works completed late 2022.	
March 2023	Ch.3100	Rock fall (c.0.25m^3) originating from AA19 Upper and impacting road at AA19 on 02/03/2023.	

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
March 2023	Ch.3100	Rock fall (c.0.1m³) originating from AA19 Upper and impacting road at AA19 on 29/03/2023.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
Before AECOM Involvement (i.e. pre 2012)	Mesh around block at NG 91273 37654		Area of Maccaferri mesh strapped around rock protrusion 2m high and 4m wide secured by two cables. Loose blocks noted in this area.	
2013 – Phase 7 works	Tree stump removed which was previously retained by cable straps.			
2015 – Phase 8 works	Uprooted trees and associated root balls and loose blocks were removed			
2022	- Emergency scaling works following rock fall. - Clearing out catch pit and increasing its capacity			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2012 Inspection:** Potential for numerous block falls approximately 60m above road due to root jacking. Block size up to 1m³.	No change noted during 2023 inspection	
NG 91276 37645	**2013 Inspection:** Developing toppling / root jacking failures (block size up to 1.5m x 2m x 1.5m) approximately 50m above road; 4 No. blocks (typically 1.5m x 2m x 0.4m) prone to toppling failure approximately 20m above TECCO mesh in slight gully on face (directly above left hand end of the gabions)	No change noted during 2023 inspection	
General	-	**2023 Inspection:** A number of loose blocks are lying on slope.	AA19U-2

RISK RATING		Comments
Overall Hazard Rating =	3	Increased from 2 to reflect the observed frequency of rock falls at this location.
Pathway Rating =	4	
Receptor Rating =	1	
Risk Value =	**12.0**	
Risk Level =	**Very High**	**Increased to very high to reflect recent increase in rock fall frequency at this location.**

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install rock fall catch fence above roadside cutting.	N/A	N/A

Assessed in field by:	PLM/CR	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.33 Slope Ref. AA20

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA20	**Chainage:**	3157-3215	**Start Grid Ref:**	NG 91274 37698	**End Grid Ref:**	NG 91322 37727	**Elevation:**	13m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:											
Dip (°):	80 (rock slope)	Azimuth (°):	326	Height (m):	10	Length (m):	58	Vegetation Cover:	30 to 40% ground cover, small saplings and gorse	Ditch Details:	None	Roughness:	Rough	Verge Width (m):	0-1.5

Engineering Description of Rock:
Lower slope adjacent to the road - very strong to strong dark grey mottled pink narrowly banded crystalline coarse grained GNEISS.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
August 2018	Ch. 3175	Small stones on road (x4).	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)		Details of works include: - 4 No. rock dowels adjacent to the avalanche shelter. Bar approx. 20mm diameter, 150mm*150mm face plate. Bar length etc. unknown - Concrete and steel retaining wall/debris trap between Ch.3157 & Ch.3160, 3.4m high 33m long. 'I' beams noted to be corroded. - Concrete block with 10No, ground anchors on upper slope, details unknown. Below this is temporary works that have been left in place and consist of a catch fence of Maccaferri double twist netting between 2 tall tree stumps supported by cable to nearby rock outcrop and a catch fence of railway sleepers between 2 tree stumps. **2017 Inspection:** I beams that form part of retaining wall are noted as being corroded.	No significant changes observed during inspection.
2015 – Phase 8 works	1No. rock dowel installed	Rock dowel is 4m long, 25mm GEWI bar	No significant changes observed during inspection.
2019 – Phase 11 works	Ch. 3205 - Rock dowel (originally a test anchor)		
2021 – Phase 12 works	N/A	2022 Inspection: A block rotated out during the drilling of the temporary catch fence anchor during the Phase 12 works for AA20U. The block	No change observed

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		landed on a flat area above retaining wall in AA20 at Ch.3185 and is not at risk of moving downslope.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3165 (above retaining wall)	**2016 Inspection:** Potential failures identified within rock outcrop immediately above wall (toe of blocks 4m above road level). Dilated discontinuities were evident and several blocks ranging in size from 0.1m³ to 0.5m³ (total failure volume around 2m³) are considered at risk of failure. Although the outcrop is set back from the top of the wall by around 1.5m, the ground is sloping and there is potential for blocks to reach the road.	No change noted during 2023 inspection	
Ch. 3170	**2022 Inspection:** In September 2021, a blocks rotated out during drilling of an anchor for the temporary catch fence installed during the Phase 12 works. The block came to rest on a flat area above the retaining wall and is not at risk of moving further down slope.	No change noted during 2023 inspection	
Ch. 3182	**2021 Inspection:** Root jacking observed. Potential for occasional small block fall. Limited verge width so may land on road.	No change noted during 2023 inspection	AA20-1
Ch. 3205 (between wall and avalanche shelter)	**2017 Inspection:** Large potential wedge failure located approximately 2m above road level. Verge at this location is ~0.5m with no ditch.	No change noted during 2023 inspection	
Ch.3200 to 3205 (between wall and avalanche shelter)	**2016 Inspection:** Ongoing ravelling type failures. Block size typically small (0.2m x 0.2m x 0.2m) but occasional larger blocks (0.1m³). Debris from previous failures in narrow verge (no ditch). Although some blocks could be removed by scaling, passive rock fall netting would offer a longer term solution.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	2	
Pathway Rating =	3	
Receptor Rating =	1.2	
Risk Value =	**7.2**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Install passive rock fall netting system over rock face prone to ravelling at Ch. 3200 to 3205. - Light scale and dowel blocks above wall at Ch. 3175.	N/A

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.34 Slope Ref. AA20 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA20U	**Chainage:**	3157-3215	**Start Grid Ref:**	NG 91274 37698	**End Grid Ref:**	NG 91322 37727	**Elevation:**	13m AOD

Photo at Start Chainage (looking east)	
	

Engineering Description of Rock:
Lower slope adjacent to the road - very strong to strong dark grey mottled pink narrowly banded crystalline coarse grained GNEISS.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
August 2018	Ch. 3175	Small stones on road (x4).	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**	**Photo Reference**
2021 – Phase 12 works	Rock fall catch fence installed between Ch. 3170 to 3215	Catch fence is 30m wide x 6m high situated c.15m above road level.	New catch fence assessed and noted to be in good condition. There is some surface corrosion evident on shackle bolts. Additionally, there are a few small blocks which have been retained behind the fence.	AA20U-1 AA20U-2 AA20U-3

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
General	**2014 Inspection:** Numerous loose blocks caused by root jacking and toppling failure were observed on the slope. Individual block size up to 0.125m³ and total failure volume is approximately 1m³.	No change noted during 2023 inspection	
Ch. 3172	**2016 Inspection:** 0.25m³ block approximately 12m above road level.	No change noted during 2023 inspection	
Ch. 3175	**2017 Inspection:** ~40m above road level, large area of fractured rock mass with dilated cracks between 50mm and 200mm, with concave joint curving at 70° down to 25° and area approximately 5m high, 2m deep and 5m wide. Rock mass is noted as overhanging at base and left hand side. It is considered that if any of these blocks were to fail they are likely to reach road and railway. Unstable boulders were also noted beside uprooted tree on left hand side.	No change noted during 2023 inspection	
Ch. 3190	**2016 Inspection:** 0.5m³ block approximately 15m above road level. Potential for root jacking.	No change noted during 2023 inspection	
Ch. 3195	**2017 Inspection:** 20m above road level. Partially unstable 4m³ block identified.	No change noted during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3198	**2016 Inspection:** 1m³ block approximately 15m above road level. Potential for root jacking.	No change noted during 2023 inspection	
Ch. 3210	**2017 Inspection:** Rock mass 30m above road level is very fractured with open fractures. Noted at least 3No. blocks (dimensions 0.5 x 0.5 x 0.5) with clay infilled cracks on right hand side and base. Base is on an approximately 35° plane. Block is also supporting a 1.0-1.5m³ detached block with two trees and root jacking above.	No change noted during 2023 inspection	
NG 91361 37572	**2021 Inspection:** Boundary fence at edge of treeline above AA20 Upper has been severely damaged by fallen trees.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	2	Reduced from 5 in 2022 due to catch fence installation.
Receptor Rating =	1.2	
Risk Value =	**7.2**	
Risk Level =	**Moderate**	**Reduced from 'Very High' to 'Moderate' due to catch fence installation.**

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Selected controlled removal of unstable blocks.	- Coppice trees growing on rock face.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.35 Slope Ref. AA21

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA21	**Chainage:**	3280-3386	**Start Grid Ref:**	NG 91381 37761	**End Grid Ref:**	NG 91451 37842	**Elevation:**	18m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:							
Dip (°): 75	Azimuth (°): 320	Height (m): 15	Length (m): 106	Vegetation Cover: c.10% cover: saplings and shrubs.	Ditch Details: Typically none, although 1m wide, 0.5m deep towards end of section	Roughness: Rough	Verge Width (m): 0.5

Engineering Description of Rock:
Very strong thinly foliated dark grey GNEISS with white quartz banding.

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose/Findings	Photo Reference
2017	Ch. 3305	To inspect large wedge of rock at crest behind gap in mesh (2m deep, 5m wide, 5-6m high). Findings - Wedge area is blast damaged with dilated joints at the rear. Big gap behind drape which would allow block to gain energy and potentially exceed capacity of passive netting system. Verge only 1m wide and no ditch present at this location, so likely to reach road in event of failure.	
2023	Ch. 3350	To inspect area where overhanging/fractured block is. To check if the remediation in place is adequate. Findings - Overhanging rock mass ca. 1.5m. Gape below is 2m. Block is at least 1m³ up to 1.5m³, with dilated release joint. Keyed in at bottom right. Block at crest has a dowel in it but positioning isn't optimal. Similarly block with cable restraint has a dowel at a sub-optimal position and orientation. Cable clamps on cable restraint are rusted. Recommendations - Install active netting system (TECCO) 5m width (between buttress) and then 2 panels of TECCO beyond this, profiled into face. Problem area is between 5-10m above toe so could drape lower half of slope. No ditch or verge at this location.	AA21-1 AA21-2 AA21-3

THC Monthly Reports:

Date	Location	Comments	Photo Reference
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting between Ch. 3280 to 3370.	Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - c.5-5.5m anchor spacing and 25mm(?) galvanised bars - Cable-anchor connection: stainless steel eye nuts (bar machined to M20 thread) - 4 cable clamps - Netting lap connections using 2 rows of staggered spenax rings - Laps on anchors: Yes, every fourth anchor. 2 cable clamps on each side - Vertical Reinforcing: 8mm cable at 1m spacing (2 cable clamps) Several faults noted within netting system, which is generally in poor condition: -PVC coating is brittle and cracked in places, corrosion of wire noted. - lateral reinforcing cables are very slack with rare spenax jointing to netting. - cable clamps are corroded. **2016 Inspection:** PVC coating on netting is brittle and locally broken. Some corrosion of wire noted. Lateral reinforcing cables are very slack, with rare spenax jointing to netting. Cable clamps noted to be very corroded on both lateral and vertical reinforcing cables.	7No. stainless dowels face plates engraved 2002, 1 cable restraint and 16mm galvanised bars with corrosion protection at stainless dowels at Ch. 3350.
2015 – Phase 8 works	- Scaling and 5No. dowels installed - Additional bottom anchor installed to pre-existing netting		

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3305	**2016 Inspection:** Large wedge at crest of rock slope (2m x 5m x 5-6m high). Rock mass blast damaged and dilated discontinuities present. Big gap between drape mesh and rockface would allow failure to gain energy and potentially exceed capacity of netting, impacting road below.	No change noted during 2023 inspection	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3310	**2016 Inspection:** Root jacking evident approximately 3m above road level. No immediate risk of failure but would be worth coppicing.	No change noted during 2023 inspection	AA21-4
Ch. 3322	**2016 Inspection:** Potential wedge failure approximately 5m above road level. Multiple blocks, total volume 1.5m^3.	No change noted during 2023 inspection	
Ch. 3363	**2016 Inspection:** Broken rock mass at crest. Root jacking an issue. Potential failure volume around 1m3 (multiple blocks). Mesh should contain but would benefit from coppicing and light scaling.	No change noted during 2023 inspection	AA21-5
Ch. 3350	**2019 Inspection:** Rock mass at crest with dilated release plane. Numerous dowels, but only in one block, and a cable present. Ca. 15m above road level. 3m x 2m x 1.5m.	Rope access inspection completed in 2023 – see notes above.	AA21-6
Ch. 3371	**2021 Inspection:** Some dilated fractures on face of rock slope in area of water flow; freeze-thaw could lead to deterioration of some blocks.	No change noted during 2023 inspection	AA21-7

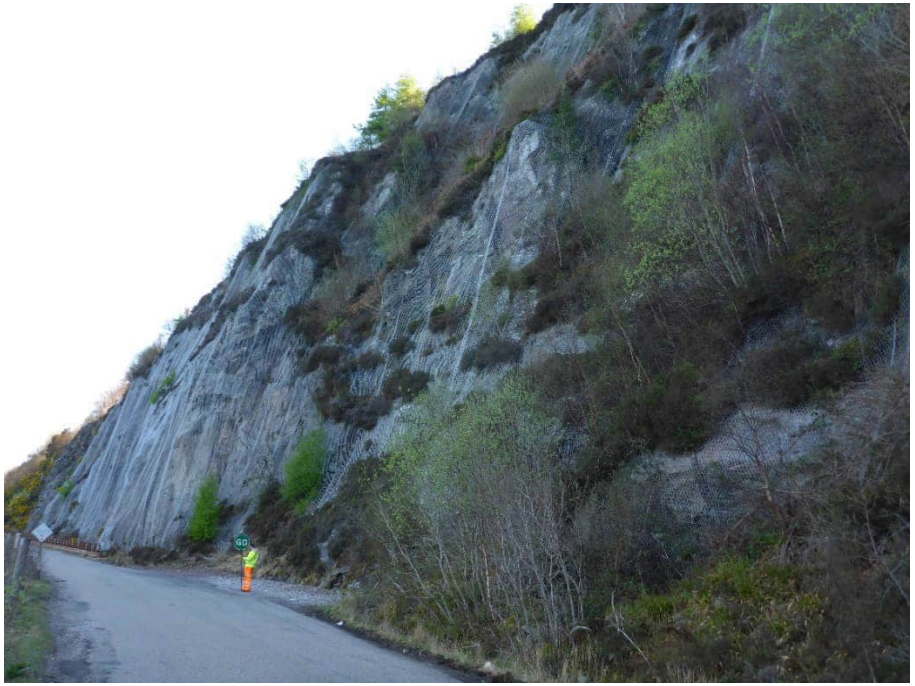
RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1	
Risk Value =	**9**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Ch. 3305: Open existing drape and install 10m high x 8m wide panel of active netting (e.g. TECCO). Re-join drape netting on completion. - Ch. 3350: Replace current passive netting with active netting system (TECCO)	- Install dowels in potential failure at Ch. 3322 (4m long). - Coppice tree at crest at Ch. 3366 and light scale broken rock mass.	- Coppice tree at Ch. 3310. - Remove 3-4 No. cut logs trapped under top netting cable. - Re-tension lateral reinforcing cables and install additional spenax rings. - Replace corroded cable clamps on lateral and vertical reinforcing cables.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.36 Slope Ref. AA22A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA22A	**Chainage:**	3386-3415	**Start Grid Ref:**	NG 91451 37842	**End Grid Ref:**	NG 91483 37882	**Elevation:**	17m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	75-80	Azimuth (°):	310	Height (m):	30	Length (m):	29	Vegetation Cover:	Up to c.60% cover comprising heather and saplings.
Ditch Details:	Width 1.0m Depth 0.3m	Roughness:	Rough	Verge Width (m):	1				

Engineering Description of Rock:
Very strong thinly to thickly foliated dark grey GNEISS with thin pink and white quartz bands.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2017	Ch. 3390	To inspect overhanging blocks at crest. Findings - Rock mass noted to be particularly blast damaged (~8m wide, 1m deep, and 2-3m high) with large gap between mesh and rock slope. Recommendations - Installation of 8 No. 5m long dowels recommended.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting installed	Details of netting system include: - PVC coated double twist - Top cable 12mm galvanised - c.5.5-10m anchor spacing and 25mm(?) stainless bars and occasional old 18mm machine threaded bars - Cable-anchor connection: stainless steel eye nuts (bar machined to M20 thread) - 3 cable clamps - Netting lap connections using 2 rows of cable twists every fourth aperture - No anchor laps - Vertical Reinforcing: 8mm cable at 1m spacing (3 cable clamps) in some areas Note: Western terminal anchor loose **2016 Inspection:** Bottom anchors at a spacing of 10m. Bottom cable locally corroded (associated with water flow).	No significant changes to netting observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2015 – Phase 8 works	Areas were de-vegetated. 11No. dowels were installed.		
2021 – Phase 12 works	Ditch/bund between Ch.3385 to 3425 has been cleared and reinstated.		No change – ditch remains effective.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3388	**2019 Inspection:** A 0.3m x 0.3m x 0.1m block retained at base of netting 1.5m above road level.	No change noted during 2023 inspection	AA22A-1
Ch. 3390	**2016 Inspection:** Overhanging blocks noted within blast damaged area at crest (~8m wide, 1m deep, and 2-3m high). Large gap between mesh and rock slope at this location.	No change noted during 2023 inspection	
Across section	**2021 Inspection:** Vegetation obscuring large proportions of rock face and potential increasing failure potential through root jacking	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	2	
Receptor Rating =	1	
Risk Value =	**6**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Ch.3390- Install 8 No 5m dowels to secure overhanging blocks at crest.	- De-vegetation / coppicing (approx. 50% cover) and inspection of previously obscured rock mass. - Install additional bottom anchors.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/2023

5.2.37 Slope Ref. AA22B

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA22B	**Chainage:**	3415-3592	**Start Grid Ref:**	NG 91483 37882	**End Grid Ref:**	NG 91561 38016	**Elevation:**	11m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	85	Azimuth (°):	296	Height (m):	20	Length (m):	177	Vegetation Cover:	20% on main cutting face; 60% on upper third of slope. Comprising of heather and saplings.
Ditch Details:	None but Armco barrier creates rock trap.	Roughness:	Rough	Verge Width (m):	Ch. 3415-3445 1.5m verge. 1m verge from 3445 (start of Armco)				

Engineering Description of Rock:
Extremely strong dark grey and white irregular narrow banding crystalline coarse grained GNEISS. Particularly massive along this section of road.

Rope Access Inspections:			
Year of Rope Access Inspection	**Location**	**Purpose**	**Photo Reference**
2017 (and again in 2019)	Ch. 3465	To inspect overhang c. 7m above road level. Findings - overhanging rock mass ~7m above road with dilated fractures at rear with releasing block beneath overhang. Fractured rock mass is approximately 5m high, 5m wide with 1.8m overhanging from rock slope. Recommendations - Heavy scaling recommended (and completed in 2019)	
2017 (and again in 2019)	Ch. 3475	To inspect overhang c. 15m above road level. Findings - old chain link is present across slope and often burst with reinforcing (Maccaferri) mesh over chain link. Although rock mass is fractured, there are no obvious dilated joints.	
2017	Ch. 3500	To inspect column of blast damaged rock c.2.8m above road level. Findings - rock mass is fractured with visible dilated release joint visible at rear on the west side (~4m high, 3.5m wide, overhanging of 1.2m). Recommendations - Scaling is recommended. (TECCO netting installed in 2019 remediating risk)	
2017	Ch. 3510	To inspect large recess behind netting c.10-15 above road level. Findings - upper 8m of rock slope is highly fractured and overhanging. There is a large gap between netting and rock face at this location, which would allow falling blocks to gain energy and potentially burst through existing drape netting. Recommendations - It is recommended existing inadequate drape netting be removed over an 8m width. Scaling of upper 8m of slope required prior to installation of active netting system (e.g. Tecco), which should continue over lower half of rock face as a high strength drape. (Remedial works completed in 2019)	

Rope Access Inspections:			
Year of Rope Access Inspection	**Location**	**Purpose**	**Photo Reference**
2023	Ch. 3530	To inspect possible rotated block and overhang at crest. Findings - The possible rotated block is in-situ. 1m deep x 0.3m wide x 1m high – protrudes at 45° to right. Gape in mesh. No sign of dilated fractures. Has not rotated out/hasn't moved. It is not considered a significant hazard. The overhang at crest has a slight dilated fracture but it is not fresh/new.	AA22B-1

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
November 2020	Ch. 3530 - 5m NW of end of road barrier	Possible rotated block from overhang at crest behind mesh - not posing significant risk but recommend rope access inspection to confirm if loose or in situ. (Rope access completed in 2023)	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting system between Ch. 2415 to 3542	Details of netting system include: - PVC coated double twist - Top cable 8 mm galvanised, later reinforced with a 12mm galvanised cable connected with cable clamps every 1 – 2m - c.5.5m anchor spacing and 25mm(?) stainless bars and occasional old 18mm machine threaded bars - Cable-anchor connection: stainless eye nuts (bar machined to M20 thread) - 3 cable clamps - Netting lap connections using 2 rows of cable twists every fourth aperture - No anchor laps - Vertical Reinforcing: 8mm cable at 1m spacing (3 cable clamps) in some areas Netting systems noted to be in poor condition: PVC coating cracked and brittle; limited number of bottom anchors; reinforcing cables	No significant changes to netting observed.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
		slack, poorly attached and with corroded clamps; bottom cable corroded.	
Before AECOM involvement (i.e. pre 2012)	Netting system between Ch. 3543 to 3497 and Ch. 3515 to 3567	Details of netting system include: - PVC coated double twist - Top cable 12 mm galvanised - c.8m anchor spacing and 18mm machined threaded bars - Cable-anchor connection: D shackle (connected with locking nuts on one side only) - 2 cable clamps - Netting lap connections using 2 rows of cable twists every fourth aperture - No anchor laps or vertical reinforcing Netting systems noted to be in poor condition: PVC coating cracked and brittle; limited number of bottom anchors; reinforcing cables slack, poorly attached and with corroded clamps; bottom cable corroded.	No significant changes to netting observed.
2013 – Phase 7 works	Heavy scaling of overhang at Ch. 3425		
2019 – Phase 11 works	- Heavy scaling of overhanging rock mass at Ch. 3465 - Replacement of Maccaferri drape netting with active TECCO netting system between Ch. 3497 to 3515.	- Overhang at Ch. 3465 was significantly reduced during heavy scaling works. Although a small overhang remains c.5m above road level, the presence of a rock trap below means the residual risk to the road is low. **2022 Inspection:** Cut end bars as part of the TECCO netting system are corroded.	No significant changes to netting observed.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3425	**2021 Inspection:** Failure in 2021 originating c.6m above road level where blocks (c.0.25m³) have slid along a steep release plane and have come to rest at toe of slope behind netting. Water seepage in the area gives potential for further rock fall. It is likely that this would be a volume of c.0.4m³ and a maximum	No change noted during 2023 inspection	AA22B-2

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
	block size of c.0.3m x 0.3m x 0.3m. Any future failure likely to be within the design capacity of netting but accumulation of further debris at toe of slope should be monitored.		
Ch. 3454	**2022 Inspection:** Block (c.0.3m x 0.2mx 0.2m) positioned approx. 2m above ground level is being held by netting. Has fallen 5m to current position.	No change noted during 2023 inspection	
Ch. 3475	**2021 Inspection:** Minor rock fall with small blocks at base of netting system. Largest block c.0.4m x 0.1m x 0.1m. Seems to have originated from righthand-side base of previously observed overhang. No damage to netting. Fractured rock with dilated joints apparent along base of overhang indicating potential for further failures in this area. At this location there is a 2m wide ditch behind Armco barrier which is likely to act as an effective rock trap. Risk to road from this hazard is therefore considered to be low to moderate but should be kept under observation during future inspections.	No change noted during 2023 inspection	
Ch. 3485	**2021 Inspection:** 3 to 4 cobble sized blocks sitting on ledge behind netting c.7m above road level. No damage to netting observed. Source likely to be overhanging blocks near crest.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	2	
Receptor Rating =	1	
Risk Value =	**6**	Re-assessed following completion of Phase 11 works and risk level reduced from high.
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Replace corroded bottom anchors and install additional anchors to achieve maximum spacing of 5m. - Replace bottom cable between Ch. 3462 and 3500. - Replace corroded cable clamps on lateral and vertical reinforcing cables. Re-tension and install additional spenax rings. - Apply anti-corrosion paint on cut end bars as part of the TECCO netting system to prevent further corrosion.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.38 Slope Ref. AA23N

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA23N	**Chainage:**	3640-3690	**Start Grid Ref:**	NG 91589 38050	**End Grid Ref:**	NG 91626 38084	**Elevation:**	26m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	60	Azimuth (°):	230	Height (m):	6	Length (m):	50	Vegetation Cover:	c.60% cover: predominantly gorse
Ditch Details:	1m wide, 0.2m deep	Roughness:	Rough	Verge Width (m):	0.5				

Engineering Description of Rock:
Very strong very thinly banded grey and white GNEISS.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
N/A			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Northern end of slope	**2017 Inspection:** Localised root jacking, however, small blocks will be retained by ditch.	No change noted during 2023 inspection	
Ch. 3669	**2022 Inspection:** Block fall c.0.4m x 0.4m x 0.3m has landed in the ditch. Block originated c.2m up rock slope.	No change noted during 2023 inspection	AA23N-1

RISK RATING		Comments
Overall Hazard Rating =	1	
Pathway Rating =	2	
Receptor Rating =	1.2	
Risk Value =	**2.4**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.39 Slope Ref. AA23S

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA23S	**Chainage:**	3630-3708	**Start Grid Ref:**	NG 91586 38039	**End Grid Ref:**	NG 91643 38087	**Elevation:**	25m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	324	Height (m):	8	Length (m):	78	Vegetation Cover:	30-40% cover. Grass, gorse, saplings.
Ditch Details:	From Ch.3660: Width 1.0m Depth 0.5m	Roughness:	Rough	Verge Width (m):	1				

Engineering Description of Rock:
Extremely strong very thinly banded grey and white GNEISS.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
2021 – Phase 12 works	Debris cleared from ditch at Ch. 3691 and between Ch. 3630 to 3650.	During the Phase 12 works in late 2021, a rock fall occurred which on impacting the ditch fragmented into small blocks at Ch 3671. Block originated c.7m above toe of slope. Volume of material c.0.25m^3. Material was cleared out from ditch during the Phase 12 works	No change – ditch remains effective.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3665-3687	**2016 Inspection:** Potential for small blocks (max 0.05m^3) to fail due to ravelling and root jacking. The verge here is flat and approx. 1.5m wide and should retain most blocks but some may reach road. There is no ditch here and no scope for adding one - buried drainage pipe and on corner (evidence of vehicles using verge). Placing some form of fence/barrier here would prevent debris reaching road. If this is not possible then passive rock fall netting will be required.	No change noted during 2023 inspection	
Ch. 3680	**2019 Inspection:** Boulders and cobbles weathering out of exposed soil slope and landing in ditch below.	No change noted during 2023 inspection	
Whole section	**2016 Inspection:** Presence of trees immediately above rock face may lead to root jacking / failures associated with uprooted trees.	No change noted during 2023 inspection	

RISK RATING		Comments
Overall Hazard Rating =	2	
Pathway Rating =	3	
Receptor Rating =	1.2	
Risk Value =	**7.2**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Install fence/barriers on verge between Ch. 3665 to 3687 (e.g. concrete barriers currently stored at end of AA22B). If this is not feasible then install passive rock fall netting.	- De-vegetate and light scale rock face. - Coppice trees within 5m of crest of rock face. - Build-up of debris in ditch should be monitored and clearance works undertaken as required to maintain its capacity.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.2.40 Slope Ref. AA24

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA24	**Chainage:**	3708-3892	**Start Grid Ref:**	NG 91643 38087	**End Grid Ref:**	NG 91807 38166	**Elevation:**	32m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	340	Height (m):	12	Length (m):	184	Vegetation Cover:	30% cover over highest rock slope, increasing to 80% cover towards N of section. Generally comprised grass, ferns and gorse.
Ditch Details:	Typical width 0.5m, depth 0.3m From Ch.3790 2m wide, 0.6m deep.	Roughness:	Rough	Verge Width (m):	Typically 0.5m. From Ch.3790 1.5m				

Engineering Description of Rock:
Very strong very thinly banded grey and white GNEISS with occasional quartz foliation.

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2017	Ch. 3747 to 3755	To inspect rock mass at crest of slope (above Maccaferri netting). Findings - Rock mass is not considered to pose a risk to the road at this time but should remain under observation during future inspections.
2021	Ch. 3740	To inspect area around source location of the large block failure observed by THC in 2020. Findings - the block originated from the crest of the slope ca. 10m above road level, with evidence of root growth along the failure plane. The failure has left a small soil overhang at the crest, and a few small loose blocks may fall down behind the netting. However, overall there is no significant hazard.

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
October 2020	Ch. 3740	Large rock has fallen down behind netting and come to rest in verge. First observed 08/10/20. Small puncture in netting ca. 5m above road and tear in netting at toe. Source not obvious.	AA24-1

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2023 Inspection Observations**
Before AECOM involvement (i.e. pre 2012)	Netting (only present across highest area of the rock slope between Ch. 3720 to 3760)	Details of netting system include: - PVC coated double twist - Top cable 8mm galvanised - c.5m anchor spacing and 18mm machine threaded bars (top anchors visibly corroded) - Cable-anchor connection: D shackle (connected on one side only) - 3 cable clamps - Netting lap connections using cable twists - No laps on anchors or vertical reinforcing **2021 Inspection:** At Ch. 3730 - Three dowels numbered D07, D08 and D09 (dated 2002) located close to crest are supporting rock mass in front of clay filled / weathered rock joint (blast fracture). Not a significant hazard due to existing remedial measures. The top cable diameter is c.8mm; corrosion visible on top anchors; mesh secure with cable ties.	No significant change to netting observed.
2015 – Phase 8 works	- Netting panels re-connected with spenax rings - New top cable and anchors installed to pre-existing netting		

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch.3740 to 3745	**2021 Inspection:** Several blocks with dilated fractures and / or root jacking potential have been identified that are likely to fail in the future but should be contained by the Maccaferri netting.	No change noted during 2023 inspection	
Ch. 3748	**2021 Inspection:** Small accumulation of debris at toe of slope behind netting c.1m x 0.4m x 0.2m. Source c.4m above toe. Material not loading net. Keep under observation.	No change noted during 2023 inspection	
Ch. 3762-3800	**2016 Inspection:** Trees at crest of slope could cause block fall associated with root jacking/ uprooted trees.	No change noted during 2023 inspection	
Ch. 3783 - 3792	**2016 Inspection:** Exposed soil slope 4m above road level with boulders in back scar of previous failure which could weather out and reach road. Slumping is also noted upslope from back scar.	No change noted during 2023 inspection	AA24-2

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2023 Inspection Observations**	**Photo Reference**
Ch. 3783 to 3892	**2017 Inspection:** Potential for ravelling of small blocks, however, ditch below sufficiently wide/deep to retain.	No change noted during 2023 inspection	
Ch. 3790	**2017 Inspection:** Broken rock at crest of slope. Likely to be caught by ditch but should remain under inspection.	No change noted during 2023 inspection	
Ch. 3810	**2019 Inspection:** 0.4m x 0.3m x 0.2m block in ditch. Source not obvious but recent (no paint).	No change noted during 2023 inspection	
Ch. 3870	**2017 Inspection:** Potential planar failure 3m above road. Small tabular blocks likely to be contained by ditch below.	A new block has landed in the ditch, confirming this ongoing planar failure mechanism.	AA24-3

RISK RATING		**Comments**
Overall Hazard Rating =	3	
Pathway Rating =	2	
Receptor Rating =	1.2	
Risk Value =	**7.2**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Ch.3783 - 3790: Re-profile vertical soil slope and install erosion control matting.	- Coppice trees within 5m of crest of rock face between Ch. 3762 and 3800. - Build-up of debris in ditch should be monitored and clearance works undertaken as required to maintain its capacity.

Assessed in field by:	MT/JG	**Date:**	19/04/2023	**Reviewed by:**	PLM	**Date:**	16/06/23

5.3 Summary of Findings: Risk Ratings

The relative rock fall risk associated with each of the slopes is summarised in Table 5-1 below, ranked from highest to lowest risk. It is important to note that the risk ratings are relative and that a risk of 'low' does not mean that a rock fall will not occur, but that it is considered that the likelihood and/or consequences of a rock fall is lower than at other locations.

The 2023 inspection did not identify any hazards or features considered to pose an immediate risk of rock fall affecting the operation of the road nor did it identify any hazards or features considered to pose an immediate risk of failure affecting the operation of the road. However, the need for urgent maintenance works was identified at several locations. The scope of these works is discussed further in 6.2.2.

Table 5-1: Relative Risk Level of Slopes

Risk Ranking	Slope Ref.	Risk Rating	Relative Risk Level	Changes to 2022 Risk Rating
1	AA19 Upper	12.0*	Very High	*Increased to very high to reflect recent increase in rock fall frequency at this location.
2	AA2A	14.4	High	Risk re-assessed following changes to the start chainage of the slope ref. Increased from 'Low'.
3	AA14 East	12.6	High	None
4	AA5	12.0	High	None
5	AA13 / 14 Upper	10.8	High	Not inspected in 2023 other than review of drone survey imagery. Risk rating as per 2022 inspection.
	AA15 Upper	10.8	High	Not inspected in 2023 other than review of drone survey imagery. Risk rating as per 2022 inspection.
	AA16-17-18 Upper	10.8	High	None
6	AA4	9.0	Moderate	None
	AA4 Upper	9.0	Moderate	Not inspected in 2023. Risk rating as per 2022 inspection.
	AA10	9.0	Moderate	None
	AA21	9.0	Moderate	None
7	AA6A	8.0	Moderate	None
8	AA15	7.2	Moderate	None
	AA17	7.2	Moderate	Pathway re-assessed. Most blocks not expected to reach road due to netting system. Reduced from 'High'.
	AA20	7.2	Moderate	None
	AA20 Upper	7.2	Moderate	None
	AA23S	7.2	Moderate	None
	AA24	7.2	Moderate	None
9	AA5A	6.0	Moderate	None
	AA9	6.0	Moderate	None
	AA16	6.0	Moderate	None
	AA22A	6.0	Moderate	None
	AA22B	6.0	Moderate	None
10	AA2	4.8	Low	Risk re-assessed following changes to the end chainage of the slope ref. Reduced from 'High'.
	AA6B	4.8	Low	None
	AA7	4.8	Low	None
	AA11	4.8	Low	None
11	AA3	4.0	Low	None
	AA8	4.0	Low	None

Risk Ranking	Slope Ref.	Risk Rating	Relative Risk Level	Changes to 2022 Risk Rating
12	AA1	2.4	Low	None
	AA13	2.4	Low	None
	AA23N	2.4	Low	None
13	AA19	2.0	Low	None
	AA3A	2.0	Low	None
	AA6	2.0	Low	None
	AA12	2.0	Low	None
	AA14W	2.0	Low	None
14	AA18	1.0	Low	None
	AA18-19	1.0	Low	None

6. Debris Flow Risk

Debris flows as mass movements of soil or rock debris suspended in a liquid matrix. Debris flows are often channelised, but can also occur on open hillsides. They are high energy dynamic events generally characterised by high rainfall and rapid erosion, and can have long run out paths.

AECOM is aware of several occasions in the past where the road has been blocked / partially blocked by saturated soil and rock debris. Locations of previous debris flow events, which have also been referred to by THC as 'wash outs' or 'landslides' include Frenchman's Burn, the boundary between AA5 and AA5A, AA18-19, AA13, AA7 and, most recently AA2A (see section 5.2.3 for further details). The continued downslope movement of scree at AA18-19 is also considered to have a debris flow component, associated with overtopping of the adjacent hillside drainage channel.

Following the events at Frenchman's Burn and AA5/AA5A, which pre-date AECOM's involvement at the Stromeferry Bypass, targeted remedial works in the form of debris catch basins and improved slope drainage were installed respectively.

Recorded debris flow events along the Stromeferry Bypass have predominantly originated from existing watercourses or drainage channels, resulting in channelised debris flows that pose a short-lived or episodic risk to the road below, generally during or following periods of high rainfall. Although often thought of as seasonal in nature it is important to recognise that debris flows can occur at any time of year.

The potential for this type of geohazard is exacerbated by the presence of 'debris dams' within many of the watercourses and drainage channels on the slopes above the A890 (e.g. AA1, AA2, AA2A and AA16/17 Upper). Debris dams are a result of loose debris collecting against fallen trees and/or branches and impede water flow. During high rainfall events the channels become inundated and the combined weight of water and debris can result in the 'dam' bursting. As the saturated material moves down slope at speed, additional debris is stripped from the sidewalls of the watercourse.

The combination of water and high sediment loads in channelised debris flows has substantial erosive power and can cause significant damage to the slope and result in localised blockages at road level. The potential impact of a debris flow will clearly depend on its size and location, and whether a road user is located within the immediate vicinity at the time of the event. The size and condition of roadside ditches and culverts or channels beneath the road and railway is also of relevance. If ditches or culverts are of inadequate size or operating at reduced capacity due to debris accumulation then the potential for debris over-topping increases.

To provide some context on the level of debris flow risk relative to that of rock falls (as discussed in Section 5) the rock fall risk assessment methodology outlined in Section 2.1 has been applied to debris flows. Carrying out a location by location risk assessment for debris flow is not considered practical or appropriate and instead, it is considered more helpful to consider the site as a whole. The resulting risk rating is high to very high, assuming a debris volume of volume >10m^3 and that greater than half the debris is expected to reach the road.

Although a high to very high risk would generally require some form of risk reduction, the episodic and typically weather dependant nature of debris flows means the risk is often tolerated subject to appropriate management protocols and monitoring of channels and culverts. Debris accumulation on the road is relatively straightforward to remove and, additionally, once a channelised debris flow has occurred the risk at that location is usually reduced as the debris accumulation has cleared.

To reduce debris flow risk:

- The obstruction of existing downslope drainage channels and associated culverts must be avoided. Culverts below the road (and railway) should be inspected on a regular basis (annually as a minimum) paying particular attention to debris accumulation or blockages on their upslope side. Debris clearance should be undertaken as required and where practical this should include clearance of debris from upslope channels.
- Consideration should be given to creating debris basins upslope of the road and / or railway where the topography allows. Enlarged catchments would retain water and entrained material in the event of drainage channels becoming overwhelmed.

7. Discussion and Recommendations

Whilst the annual inspections of the roadside and upper hillside slopes are carried out to identify and quantify risks to road users from falling materials, it should be recognised that given the size and terrain of the area that only limited locations and areas can be examined in detail. Furthermore the types of falls and wide range of contributing factors means that block falls and debris flows could occur at almost any location. The specific hazards and risks identified for the various slope sub-divisions should therefore be considered as indicative of the global risks associated with the site as a whole.

The Phase 6, 7, 8, 9, 10, 11 and 12 works, which were carried out in 2012, 2013, 2015, 2017, 2018, 2019 and 2021 respectively, have addressed a significant proportion of the rock fall hazards identified during AECOM's previous inspections. In particular, these remedial works have significantly reduced the risk associated with a number of formerly 'very high risk' and 'high risk' potential hazards following works including scaling and the installation of catch fences, restraining cables, spot dowels and active rock fall netting systems. Improvements to existing passive (drape) rock fall netting systems (e.g. replacing corroded elements and installing additional anchors) have also served to reduce the risk of relatively small scale rock falls reaching the road.

The most recent Phase 12 works were targeted to reduce the risk at two slopes formerly assessed as 'very high risk' (AA6A and AA20 Upper). Following these works the residual risk level for the road beneath slopes AA6A and AA20 Upper was assessed to be moderate.

The updated 2023 risk assessment identified one 'very high risk' slope at AA19 Upper and six slopes were assessed to pose a relatively high risk to road users. However, it should be noted that the risk of rock falls occurring throughout the site still remains. Additionally, the site-wide risk of debris flows (particularly channelised debris flows) affecting the road is assessed as high to very high.

The occurrence of small to moderate scale rock falls (e.g. a few brick to breeze block sized rocks landing on the road) potentially occurring every few months to years and large to very large scale rock falls (e.g. rock falls similar in scale to the Dec 2011/Jan 2012 rock fall at AA19) potentially occurring every few years to decades will be ongoing due to the degradation of the near-surface rock mass from weathering, root action, etc. Guidance on the management of risk is given in the following sections and should include regular inspection of the slopes, maintenance of existing remedial systems and, where appropriate and budget permits, the completion of remedial works.

7.1 Ongoing Risk Management

The following approach is recommended to manage the level of risk within the site.

Continued weekday drive through of the site by THC:

THC staff familiar with the site and inspection procedure should continue to drive along the road each weekday morning with the aim of identifying any rock falls or debris flows. Observations should be reported internally within THC, with specialist geotechnical advice sought where appropriate.

Continued monthly inspections by THC:

For the monthly inspections to continue to provide an appropriate management tool it is important they are carried out on by personnel with knowledge of the site (preferably by the same inspector) and an understanding of the aims and objectives of the inspections. AECOM provided guidance to THC personnel involved in the inspections during a walk-through of the site on 23rd June 2022.

The main aims of the monthly inspections are to:

- Identify any new rock falls (including behind netting systems) and, where possible, mark associated blocks with spray paint. A record should be made of the size and location of rock falls (small rock falls can be a precursor to a larger rock falls and it is therefore important to record all newly identified blocks in the verge and ditch);
- Identify any new debris flows. Record location (road level and source where possible) and estimate volume of transported material.
- Identify any areas of the roadside ditch where debris build up has reduced capacity to less than 50%;

- Identify any significant accumulations of debris behind netting systems that may require clearance;
- Identify any damage to existing installations by rock falls, vehicles, theft of metal components, etc.

For this method of risk management to be effective, the records of the monthly inspections should be reviewed monthly by AECOM geologists with knowledge of the site to assess the significance of any findings and identify the requirement for emergency inspections. This is particularly important when THC has identified a new rock fall or debris flow.

On-going annual inspections by suitably qualified and experienced Engineering Geologists / Geotechnical Engineers:

This should involve the roadside inspection of all slopes and targeted rope access inspections of selected higher risk slopes, particularly where potential hazards have been identified during previous inspections, and less accessible 'upper' rock faces and slopes that are not visible from the road. For maximum benefit, annual inspections should ideally be carried out in April, following the deleterious effects of winter and prior to the growth of vegetation.

7.2 Recommended Remedial Works

It is understood that THC is considering a new road scheme that will bypass the section of the A890 between Ardnarff and Attadale to permanently reduce the risk of ongoing rock falls.

THC should carefully consider whether the ongoing risk posed by rock falls and debris flows whilst the current road remains in use is acceptable, considering the potential for injury to road users and the potential disruption due to road closures. Consideration should also be given to the period of time that the current road will remain in use and that road users will continue to be exposed to the risk of rock falls and debris flows.

Taking cognisance of the above, AECOM recommends that THC continues to carry out scheduled remedial works on at least a biennial basis in addition to the monthly and annual inspections, to reduce the risk posed by rock falls and debris flows to an acceptable level while the current road remains in use.

Recommendations for remedial works are given in the Geotechnical Assessment Sheets in Section 5 of the report. The recommended remedial works have been split in to three categories as described below:

- Category 1 – Ongoing maintenance: Recommended maintenance work is recommended to maintain the current condition of the rock faces and slopes (including drainage) and existing rock fall protection installations. Examples of required maintenance include repair of damaged or corroded netting, clearing of existing ditches or drainage channels, and ongoing removal of loose rock and/or vegetation. Undertaking the maintenance work will not necessarily reduce the risk posed by the rock faces, but instead aims to prevent existing protection measures from deteriorating further and the risk increasing. Some of these works can be undertaken directly by THC (e.g. clearing out ditches – see Section 7.3), whilst others will require specialist contractors (e.g. replacing damaged or corroded elements or coppicing trees). These works are generally of low to moderate cost.
- Category 2 – Localised targeted rock fall and debris flow protection works: Targeted rock fall protection works are recommended to address the risk posed by individual hazards that have been identified during the inspections in the longer term. Examples of these works include dowelling/strapping/netting, removal of a small number of individual blocks or clearance of isolated debris dams within watercourses. These works will reduce the risk associated with the specific hazard but may not reduce the risk posed by the rock face or slope as a whole due to the presence of other hazards that have not been addressed. These works will involve specialist contractors and are generally of moderate cost.
- Category 3: Large scale rock fall and debris flow protection works: These are recommended to address the hazard posed by the entire rock face or slope in the long term. Examples of these works include installing new rock fall or debris flow barriers (catch fences), rock fall netting systems and associated spot dowels, cable strapping and areas of high strength netting. These works are generally high cost and will involve specialist contractors, but they would offer a significant level of risk reduction. Additional detailed inspection of the individual rock faces and slopes may be required to enable detailed design and pricing of Category 3 works.

It is recognised that THC has a limited budget for remedial works and to achieve the maximum level of risk reduction it is recommended that works are prioritised to address the highest risk slopes and hazards in the first instance (typically Category 2 and 3 works). Where the budget allows, lower priority works focussing on upgrading and

maintaining existing rock fall protection installations (typically Category 1 and 2 works) should be undertaken. On occasion, the prioritisation of Category 1 works may be appropriate to ensure existing remedial systems remain functional and continue to offer the desired level of risk reduction.

AECOM is in regular discussions with THC in relation to the budget and timing of planned remedial works such that an appropriate scope of remedial work can be selected.

7.3 Maintenance of Roadside Rock Traps / Drainage Ditches

Roadside rock trap ditches are present along the toe of many of the slopes and these must remain clear of significant debris accumulations to offer a continued level of risk reduction to the road and road users from small to moderate scale rock falls originating from the slopes above. During the 2023 inspection debris was noted in the roadside ditches at several locations and it is recommended that these be cleared to re-establish their original capacity at the earliest opportunity. These are non-specialist works and can be undertaken from road level by THC or a standard civil engineering contractor. Blocked drainage gullies were also identified and these will also require to be cleared to maintain drainage beneath the road.

The build-up of debris within the roadside ditches should be monitored during THC's monthly inspections and clearance works undertaken as required to maintain their capacity. As a guide, THC should allow for annual clearance works.

7.4 Debris Flow Risk Reduction

Many drainage channels leading to the road from the upper slopes were noted to contain debris (rock and trees). Clearance of these could be undertaken to prevent alteration to the hydrological regime and reduce the potential for channelised debris flows.

Consideration could also be given to creating debris basins upslope of the road and / or railway where the topography allows. Enlarged catchments would retain water and entrained material in the event of drainage channels becoming overwhelmed.

7.5 Additional Recommendations

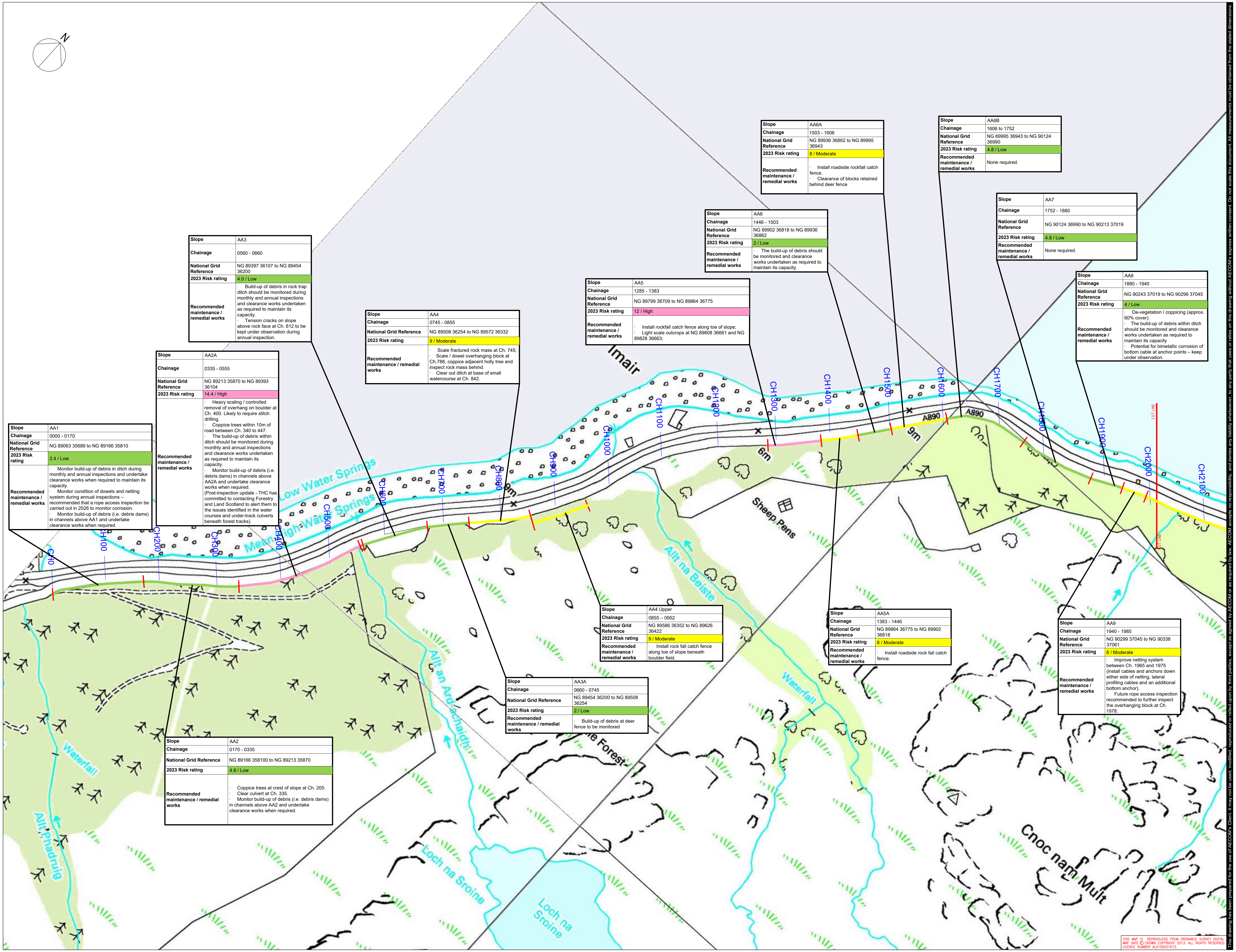
During inspections of the slopes, both in 2023 and in previous years, AECOM has identified several additional hazards that are not directly related to the condition of the roadside slopes. Considerations should be given to addressing these issues, which are summarised below:

- Trees on upper slopes - A plantation of mature coniferous trees is present on the steep hillside above slopes AA12 to AA22A. The superficial deposits on the slope are thin and the trees are consequently poorly anchored and prone to falling in high winds. A large percentage of the trees has already fallen and remains on the slope. These trees have generally come to rest against the remaining live trees or dead tree stumps. Numerous rocks dislodged when the trees fell have come to rest against these fallen trees which are acting as a natural catch feature. It is, however, known that rocks originating from the root balls of uprooted trees have occasionally rolled downslope and reached the road. The live trees that remain on the slope will continue to fall and there is a risk that dislodged rocks could roll downslope and reach the road or railway. Photographic drone surveys of the site were carried out in 2019, 2020 and 2023, allowing for a comparison to be undertaken to better quantify the risk associated with tree falls. A reduction in the number of standing trees of ca. 10% was identified between the 2020 and 2023 surveys, suggesting a relatively low rate of tree fall, however, it should be recognised that such events will be largely weather dependant and a single storm event could fell many trees. It is recommended that a repeat photographic drone survey of the slopes to the east of Frenchman's Burn be carried out in March / April 2024, when vegetation cover is at a minimum, to allow further quantification of the rate of tree falls and the pros / cons of felling to be further considered. Ultimately it is recommended that remaining standing trees be felled, and all trees be removed. If removal is not deemed possibly, consideration could be given to felling trees to fall along slope and leave stump 1-2m high to form barrier to down slope movement. It is recommended that a specialist in forestry clearance is consulted on potential clearance methods.

- Culverts – the inspection of culverts crossing beneath the road and railway was outside AECOM's inspection scope, however, localised blockages were noted. Periodic inspection of the culverts by THC is recommended, along with clearance of accumulated debris when required to maintain the flow capacity of culverts.

- Many of the chainage markers installed in 2017 were either obscured by vegetation or had been damaged by grass cutting equipment. It is recommended that the chainage markers be replaced with markers on higher posts prior to the 2024 inspection.

Appendix A Location Plans



Slope	AA1
Chainage	0000 - 0170
National Grid Reference	NG 89063 35689 to NG 89166 35810
2023 Risk rating	2.4 / Low
Recommended maintenance / remedial works	· Monitor build-up of debris in ditch during monthly and annual inspections and undertake clearance works when required to maintain its capacity. · Monitor condition of dowels and netting system during annual inspections – recommended that a rope access inspection be carried out in 2026 to monitor corrosion. · Monitor build-up of debris (i.e. debris dams) in channels above AA1 and undertake clearance works when required.

Slope	AA2
Chainage	0170 - 0335
National Grid Reference	NG 89166 358100 to NG 89213 35870
2023 Risk rating	4.8 / Low
Recommended maintenance / remedial works	· Coppice trees at crest of slope at Ch. 205. · Clear culvert at Ch. 335. · Monitor build-up of debris (i.e. debris dams) in channels above AA2 and undertake clearance works when required.

Slope	AA2A
Chainage	0335 - 0555
National Grid Reference	NG 89213 35870 to NG 89393 36104
2023 Risk rating	14.4 / High
Recommended maintenance / remedial works	· Heavy scaling / controlled removal of overhang on boulder at Ch. 400. Likely to require stitch drilling. · Coppice trees within 10m of road between Ch. 340 to 447. · The build-up of debris within ditch should be monitored during monthly and annual inspections and clearance works undertaken as required to maintain its capacity. · Monitor build-up of debris (i.e. debris dams) in channels above AA2A and undertake clearance works when required. (Post-inspection update - THC has committed to contacting Forestry and Land Scotland to alert them to the issues identified in the water courses and under-track culverts beneath forest tracks).

Slope	AA3
Chainage	0560 - 0660
National Grid Reference	NG 89397 36107 to NG 89454 36200
2023 Risk rating	4.0 / Low
Recommended maintenance / remedial works	· Build-up of debris in rock trap ditch should be monitored during monthly and annual inspections and clearance works undertaken as required to maintain its capacity. · Tension cracks on slope above rock face at Ch. 612 to be kept under observation during annual inspection.

Slope	AA3A
Chainage	0660 - 0745
National Grid Reference	NG 89454 36200 to NG 89508 36254
2023 Risk rating	2 / Low
Recommended maintenance / remedial works	· Build-up of debris at deer fence to be monitored

Slope	AA4
Chainage	0745 - 0855
National Grid Reference	NG 89508 36254 to NG 89572 36332
2023 Risk rating	9 / Moderate
Recommended maintenance / remedial works	· Scale fractured rock mass at Ch. 745; · Scale / dowel overhanging block at Ch.788, coppice adjacent holly tree and inspect rock mass behind. · Clear out ditch at base of small watercourse at Ch. 842.

Slope	AA4 Upper
Chainage	0855 – 0952
National Grid Reference	NG 89586 36352 to NG 89626 36422
2023 Risk rating	9 / Moderate
Recommended maintenance / remedial works	· Install rock fall catch fence along toe of slope beneath boulder field.

Slope	AA5
Chainage	1285 - 1383
National Grid Reference	NG 89799 36709 to NG 89864 36775
2023 Risk rating	12 / High
Recommended maintenance / remedial works	· Install rockfall catch fence along toe of slope; · Light scale outcrops at NG 89808 36661 and NG 89828 36663;

Slope	AA5A
Chainage	1383 - 1446
National Grid Reference	NG 89864 36775 to NG 89902 36818
2023 Risk rating	6 / Moderate
Recommended maintenance / remedial works	· Install roadside rock fall catch fence.

Slope	AA6
Chainage	1446 - 1503
National Grid Reference	NG 89902 36818 to NG 89936 36862
2023 Risk rating	2 / Low
Recommended maintenance / remedial works	· The build-up of debris should be monitored and clearance works undertaken as required to maintain its capacity.

Slope	AA6A
Chainage	1503 - 1606
National Grid Reference	NG 89936 36862 to NG 89995 36943
2023 Risk rating	8 / Moderate
Recommended maintenance / remedial works	· Install roadside rockfall catch fence. · Clearance of blocks retained behind deer fence

Slope	AA6B
Chainage	1606 to 1752
National Grid Reference	NG 89995 36943 to NG 90124 36990
2023 Risk rating	4.8 / Low
Recommended maintenance / remedial works	None required.

Slope	AA7
Chainage	1752 - 1880
National Grid Reference	NG 90124 36990 to NG 90213 37019
2023 Risk rating	4.8 / Low
Recommended maintenance / remedial works	None required.

Slope	AA8
Chainage	1880 - 1940
National Grid Reference	NG 90243 37019 to NG 90299 37045
2023 Risk rating	4 / Low
Recommended maintenance / remedial works	· De-vegetation / coppicing (approx. 60% cover). · The build-up of debris within ditch should be monitored and clearance works undertaken as required to maintain its capacity · Potential for bimetallic corrosion of bottom cable at anchor points – keep under observation.

Slope	AA9
Chainage	1940 - 1985
National Grid Reference	NG 90299 37045 to NG 90338 37061
2023 Risk rating	6 / Moderate
Recommended maintenance / remedial works	· Improve netting system between Ch. 1965 and 1975 (install cables and anchors down either side of netting, lateral profiling cables and an additional bottom anchor). · Future rope access inspection recommended to further inspect the overhanging block at Ch. 1978.

AECOM

Project

STROMEFERRY
2023 INSPECTION

Client

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Notes

Do not scale from this drawing. Work to figured dimensions only.

1. THIS DRAWING SHOULD BE CONSULTED IN CONJUNCTION WITH AECOM DRAWING 60685712-GEO-0002A.
2. FOR FURTHER DETAILS OF THE RISK ASSESSMENT AND RECOMMENDED REMEDIAL WORKS PLEASE REFER TO THE AECOM 'A890 STROMEFERRY BYPASS - ANNUAL SLOPE INSPECTION REPORT 2023.
3. THE LEVEL OF RISK ASSIGNED TO EACH SLOPE RELATED TO THE CONDITIONS OBSERVED DURING THE INSPECTION CARRIED OUT IN APRIL 2023. ALL RISK RATINGS ARE RELATIVE AND IT SHOULD BE NOTED THAT A 'LOW' RATING DOES NOT MEAN THAT A SLOPE WILL NOT FAIL, BUT THAT THE LIKELIHOOD AND/OR CONSEQUENCE OF A FAILURE IS LOWER THAN AT OTHER LOCATIONS.

KEY

APPROXIMATE CHAINAGE FROM GATES AT ARDNARFF — CH1000
APPROXIMATE LOCATION AND RISK RATING OF ROCK FACES
LOW
MODERATE
HIGH
VERY HIGH

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
A	05/07/23	UPDATED FOR 2023 INPSECTION	JG/MT/PLM

Key Plan

Purpose Of Issue

FOR INFORMATION

Project Number

60685712

Sheet Title

STROMFERRY
2023 INSPECTION
SHEET 1 OF 2

Sheet Number

60685712- 0001A

Scale: @A0 **Rev:**

N

Slope	AA10
Chainage	1985 - 2297
National Grid Reference	NG 90338 37061 to NG 90610 37206
2023 Risk rating	9 / Moderate
Recommended maintenance / remedial works	· Install targeted combination of roadside rockfall catch fences and netting; · Coppice trees growing in rock exposures (only if catch fences and netting not installed) and light scaling of broken/unstable rock; · Scale potential wedge failure at Ch. 2130.

Slope	AA11
Chainage	2360 - 2399
National Grid Reference	NG 90657 37232 to NG 90698 37266
2023 Risk rating	4.8 / Low
Recommended maintenance / remedial works	· Install bimetallic corrosion protection between cables and eye nuts; · Replace bottom cable and install additional bottom anchor; · Replace dropper cables and associated anchors.

Slope	AA12
Chainage	2399 - 2467
National Grid Reference	NG 90698 37266 to NG 90740 37326
2023 Risk rating	2 / Low
Recommended maintenance / remedial works	None required.

Slope	AA13
Chainage	2467 - 2562
National Grid Reference	NG 90740 37326 to NG 90796 37399
2023 Risk rating	2.4 / Low
Recommended maintenance / remedial works	· Replace corroded cable clamps and re-tension and install additional spenax rings on vertical reinforcing cables between Ch. 2513 and 2528.

Slope	AA14 West
Chainage	2562 - 2630
National Grid Reference	NG 90846 37438 to NG 90846 37438
2023 Risk rating	2.0 / Low
Recommended maintenance / remedial works	None required.

Slope	AA14 East
Chainage	2630 - 2664
National Grid Reference	NG 90846 37438 to NG 90871 37455
2023 Risk rating	12.6 / High
Recommended maintenance / remedial works	· Install high strength netting (e.g. Tecco) with pattern bolts over upper half of rock face and drape below; or · Install appropriately designed catch fence along slope. · Accumulation of debris behind existing catch fence to be monitored and clearance works undertaken in the event of a failure.

Slope	AA15
Chainage	2664 - 2851
National Grid Reference	NG 90781 37455 to NG 91005 37551
2023 Risk rating	7.2 / Moderate
Recommended maintenance / remedial works	· Coppice trees towards crest of slope outwith netting system between Ch.2790 and Ch.2851; · Install additional bottom anchors between Ch. 2690 and 2700; · Replace top cable and install additional top anchors; · De-vegetate rock face within netting system.

Slope	AA16
Chainage	2851 – 2923
National Grid Reference	NG 91005 37551 to NG 91069 37601
2023 Risk rating	6 / Moderate
Recommended maintenance / remedial works	· Coppice tree in broken rock mass at Ch. 2888. · Vegetation clearance/tree coppicing across slope. · Build-up of debris in ditch should be monitored and clearance works undertaken as required to maintain its capacity.

Slope	AA17
Chainage	2923 - 2987
National Grid Reference	NG 91069 37601 to NG 91123 37630
2023 Risk rating	7.2 / Moderate
Recommended maintenance / remedial works	· Scale fractured rock mass between Ch. 2933 and 2946; · Replace corroded anchor points on reinforcing cables.

Slope	AA18
Chainage	2987 - 3059
National Grid Reference	NG 91123 37630 to NG 91186 37649
2023 Risk rating	1.0 / Low
Recommended maintenance / remedial works	None required.

Slope	AA19
Chainage	3070 - 3157
National Grid Reference	NG 91199 37660 to NG 91274 37698
2023 Risk rating	2 / Low
Recommended maintenance / remedial works	· Clear debris behind gabions.

Slope	AA20
Chainage	3157 - 3215
National Grid Reference	NG 91274 37698 to NG 91322 37727
2023 Risk rating	7.2 / Moderate
Recommended maintenance / remedial works	· Install passive netting system over rock face prone to ravelling at Ch. 3200 to Ch.3205; · Light scale and dowel blocks above wall at Ch. 3175.

Slope	AA21
Chainage	3280 - 3386
National Grid Reference	NG 91381 37761 to NG 91451 37842
2023 Risk rating	9 / Moderate
Recommended maintenance / remedial works	· Install panel of high strength active netting (e.g. Tecco) behind existing drape netting at Ch. 3305; · Install dowels in potential failures at Ch. 3322; · Ch. 3350: Replace current passive netting with active netting system (TECCO) · Coppice trees at Ch. 3310 and 3366 and light scale broken rock mass at Ch. 3366; · Re-tension lateral reinforcing cables and install additional spenax rings; · Replace corroded cable clamps on reinforcing cables; · Remove logs from top of netting.

Slope	AA22B
Chainage	3415 - 3592
National Grid Reference	NG 91483 37882 to NG 91561 38016
2023 Risk rating	6 / Moderate
Recommended maintenance / remedial works	· Replace corroded bottom anchors and install additional bottom anchors; · Replace bottom cable between Ch. 3462 and 3500; · Replace corroded cable clamps on reinforcing cables, re-tension and install additional spenax rings. · Apply anti-corrosion paint on cut end bars as part of the TECCO netting system to prevent further corrosion.

Slope	AA23N
Chainage	3640 - 3690
National Grid Reference	NG 91589 38050 to NG 91626 38084
2023 Risk rating	2.4 / Low
Recommended maintenance / remedial works	None required.

Slope	AA24
Chainage	3708 - 3892
National Grid Reference	NG 91643 38087 to NG 91807 38166
2023 Risk rating	7.2 / Moderate
Recommended maintenance / remedial works	· Re-profile vertical soil slope at Ch. 3783 to Ch.3790 and install erosion control matting. · Coppice trees within 5m of crest of rock face between Ch. 3762 and 3800. · Build-up of debris in ditch should be monitored and clearance works undertaken as required to maintain its capacity.

Slope	AA13/14 Upper
Chainage	2505 - 2650
National Grid Reference	NG 90830 37319 to NG 90904 37388
2023 Risk rating	10.8 / High
Recommended maintenance / remedial works	· Controlled removal or retention of unstable blocks; · Risk be better quantified and managed by photographic and topographic surveying and monitoring by aerial drone to assess the area affected, number of trees standing/fallen, with a the area resurveyed annually to assess any changes, frequency of failures etc. · Consider felling trees to fall along slope and leave stump 1-2m high.

Slope	AA15 Upper
Chainage	2710 – 2733
National Grid Reference	NG 90955 37420 to NG 90971 37437
2023 Risk rating	10.8 / High
Recommended maintenance / remedial works	· Risk to be better quantified and managed by photographic and topographic surveying and monitoring by aerial drone to assess the area affected, number of trees standing/fallen, with a the area resurveyed annually to assess any changes, frequency of failures etc. · Consider felling trees to fall along slope and leave stump 1-2m high.

Slope	AA16-17-18 Upper
Chainage	2766 – 3050
National Grid Reference	NG 91016 37460 to NG 91199 37660
2023 Risk rating	10.8 / High
Recommended maintenance / remedial works	· Install rock fall catch fence along crest of roadside rock fence. · Risk to be better quantified and managed by photographic and topographic surveying and monitoring by aerial drone to assess the area affected, number of trees standing/fallen, with a the area resurveyed annually to assess any changes, frequency of failures etc. · Consider felling trees to fall along slope and leave stump 1-2m high.

Slope	AA18_19
Chainage	3059 - 3070
National Grid Reference	NG 91186 37649 to NG 91199 37660
2023 Risk rating	1 / Low
Recommended maintenance / remedial works	· Replace corroded cable clamps. · Tears in netting from rock falls to be repaired. · Scree area cleared in September 2022 urgent works is refilling – needs to be cleared again.

Slope	AA19 Upper
Chainage	3070 - 3157
National Grid Reference	NG 91199 37660 to NG 91274 37698
2023 Risk rating	12* / Very High (*Increased to very high to reflect recent increase in rock fall frequency)
Recommended maintenance / remedial works	· Install rockfall catch fence above roadside rock face.

Slope	AA20 Upper
Chainage	3157 - 3215
National Grid Reference	NG 91274 37698 to NG 91322 37727
2023 Risk rating	7.2 / Moderate
Recommended maintenance / remedial works	· Controlled removal of selected blocks; · Coppice trees growing on rock face.

Slope	AA22A
Chainage	3386 - 3415
National Grid Reference	NG 91451 37842 to NG 91483 37882
2023 Risk rating	6 / Moderate
Recommended maintenance / remedial works	· Install rock dowels to secure overhanging block at crest at Ch. 3390; · De-vegetate / coppice and inspect previously obscured rock mass; · Install additional bottom anchors.

Slope	AA23S
Chainage	3630 - 3708
National Grid Reference	NG 91586 38039 to NG 91643 38087
2023 Risk rating	7.2 / Moderate
Recommended maintenance / remedial works	· Install fence/barriers on verge between Ch. 3665 and 3687; · De-vegetate and light scale rock face; · Coppice trees within 5m of crest of rock face. · Build-up of debris in ditch should be monitored and clearance works undertaken as required to maintain its capacity.

CH1900 CH2000 CH2100 CH2200 CH2300 CH2400 CH2500 CH2600 CH2700 CH2800 CH2900 CH3000 CH3100 CH3200 CH3300 CH3400 CH3500 CH3600 CH3700 CH3800 CH3892

FRENCHMANS BURN

8m 6m

Waterfall

Avalanche Shelter

Mean Low Water Springs

Allt Suidh na Bà

AECOM

Project
STROMEFERRY
2023 INSPECTION

Client
THE HIGHLAND COUNCIL

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Notes
Do not scale from this drawing. Work to figured dimensions only.

1. THIS DRAWING SHOULD BE CONSULTED IN CONJUNCTION WITH AECOM DRAWING 60685712-GEO-0001A.
2. FOR FURTHER DETAILS OF THE RISK ASSESSMENT AND RECOMMENDED REMEDIAL WORKS PLEASE REFER TO THE AECOM 'A890 STROMEFERRY BYPASS - ANNUAL SLOPE INSPECTION REPORT 2023.
3. THE LEVEL OF RISK ASSIGNED TO EACH SLOPE RELATED TO THE CONDITIONS OBSERVED DURING THE INSPECTION CARRIED OUT IN APRIL 2023
ALL RISK RATINGS ARE RELATIVE AND IT SHOULD BE NOTED THAT A 'LOW' RATING DOES NOT MEAN THAT A SLOPE WILL NOT FAIL, BUT THAT THE LIKELIHOOD AND/OR CONSEQUENCE OF A FAILURE IS LOWER THAN AT OTHER LOCATIONS.

KEY
APPROXIMATE CHAINAGE FROM GATES AT ARDNARFF CH1000
APPROXIMATE LOCATION AND RISK RATING OF ROCK FACES
LOW
MODERATE
HIGH
VERY HIGH

ISSUE/REVISION

Rev	Date	Description	Dm/Chk/Appr
A	05/07/23	UPDATED FOR 2023 INPSECTION	JG/MT/PLM

Key Plan

Purpose Of Issue
FOR INFORMATION

Project Number
60685712

Sheet Title
STROMFERRY
2023 INSPECTION
SHEET 2 OF 2

Sheet Number
60685712-0002A

Scale: @A0 **Rev:**

Last saved by: PETER.MORGAN1 (2023-07-11) Last Plotted: 2023-07-11
Filename: L:\LEGACY\WP2\MOU\6\MOU\RJD\00 THC STROMEFERRY BYP\ASS ROCKWORKS 2022-2026\2023 STROMEFERRY BYPASS INSPECTION\2023 ANNUAL INSPECTION\02. REPORTING\APPENDIX A - DRAWINGS\60685712-GEO-0001 & 0002.DWG

Appendix B Drone Survey Tree Fall Review

Stromeferry

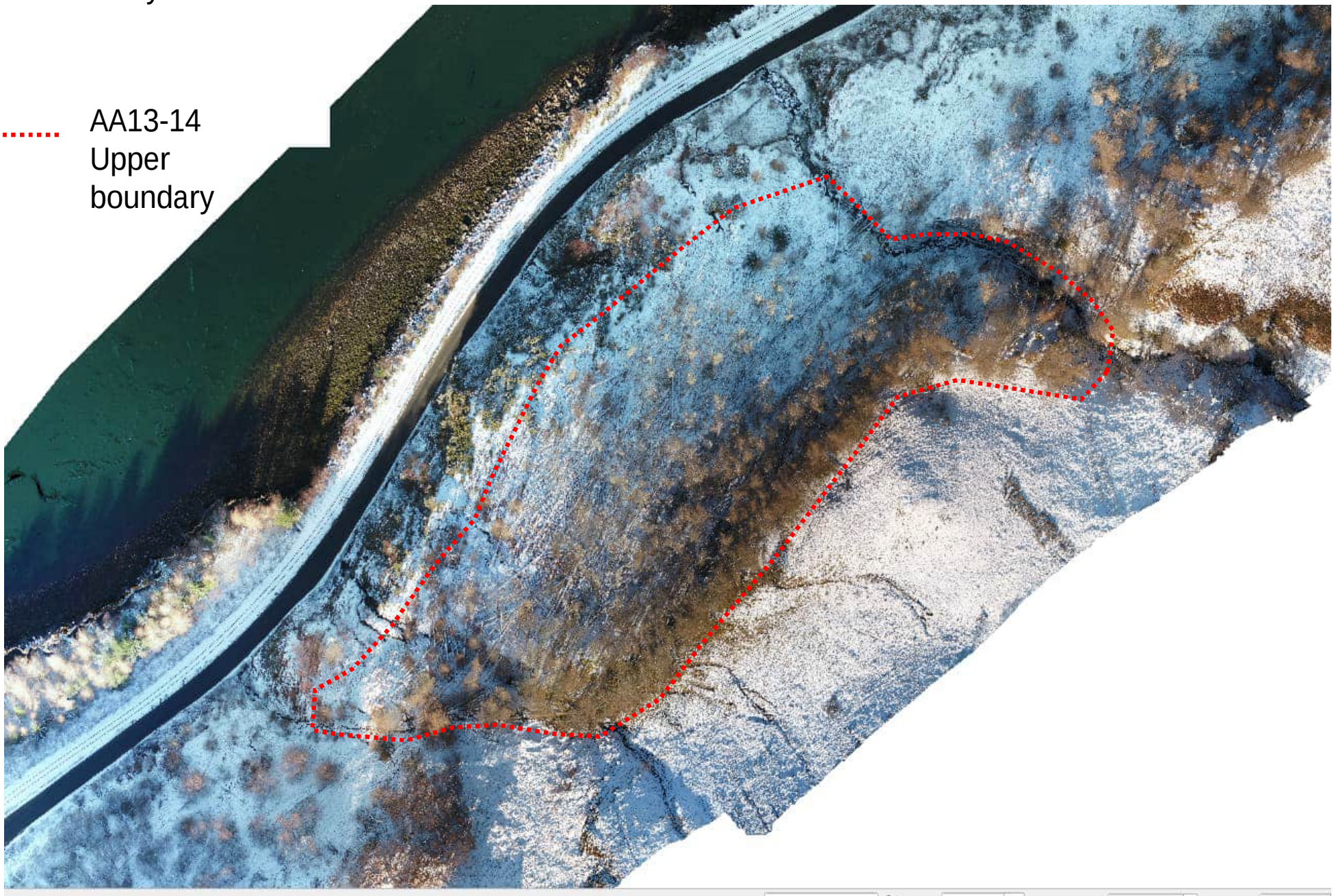
AA13-14 Upper - 2020:2023 Drone Survey Comparison

2020 Drone Survey

AA13-14 Upper boundary

2023 Drone Survey

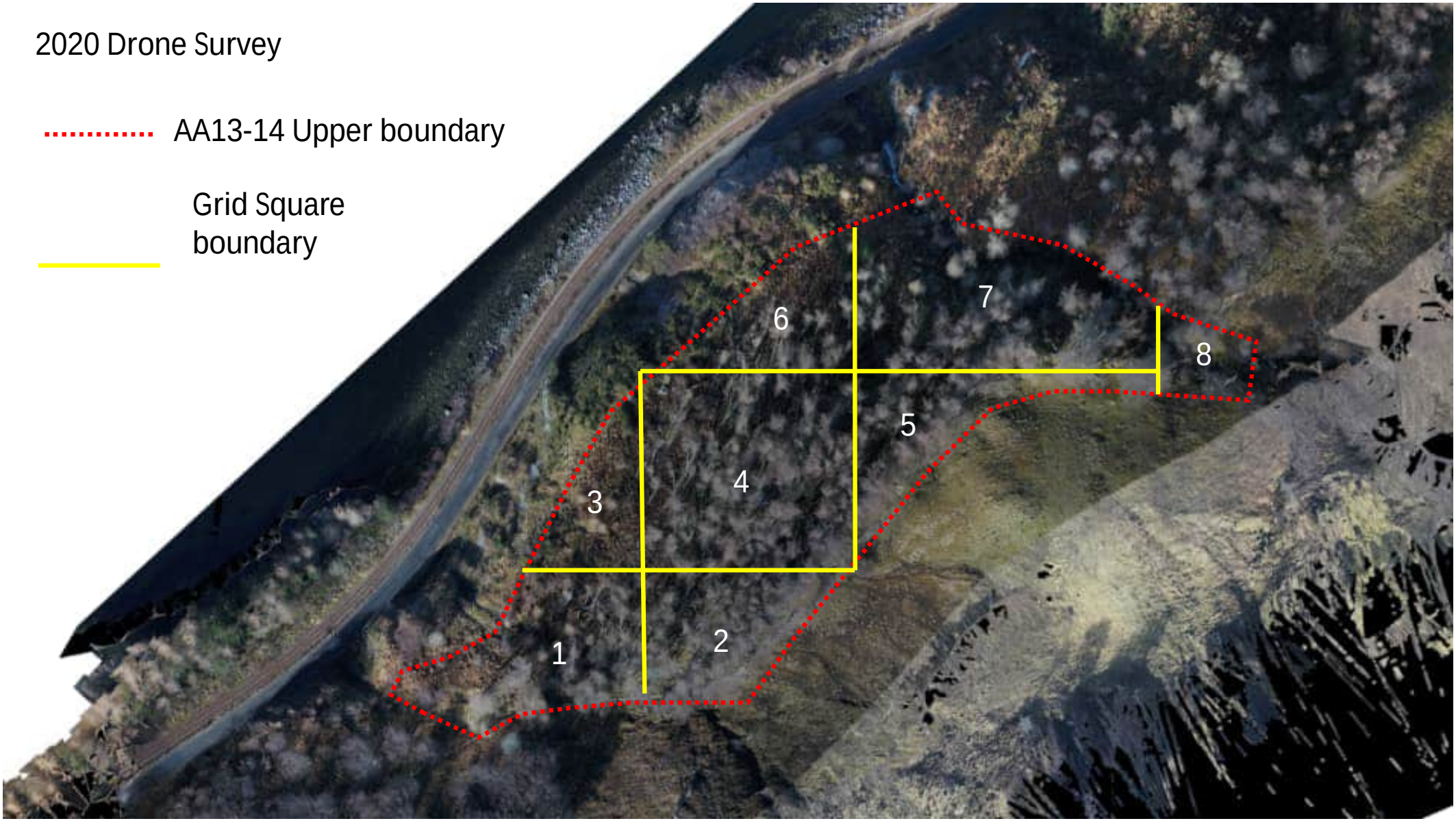
AA13-14 Upper boundary



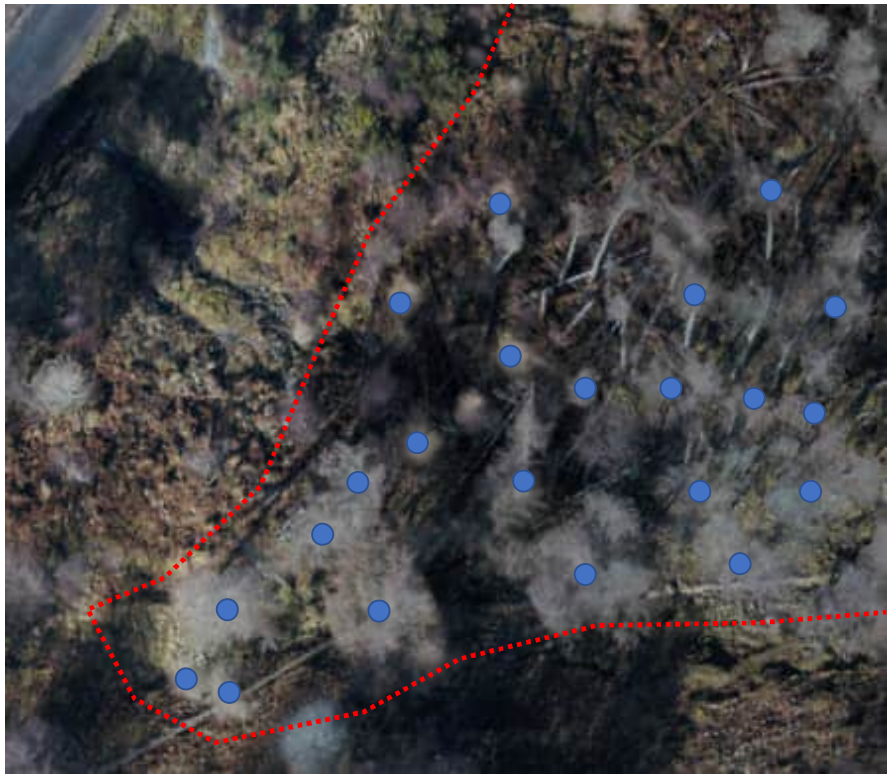
2020 Drone Survey

AA13-14 Upper boundary

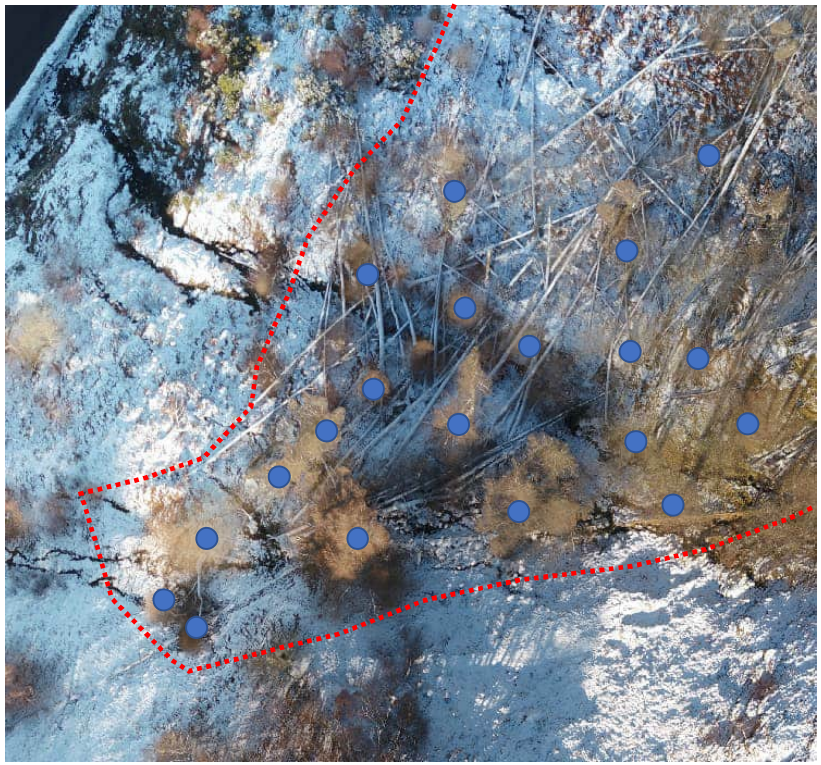
Grid Square boundary



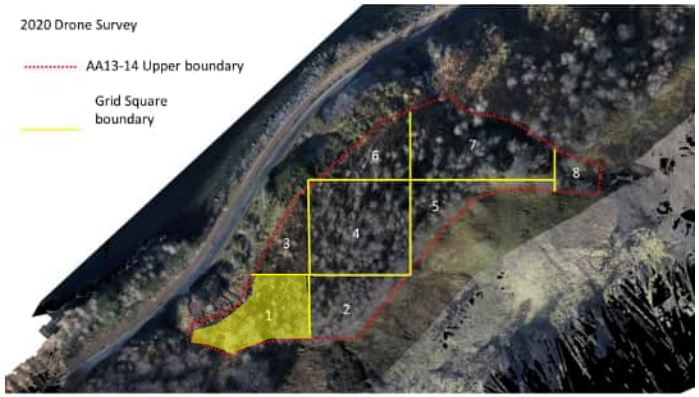
2020 Drone Survey



2023 Drone Survey



Grid Square 1



- Tree

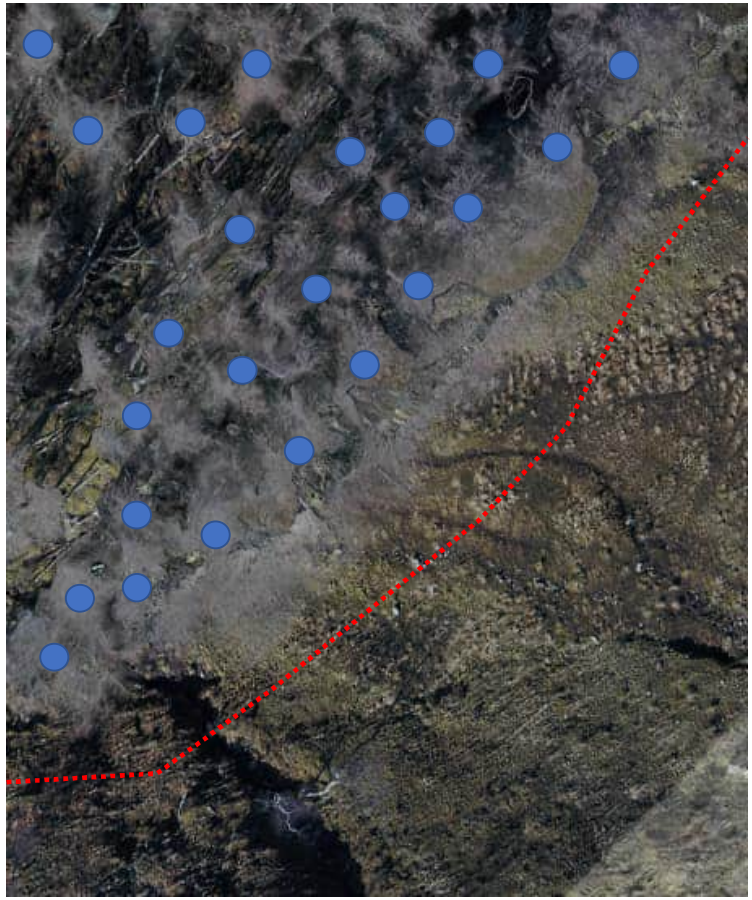
Approx. number of trees standing in 2020: 22

Approx. number of trees standing in 2023: 20

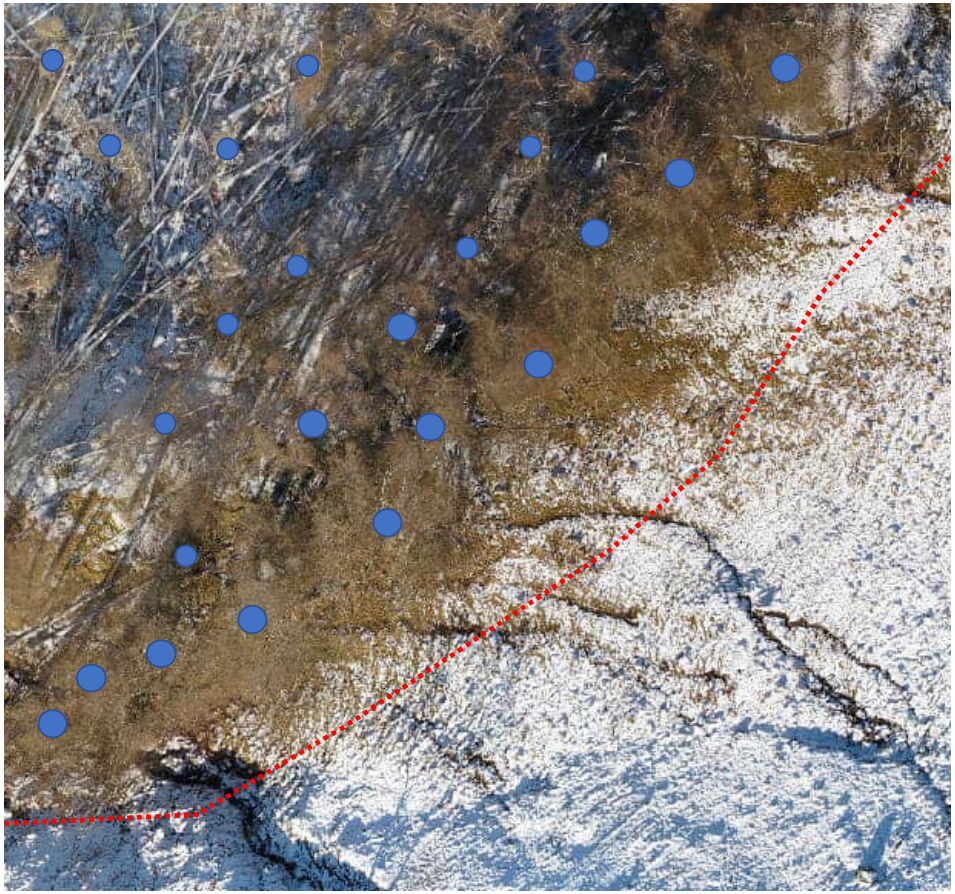
Approx. number of fallen trees between 2020 to 2023: 2

% of trees that have fallen: 9.1%

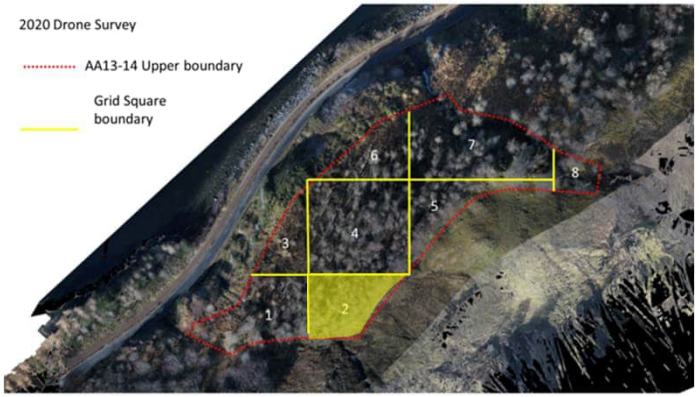
2020 Drone Survey



2023 Drone Survey



Grid Square 2



- Tree

Approx. number of trees standing in 2020: 24*

Approx. number of trees standing in 2023: 23

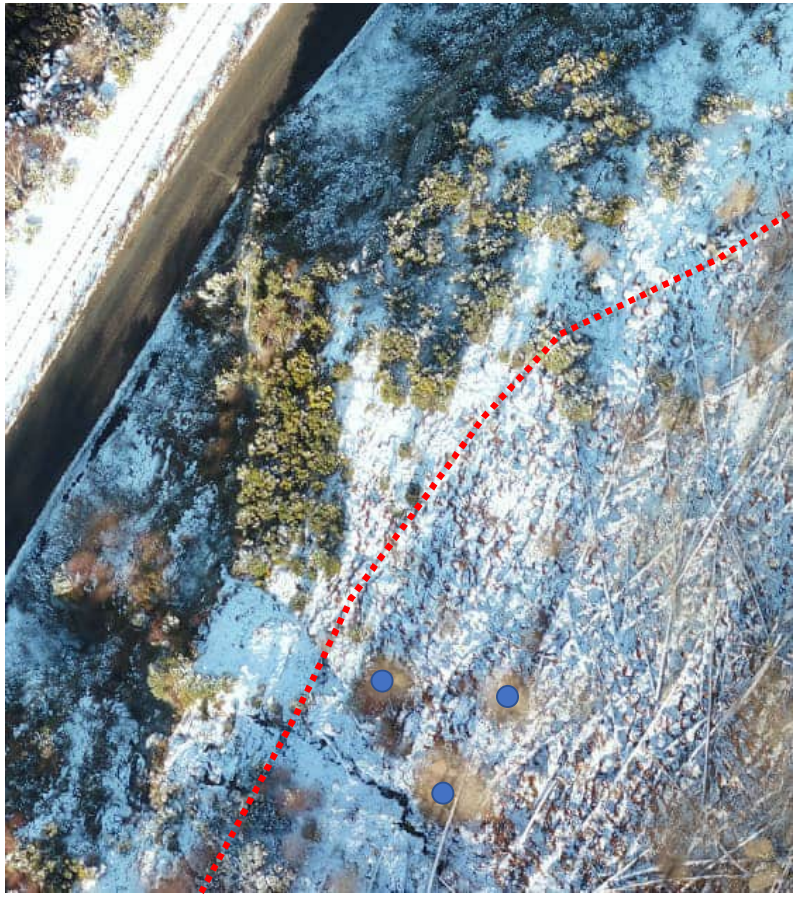
Approx. number of fallen trees between 2020 to 2023: 1

% of trees that have fallen: 4.2%

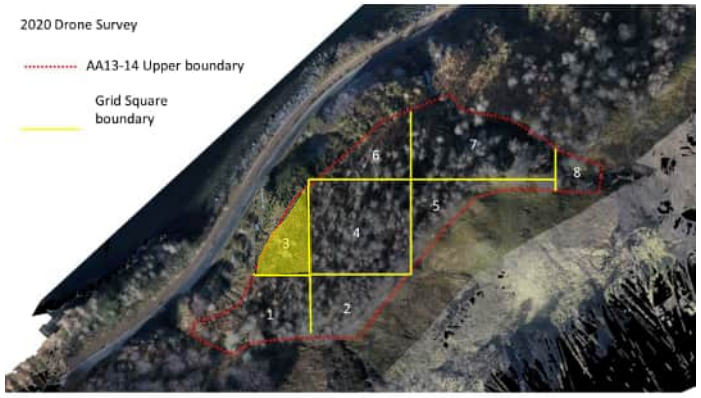
*Note this is 2 less than what was provided in the 2020 annual report – these two trees are counted in grid square 1.

2020 Drone Survey

2023 Drone Survey



Grid Square 3



- Tree

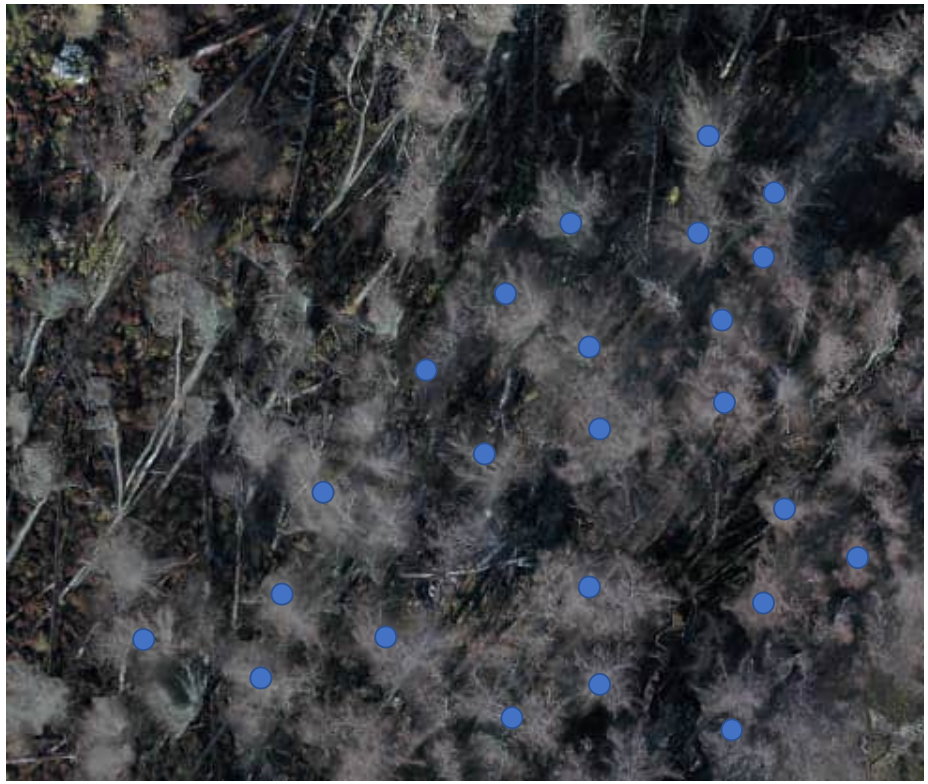
Approx. number of trees standing in 2020: 4

Approx. number of trees standing in 2023: 3

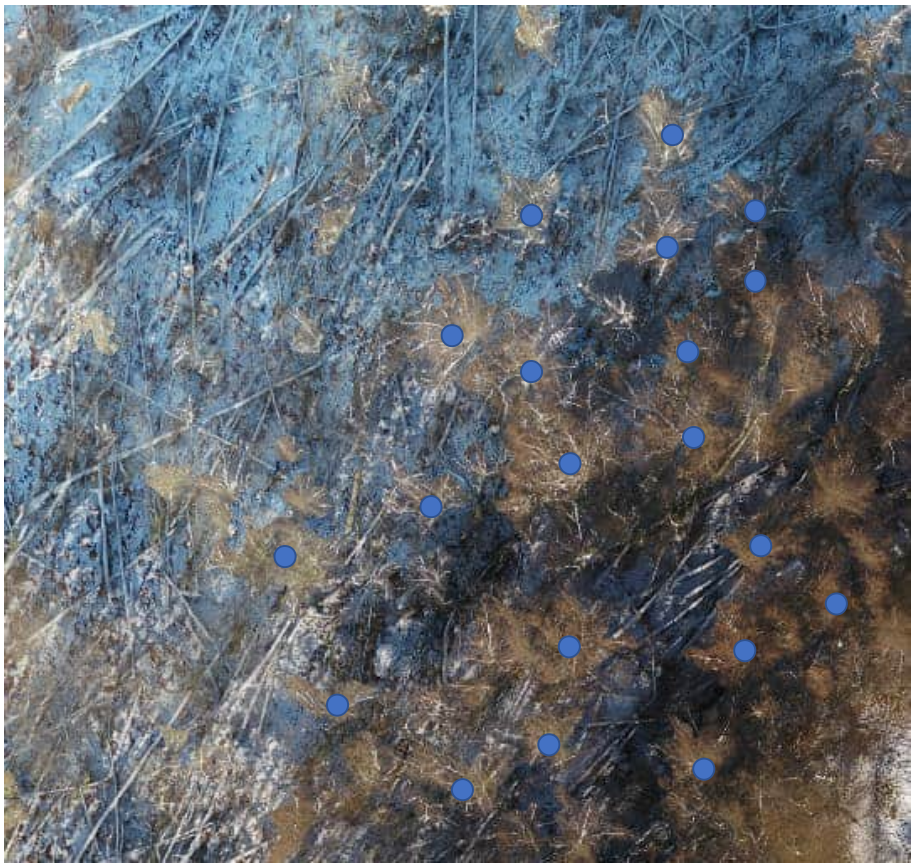
Approx. number of fallen trees between 2020 to 2023: 1

% of trees that have fallen: 25%

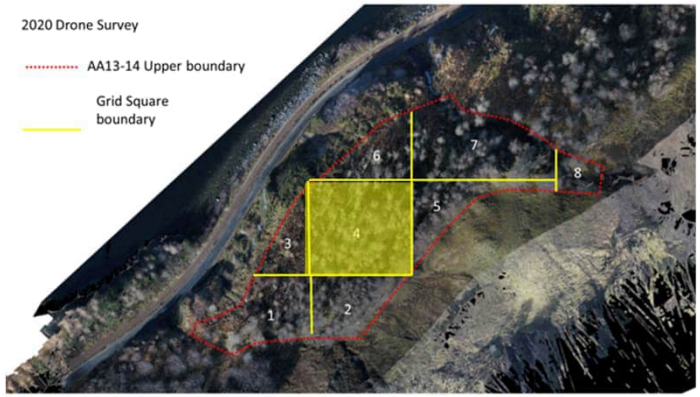
2020 Drone Survey



2023 Drone Survey



Grid Square 4



- Tree

Approx. number of trees standing in 2020: 24*

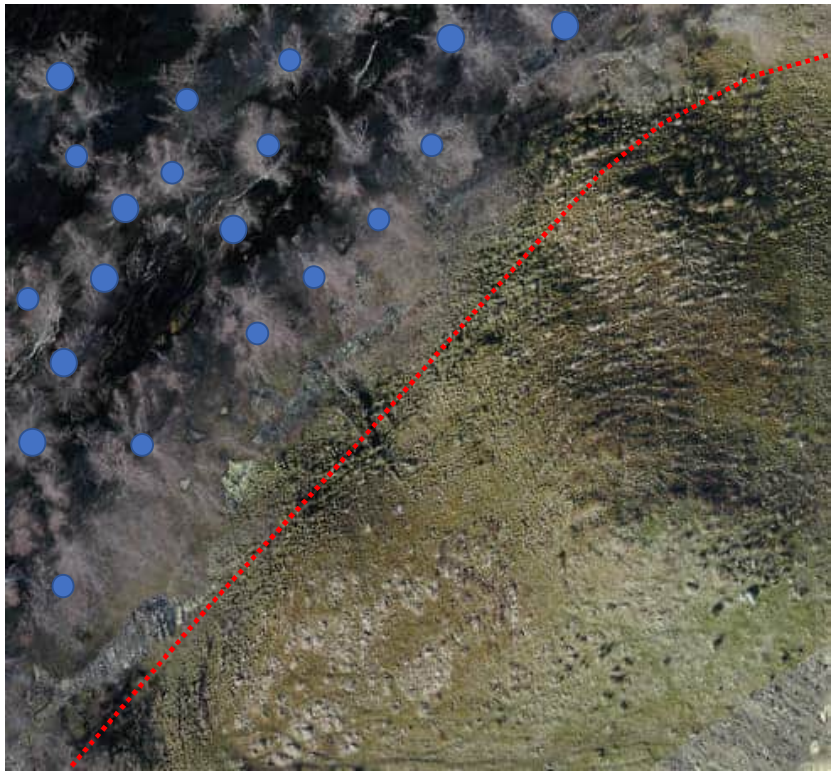
Approx. number of trees standing in 2023: 20

Approx. number of fallen trees between 2020 to 2023: 4

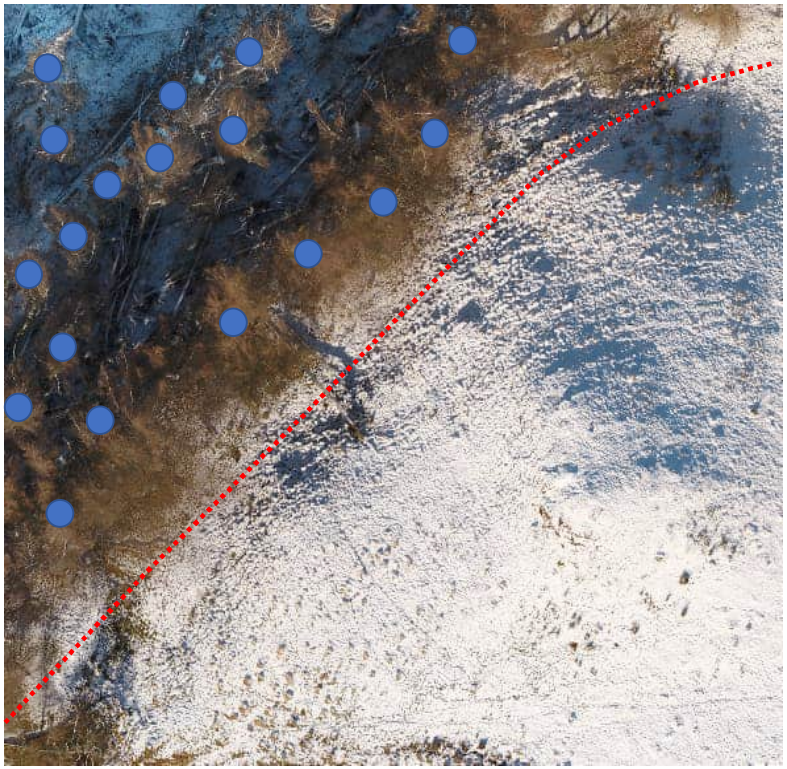
% of trees that have fallen: 16.6%

*Note this is 3 less than what was provided in the 2020 annual report – these three trees are counted in grid square 2.

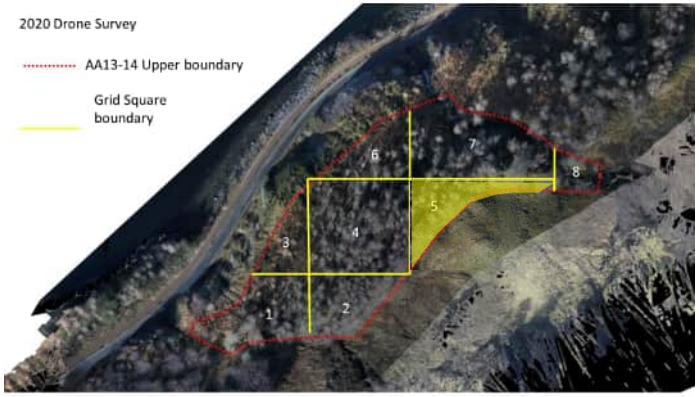
2020 Drone Survey



2023 Drone Survey



Grid Square 5



- Tree

Approx. number of trees standing in 2020: 20

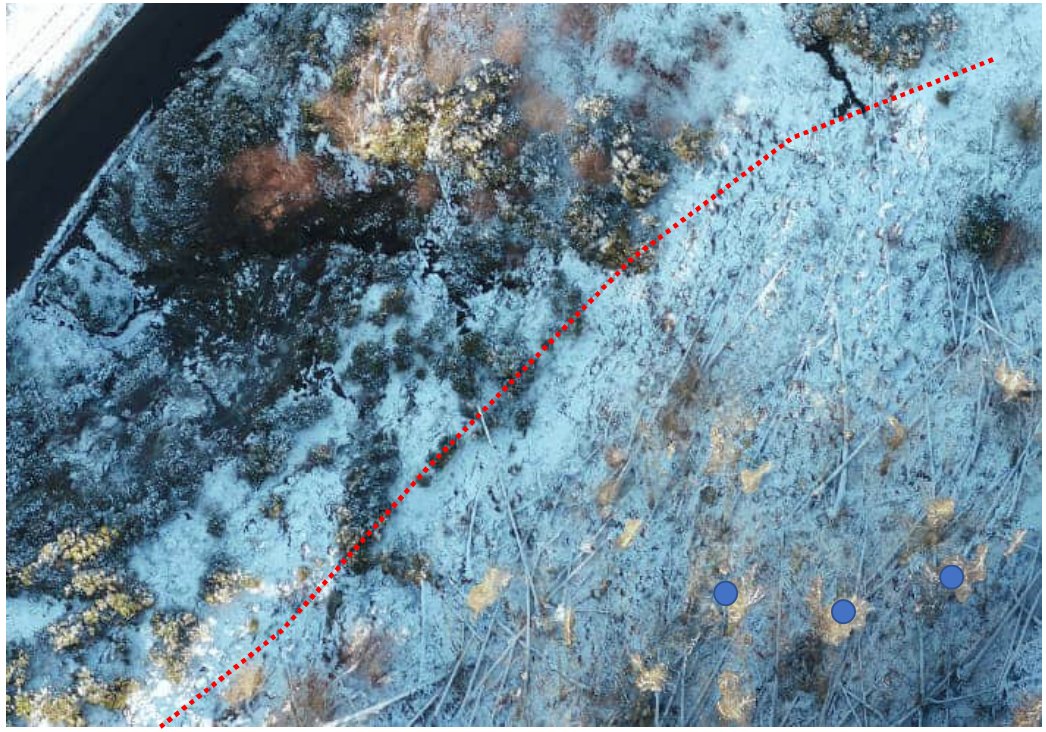
Approx. number of trees standing in 2023: 18

Approx. number of fallen trees between 2020 to 2023: 2

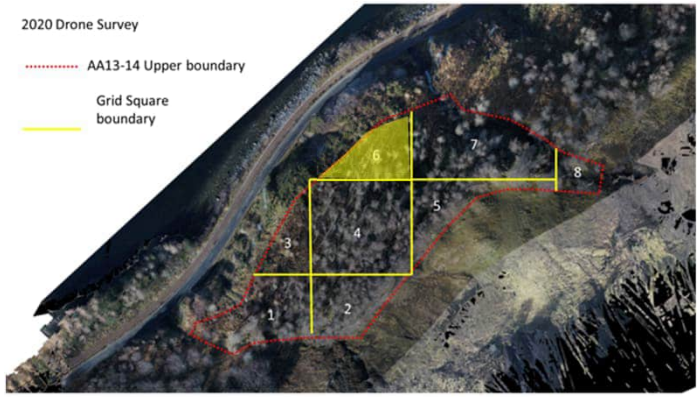
% of trees that have fallen: 10%

2020 Drone Survey

2023 Drone Survey



Grid Square 6



- Tree

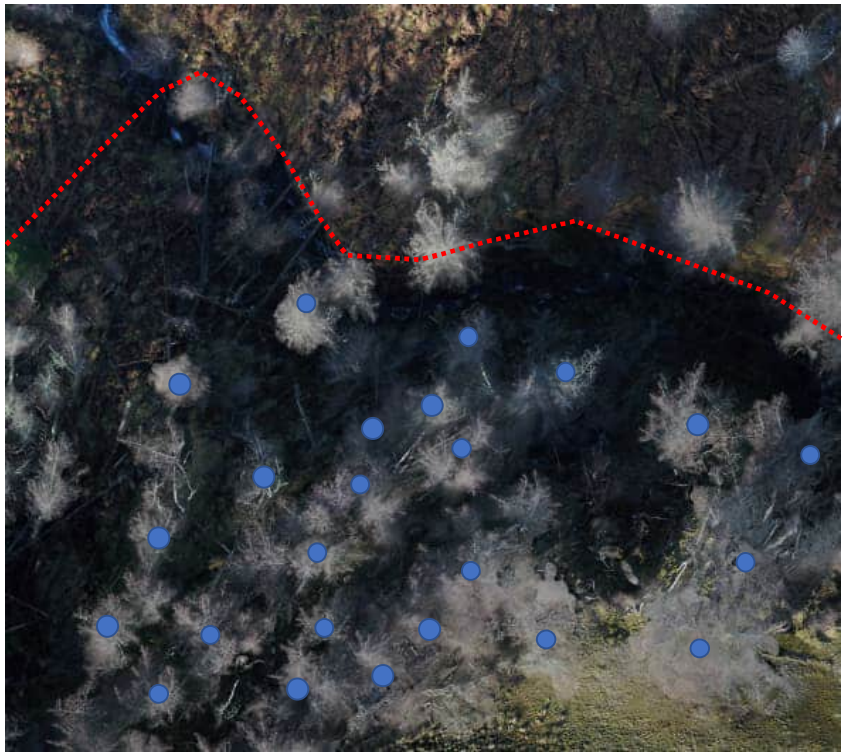
Approx. number of trees standing in 2020: 3

Approx. number of trees standing in 2023: 3

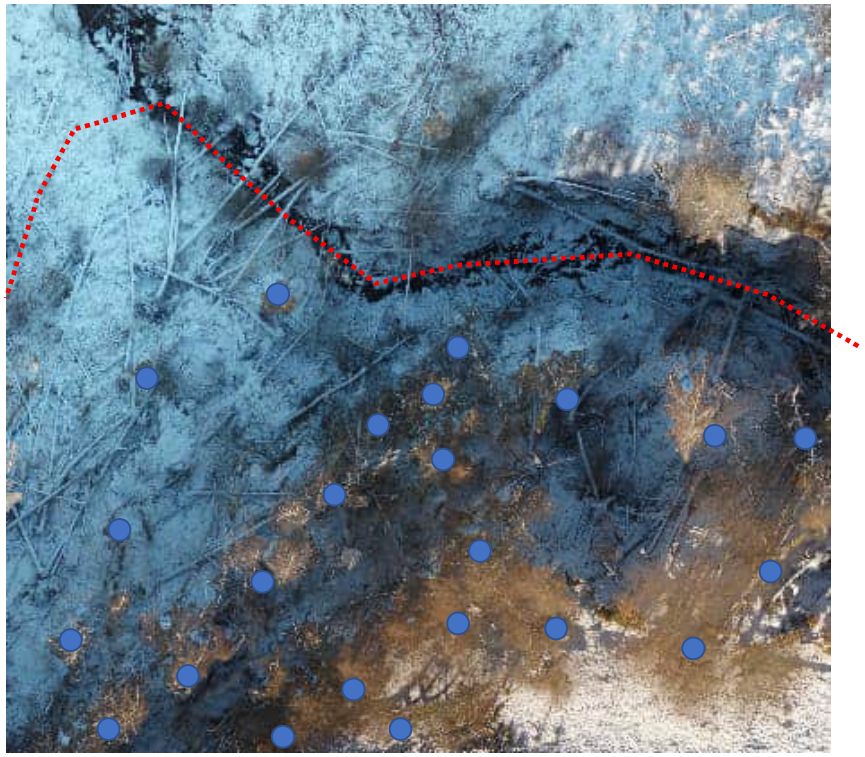
Approx. number of fallen trees between 2020 to 2023: 0

% of trees that have fallen: 0 %

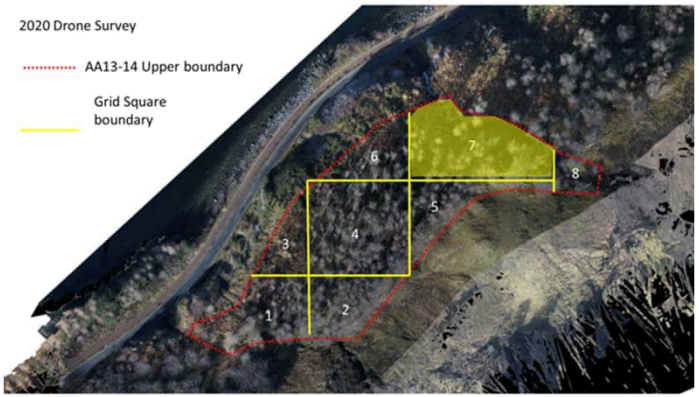
2020 Drone Survey



2023 Drone Survey



Grid Square 7



- Tree

Approx. number of trees standing in 2020: 24

Approx. number of trees standing in 2023: 23

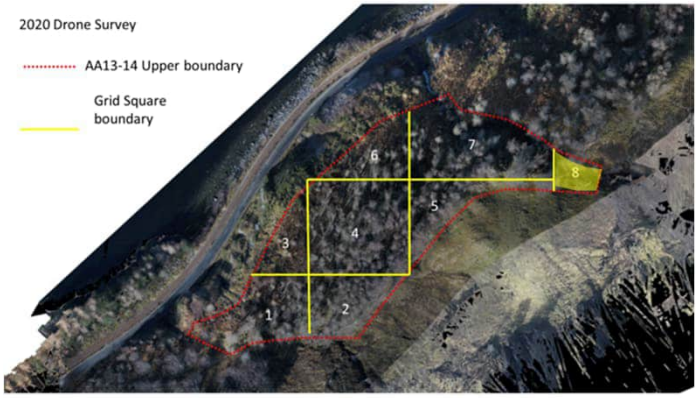
Approx. number of fallen trees between 2020 to 2023: 1

% of trees that have fallen: 4.2%

2020 Drone Survey

2023 Drone Survey

Grid Square 8



● Tree

Approx. number of trees standing in 2020: 3

Approx. number of trees standing in 2023: 2

Approx. number of fallen trees between 2020 to 2023: 1

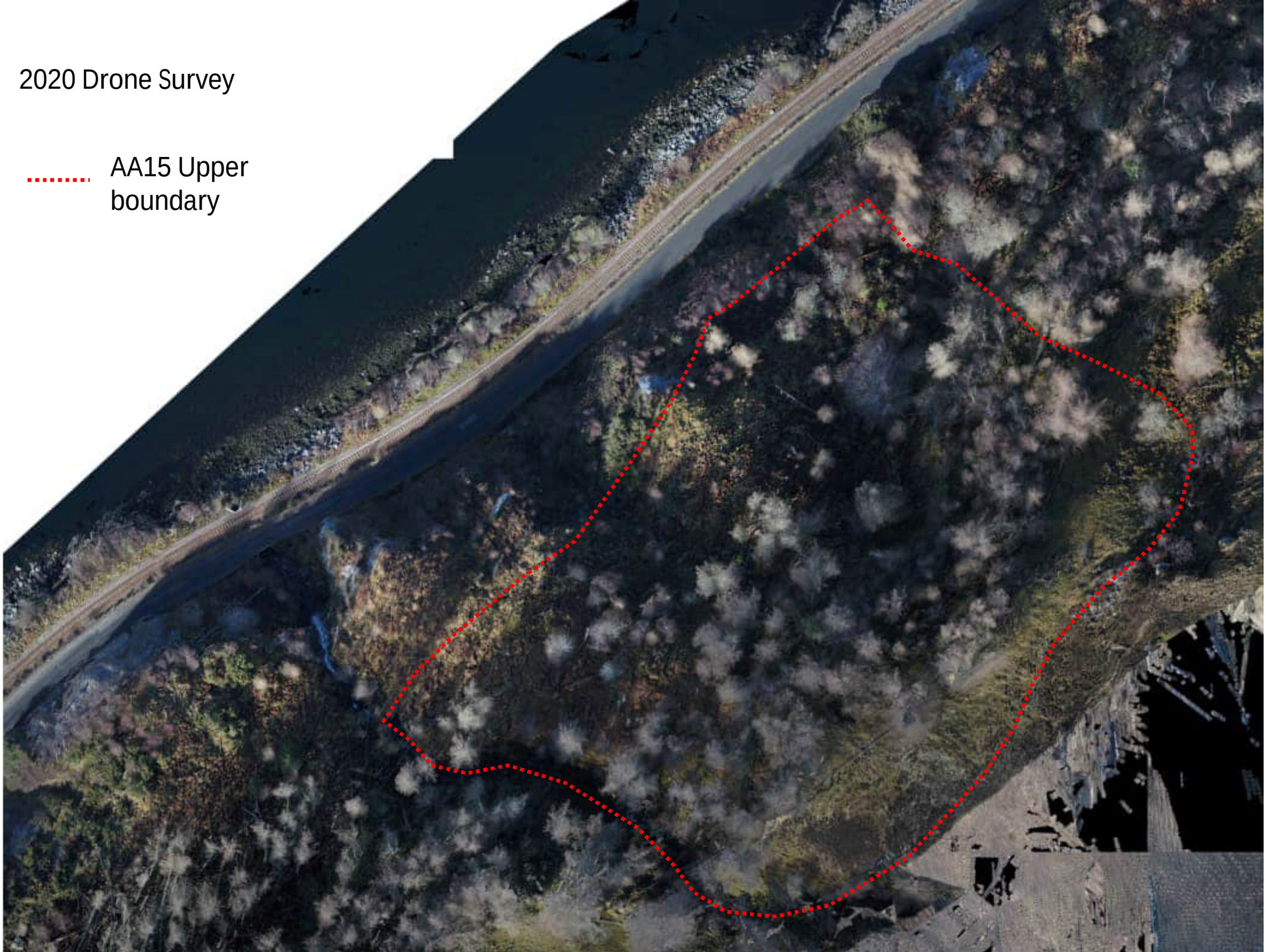
% of trees that have fallen: 33.3%

AA13-14 Upper Summary Table

Grid Square	Approx. number of trees standing in 2020	Approx. number of trees standing in 2023	Approx. number of fallen trees between 2020 to 2023	% of trees that have fallen
1	22	20	2	9.1%
2	24	23	1	4.2%
3	4	3	1	25.0%
4	24	20	4	16.6%
5	20	18	2	10.0%
6	3	3	0	0%
7	24	23	1	4.2%
8	3	2	1	33.3%
ALL (total)	124	112	12	9.7%

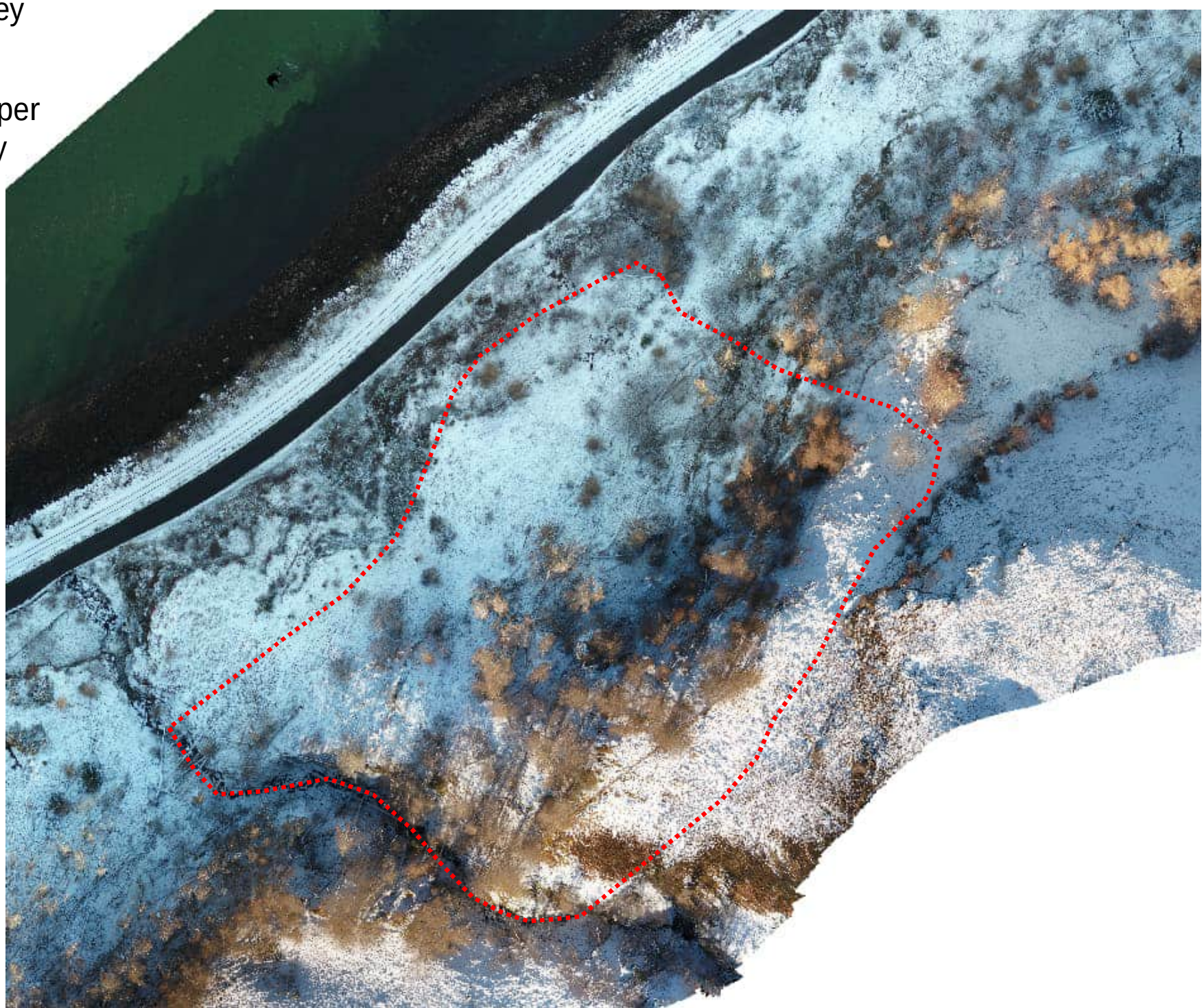
Stromeferry

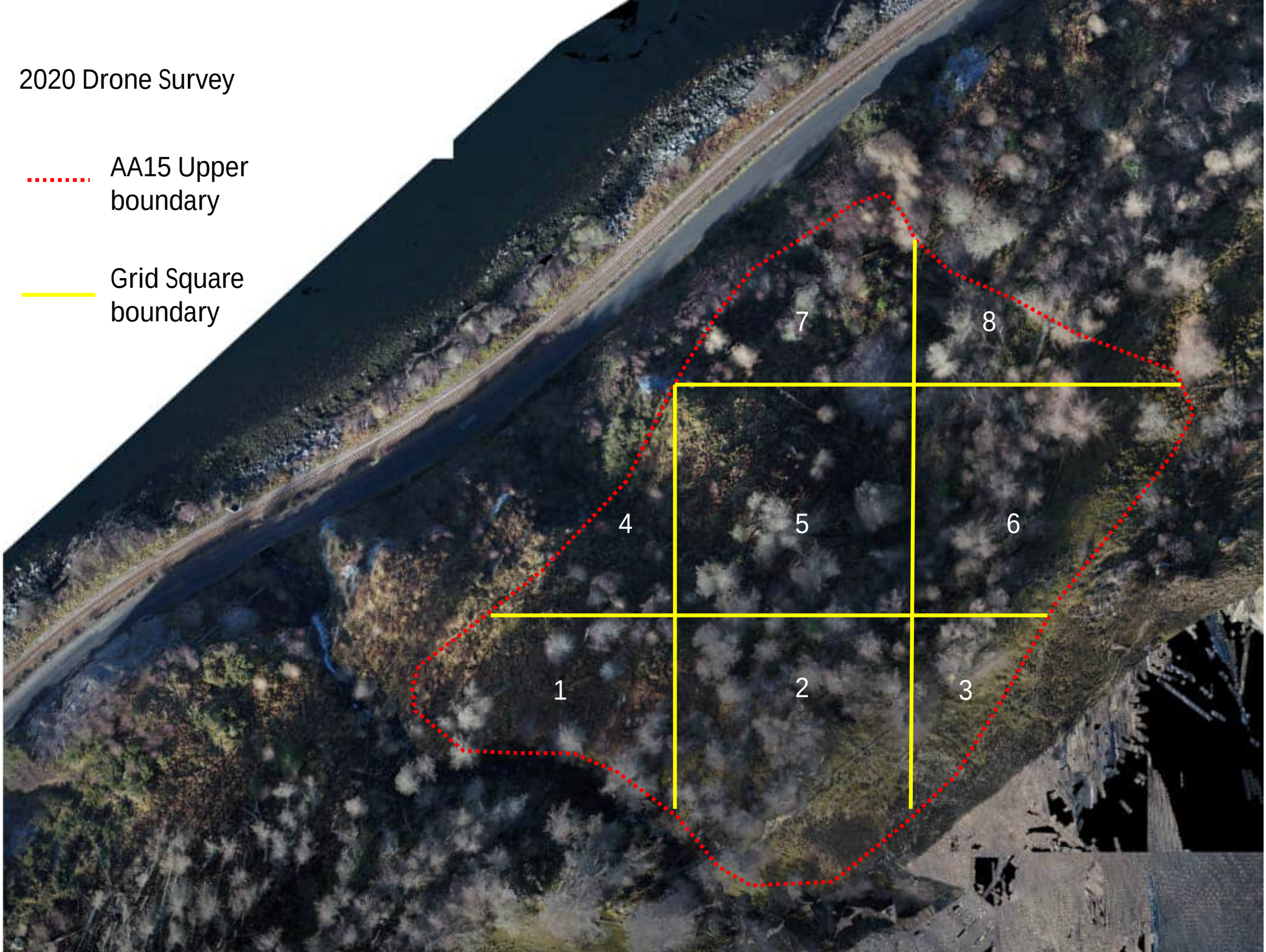
AA15 Upper - 2020:2023 Drone Survey Comparison


2020 Drone Survey
AA15 Upper boundary

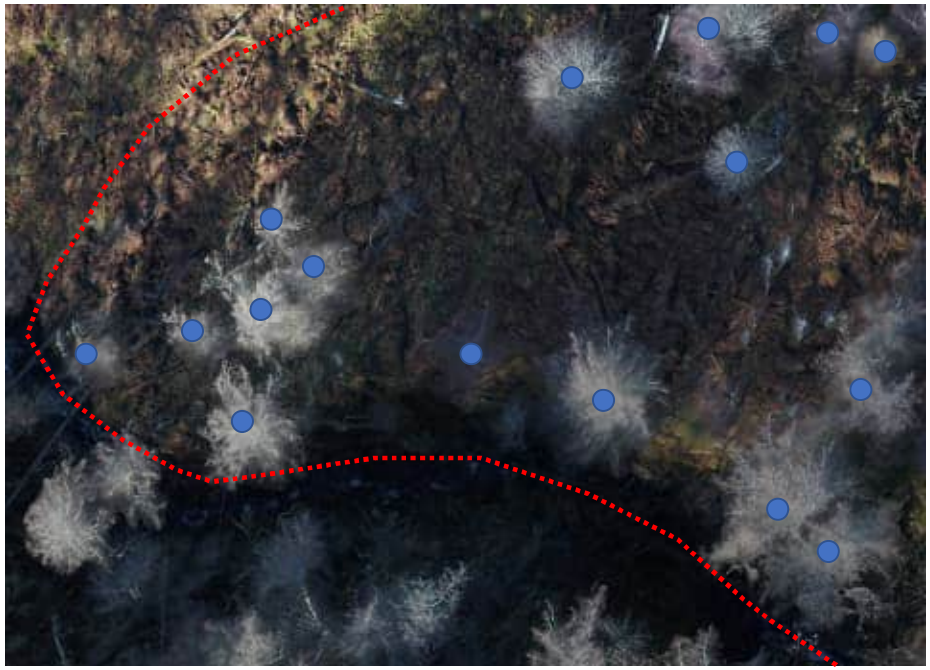
2023 Drone Survey

AA15 Upper boundary

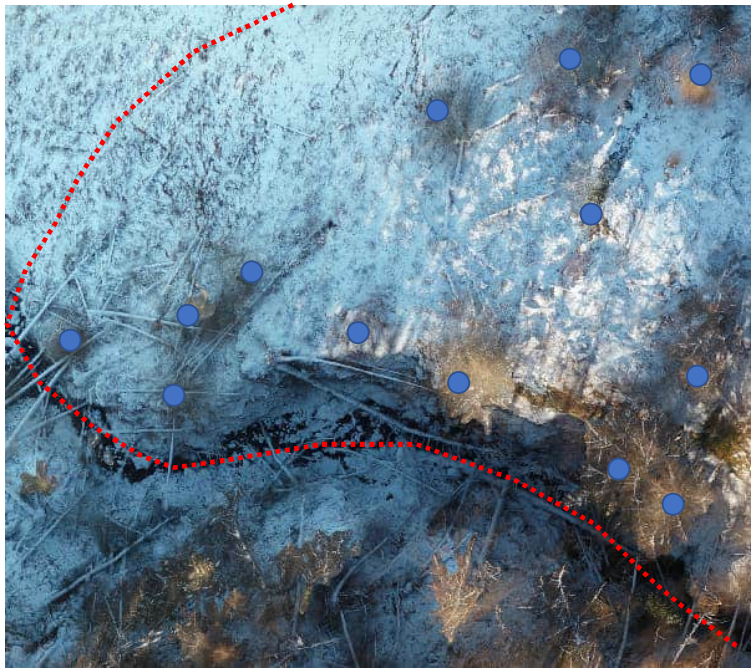



2020 Drone Survey
AA15 Upper boundary
Grid Square boundary
7
8
4
5
6
1
2
3

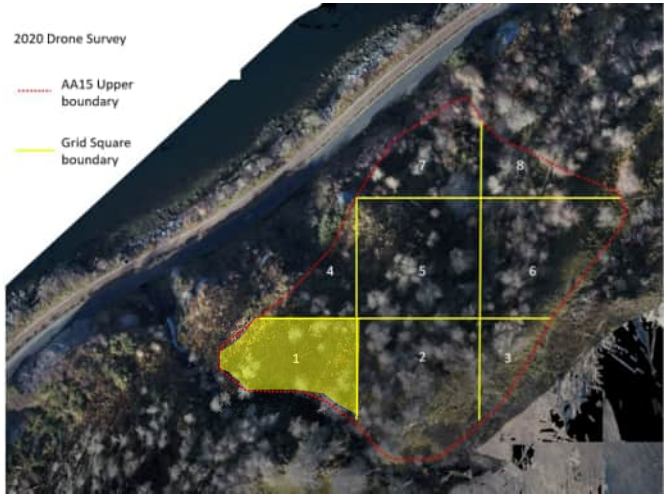
2020 Drone Survey



2023 Drone Survey



Grid Square 1



- Tree

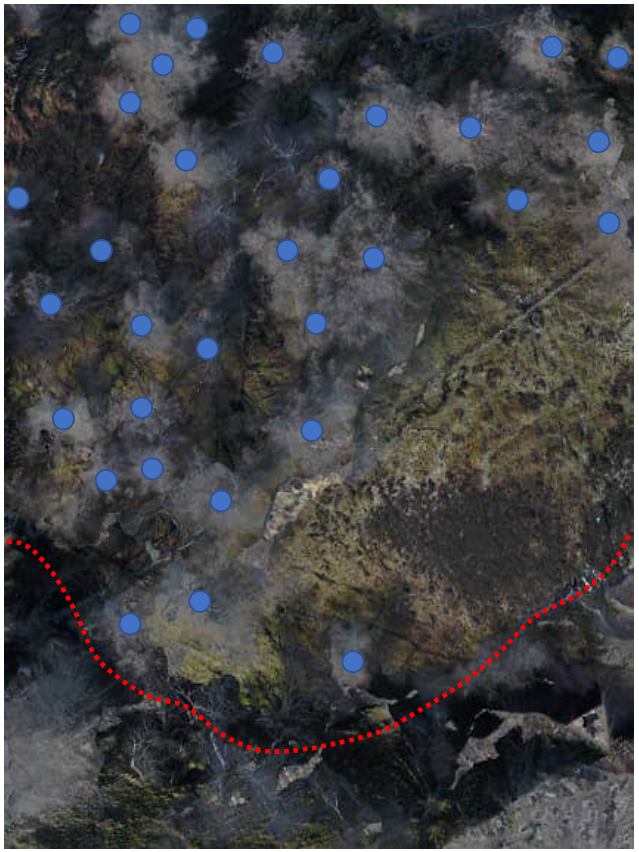
Approx. number of trees standing in 2020: 16

Approx. number of trees standing in 2023: 13

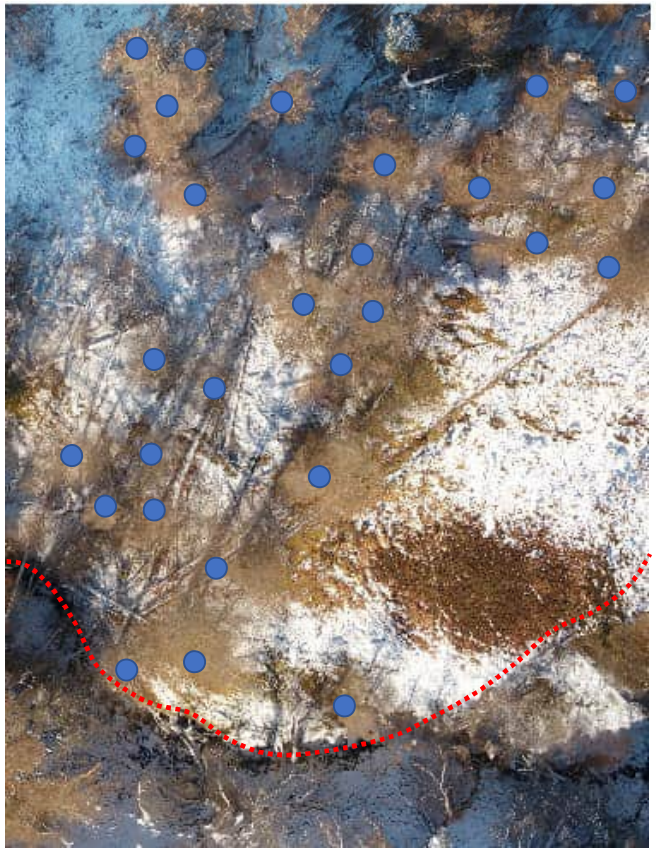
Approx. number of fallen trees between 2020 to 2023: 3

% of trees that have fallen: 18.8%

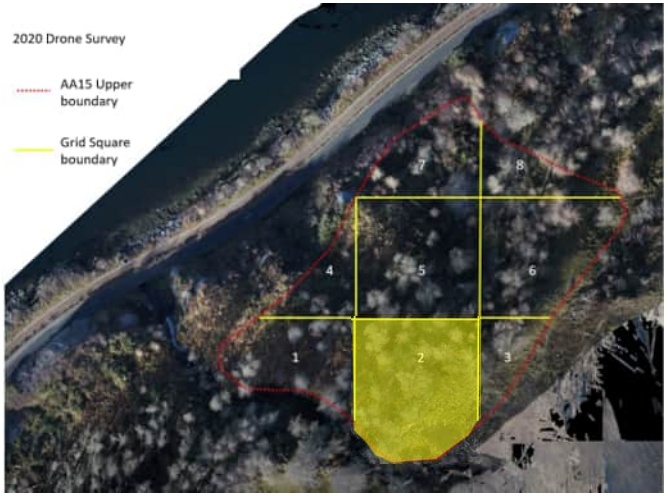
2020 Drone Survey



2023 Drone Survey



Grid Square 2



- Tree

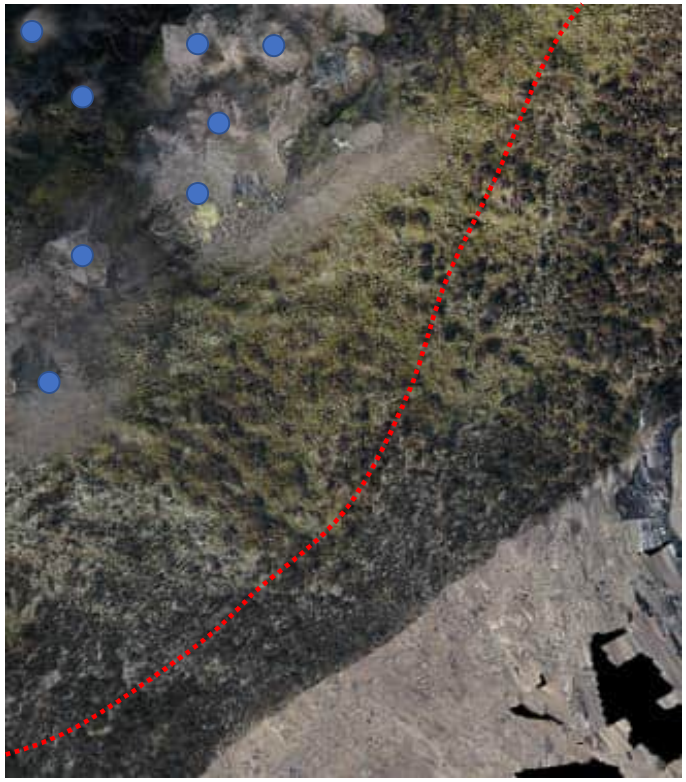
Approx. number of trees standing in 2020: 31

Approx. number of trees standing in 2023: 28

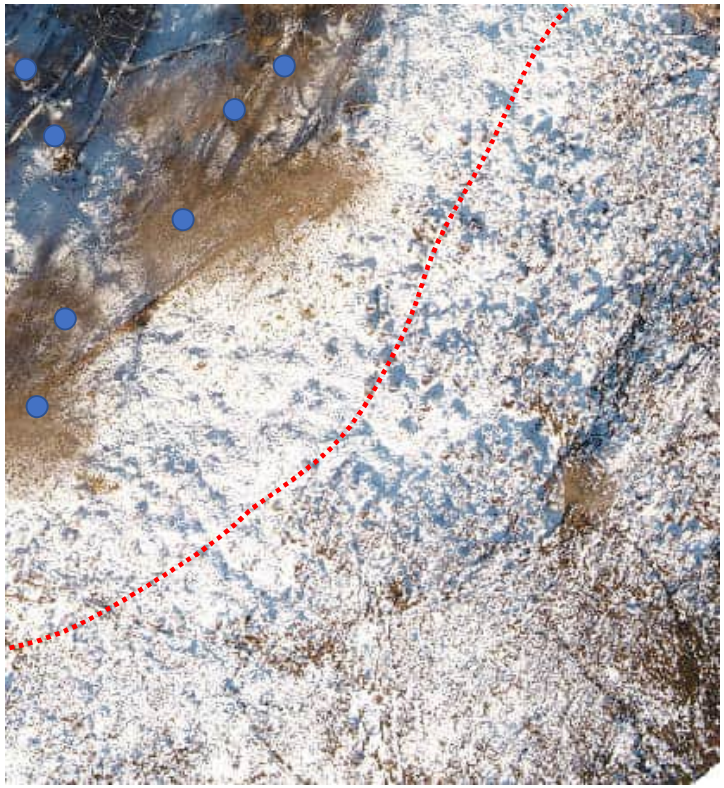
Approx. number of fallen trees between 2020 to 2023: 3

% of trees that have fallen: 9.7%

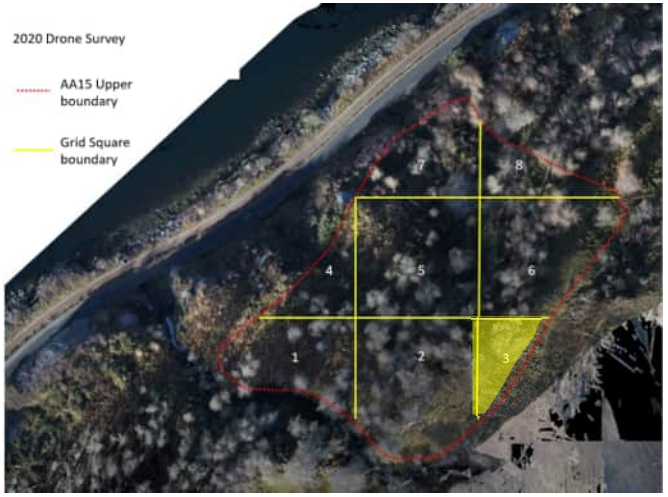
2020 Drone Survey



2023 Drone Survey



Grid Square 3



- Tree

Approx. number of trees standing in 2020: 8

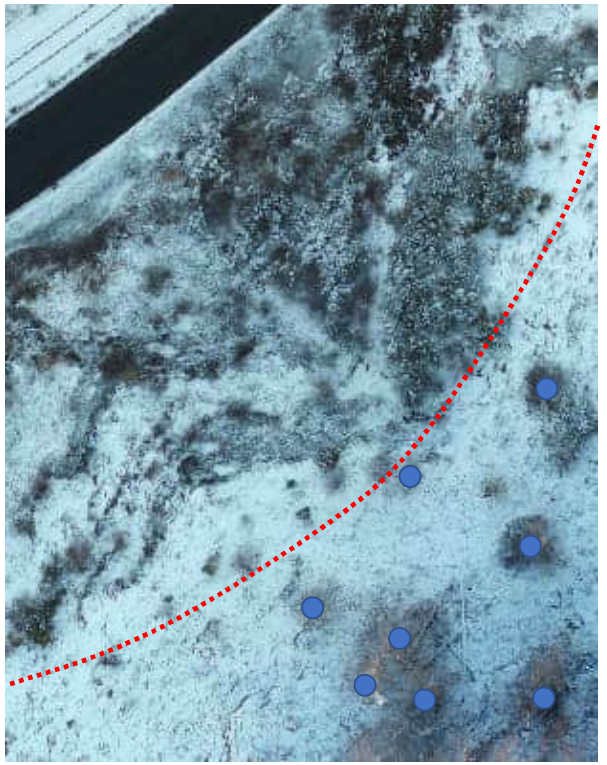
Approx. number of trees standing in 2023: 7

Approx. number of fallen trees between 2020 to 2023: 1

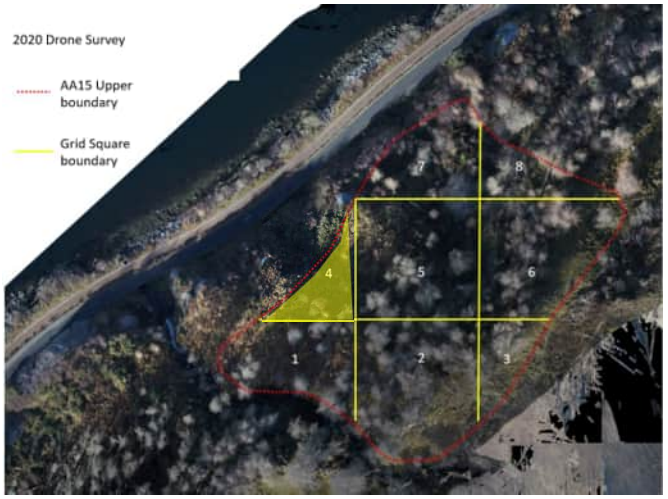
% of trees that have fallen: 12.5%

2020 Drone Survey

2023 Drone Survey



Grid Square 4



- Tree

Approx. number of trees standing in 2020: 8*

Approx. number of trees standing in 2023: 8

Approx. number of fallen trees between 2020 to 2023: 0

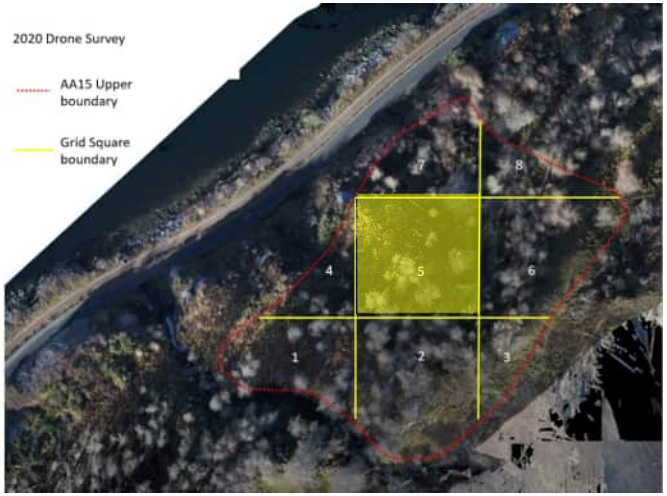
% of trees that have fallen: 0%

*Note this is 2 less than what was provided in the 2020 annual report – these two trees are counted in grid square 1.

2020 Drone Survey

2023 Drone Survey

Grid Square 5



- Tree

Approx. number of trees standing in 2020: 23

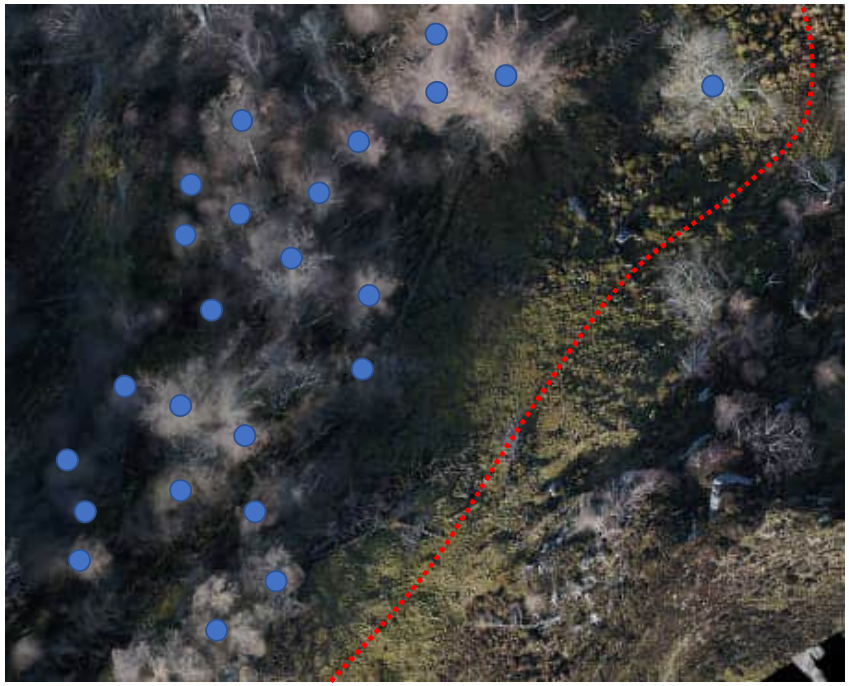
Approx. number of trees standing in 2023: 22

Approx. number of fallen trees between 2020 to 2023: 1

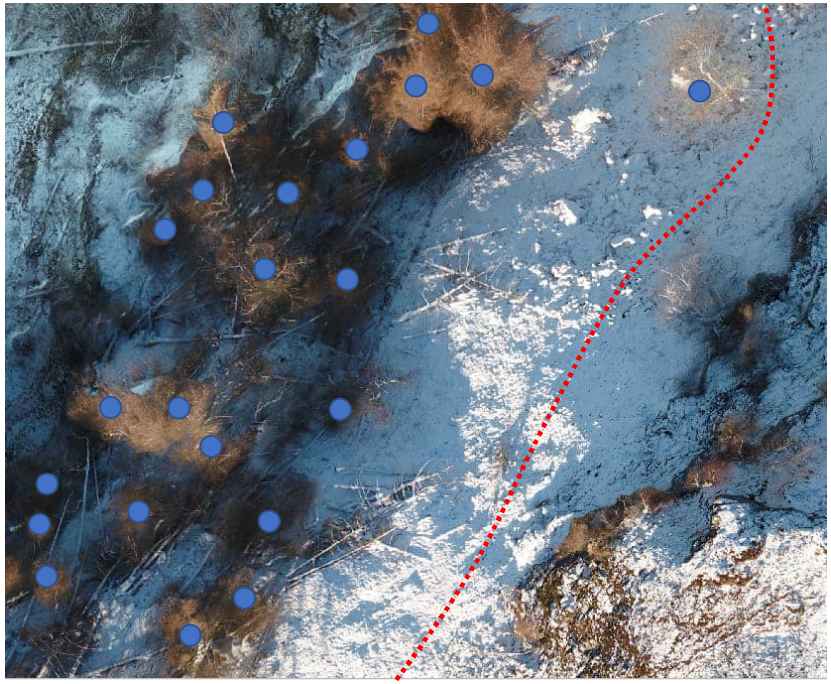
% of trees that have fallen: 4.3%

*Note this is 1 less than what was provided in the 2020 annual report – this one tree is counted in grid square 4.

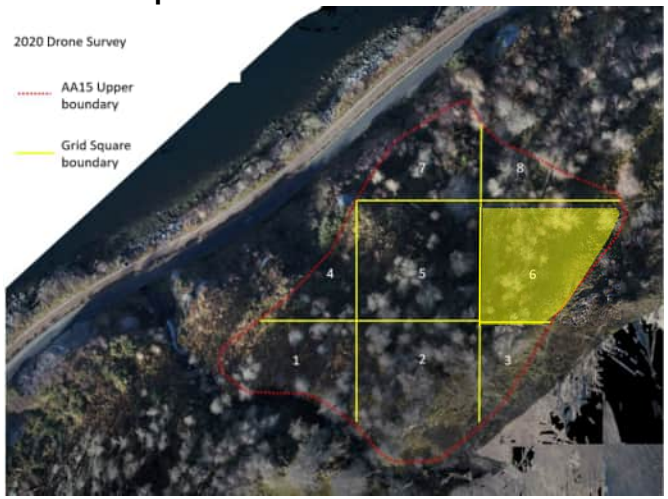
2020 Drone Survey



2023 Drone Survey



Grid Square 6



- Tree

Approx. number of trees standing in 2020: 24

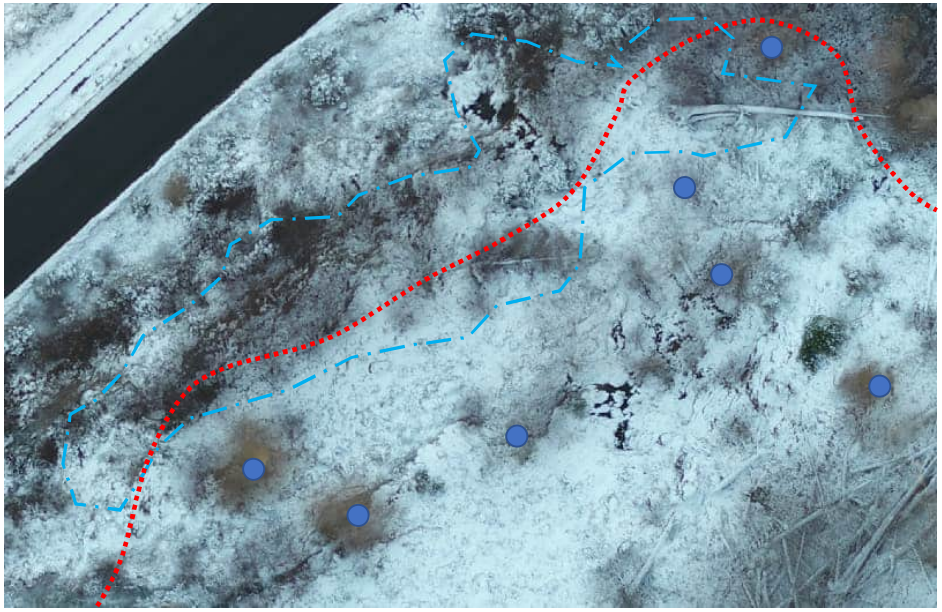
Approx. number of trees standing in 2023: 22

Approx. number of fallen trees between 2020 to 2023: 2

% of trees that have fallen: 8.3%

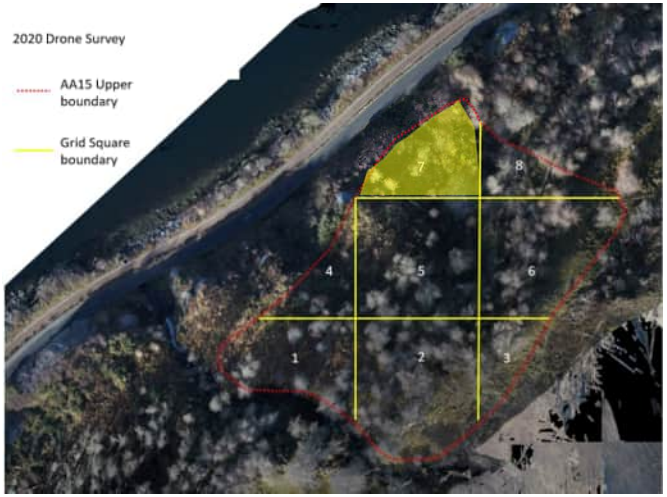
2020 Drone Survey

2023 Drone Survey



Area boundary where there are many smaller trees on face of slope. Excluded from assessment.

Grid Square 7



Tree

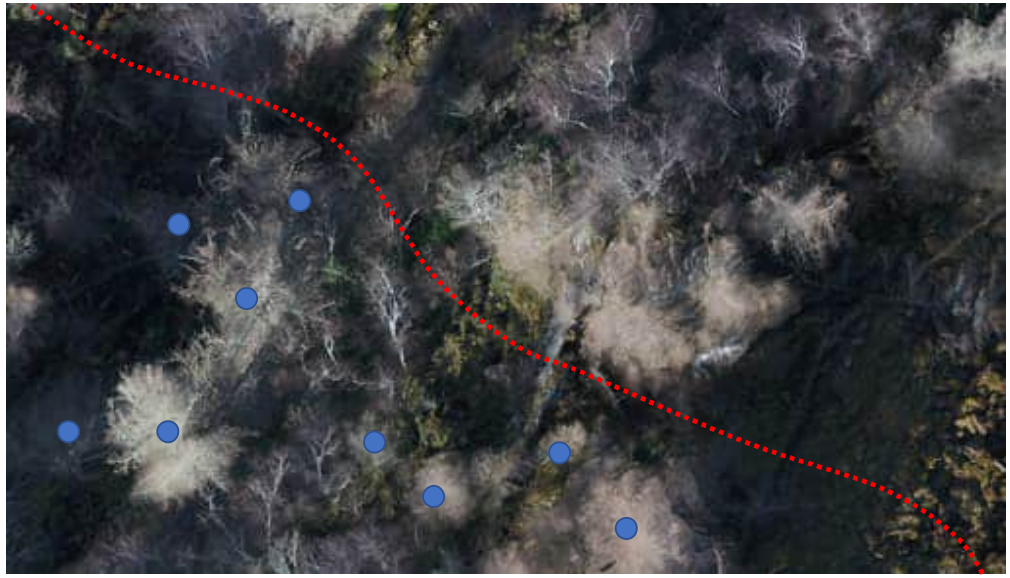
Approx. number of trees standing in 2020: 9

Approx. number of trees standing in 2023: 7

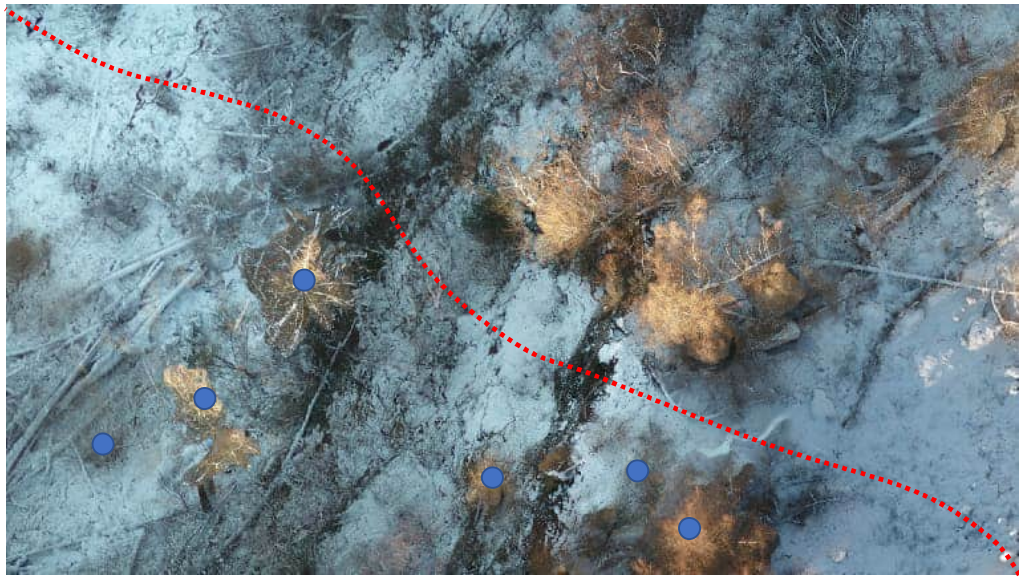
Approx. number of fallen trees between 2020 to 2023: 2

% of trees that have fallen: 22.2%

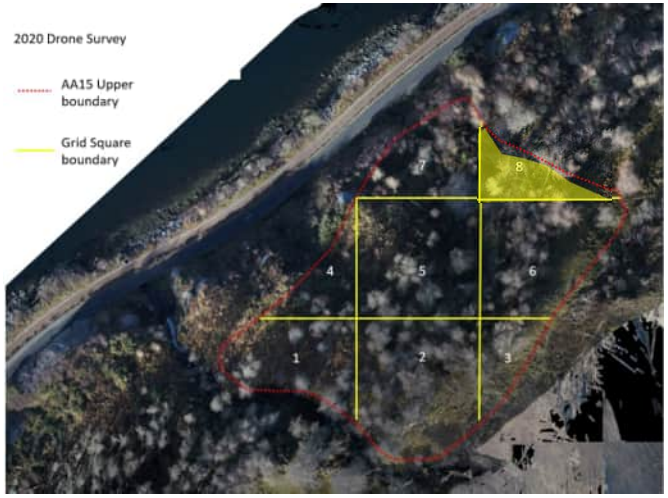
2020 Drone Survey



2023 Drone Survey



Grid Square 8



- Tree

Approx. number of trees standing in 2020: 9*

Approx. number of trees standing in 2023: 6

Approx. number of fallen trees between 2020 to 2023: 3

% of trees that have fallen: 33.3%

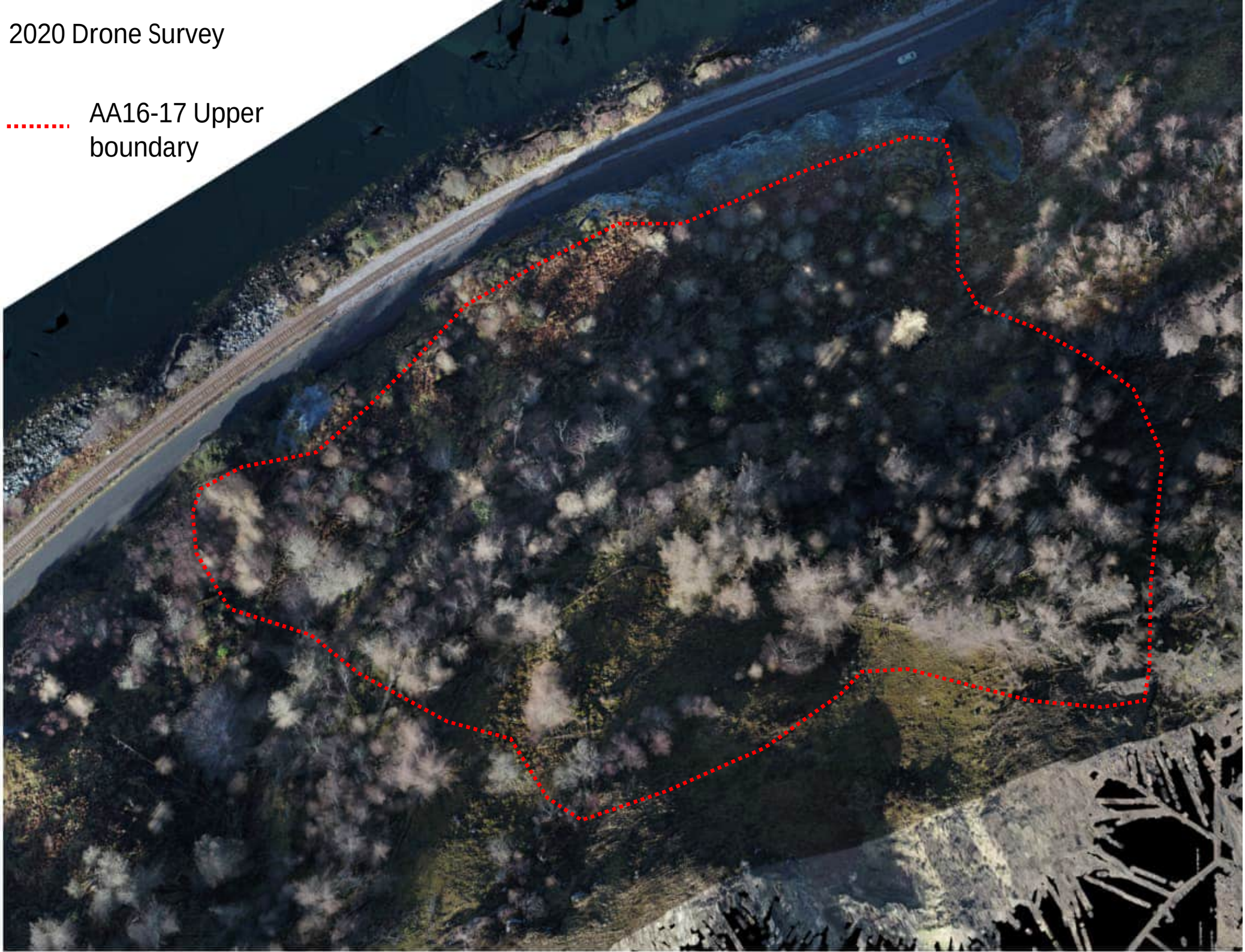
*Note this is 1 less than what was provided in the 2020 annual report – this one tree is counted in grid square 7.

AA15 Upper Summary Table

Grid Square	Approx. number of trees standing in 2020	Approx. number of trees standing in 2023	Approx. number of fallen trees between 2020 to 2023	% of trees that have fallen
1	16	13	3	18.8%
2	31	28	3	9.7%
3	8	7	1	12.5%
4	8	8	0	0%
5	23	22	1	4.3%
6	24	22	2	8.3%
7	9	7	2	22.2%
8	9	6	3	33.3%
ALL (total)	128	113	15	11.7%

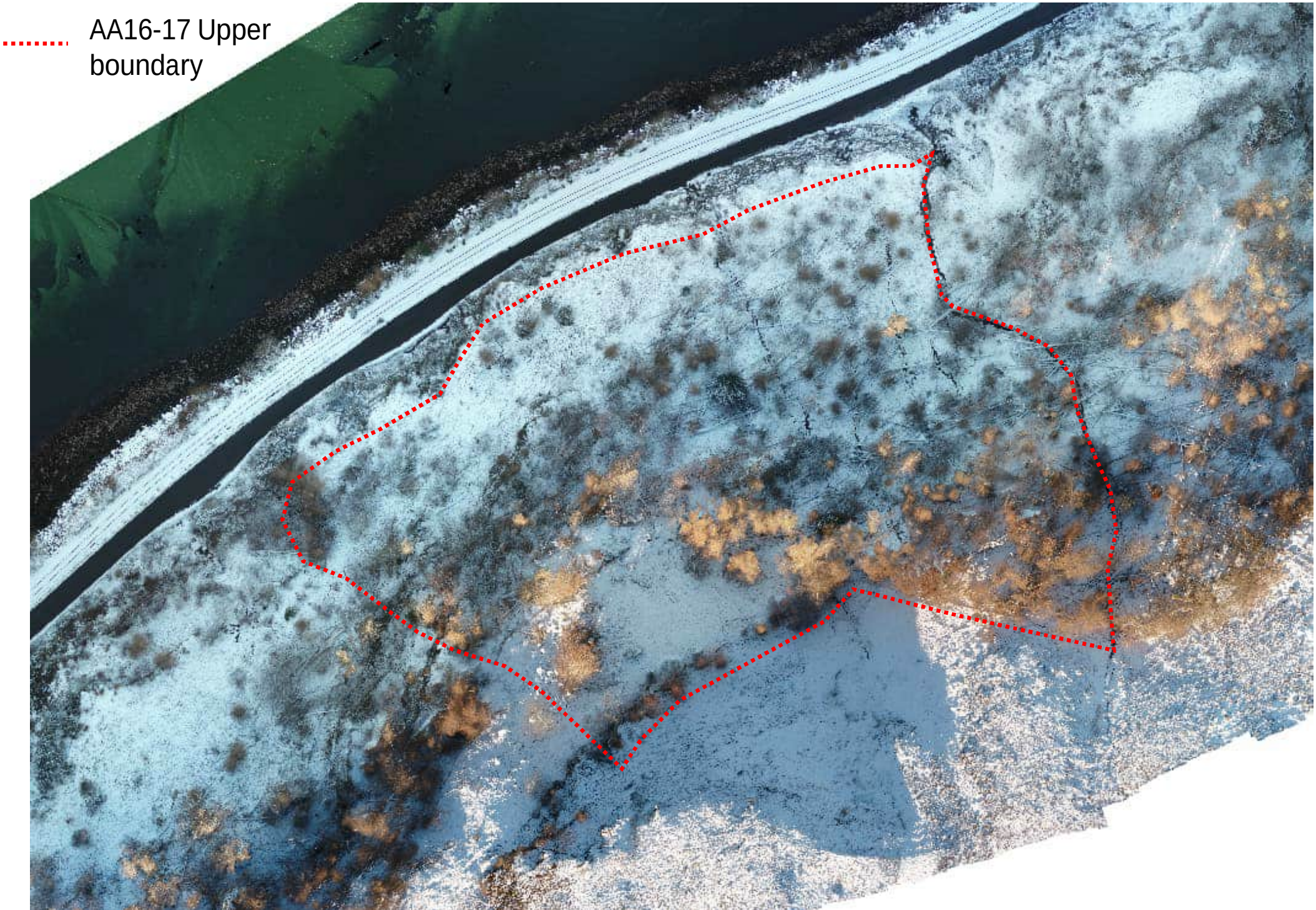
Stromeferry

AA16_17 Upper - 2020:2023 Drone Survey Comparison


2020 Drone Survey
AA16-17 Upper boundary

2023 Drone Survey

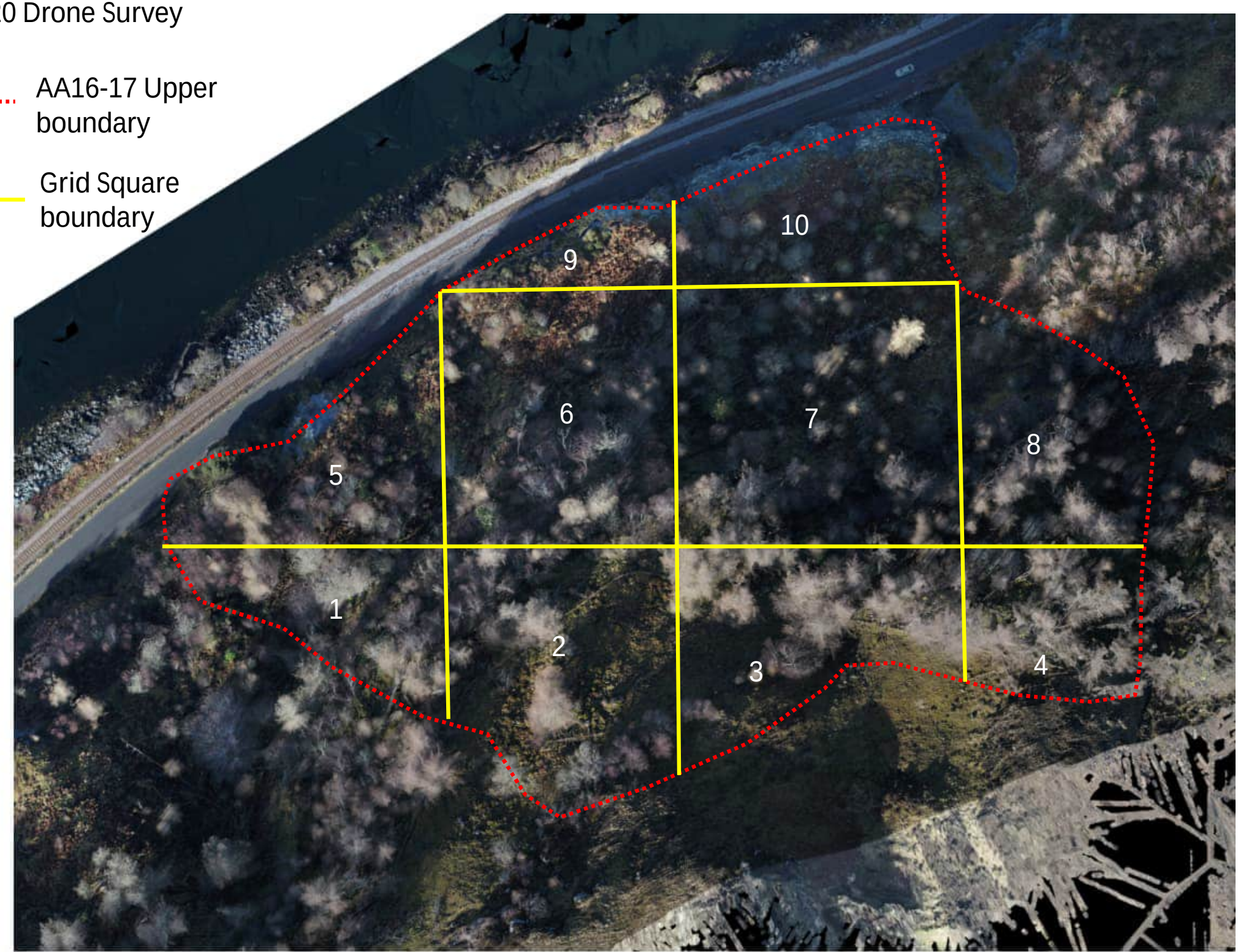
AA16-17 Upper boundary



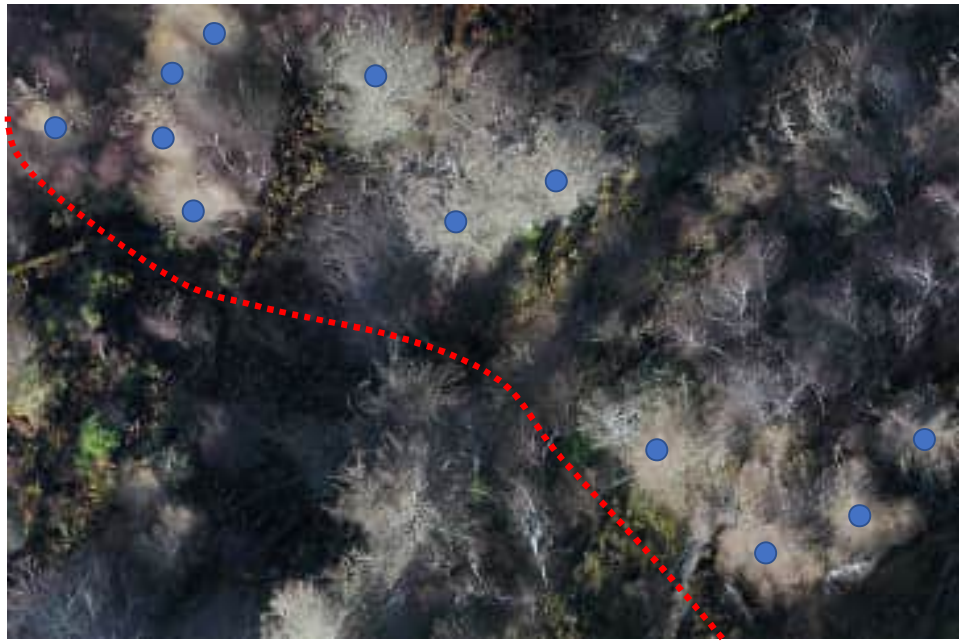
2020 Drone Survey

AA16-17 Upper boundary

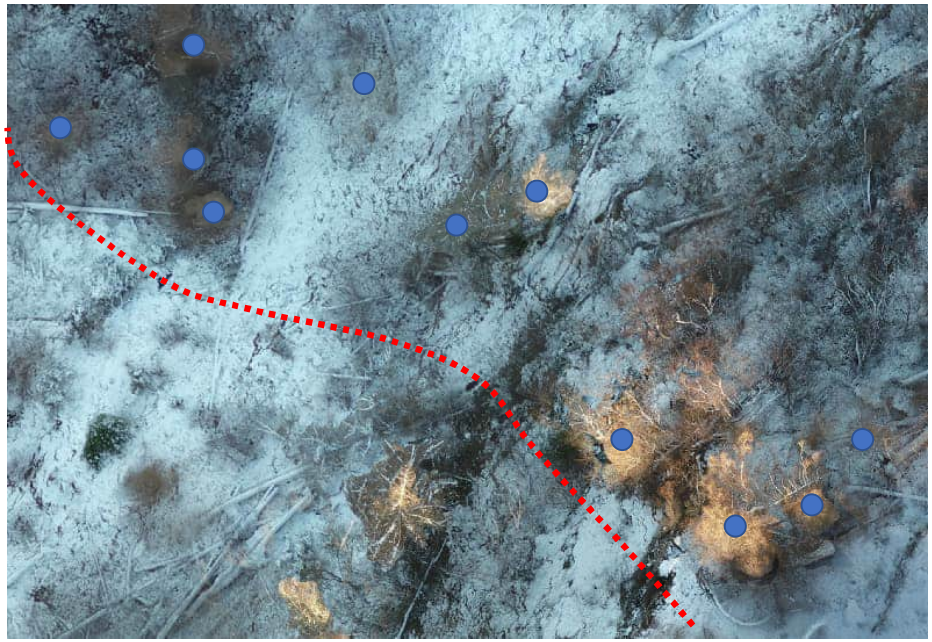
Grid Square boundary



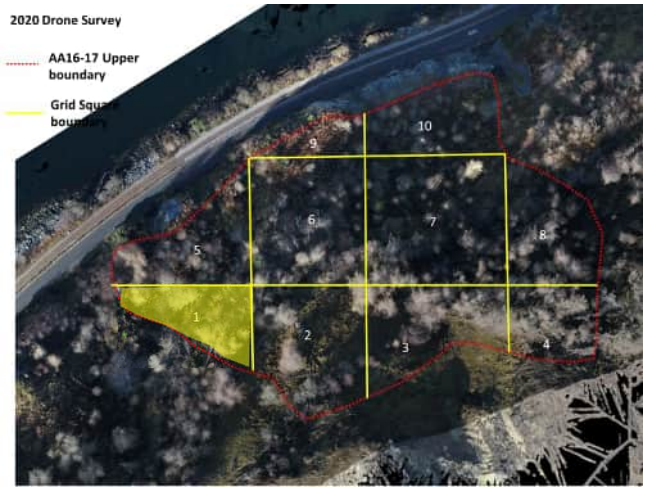
2020 Drone Survey



2023 Drone Survey



Grid Square 1



- Tree

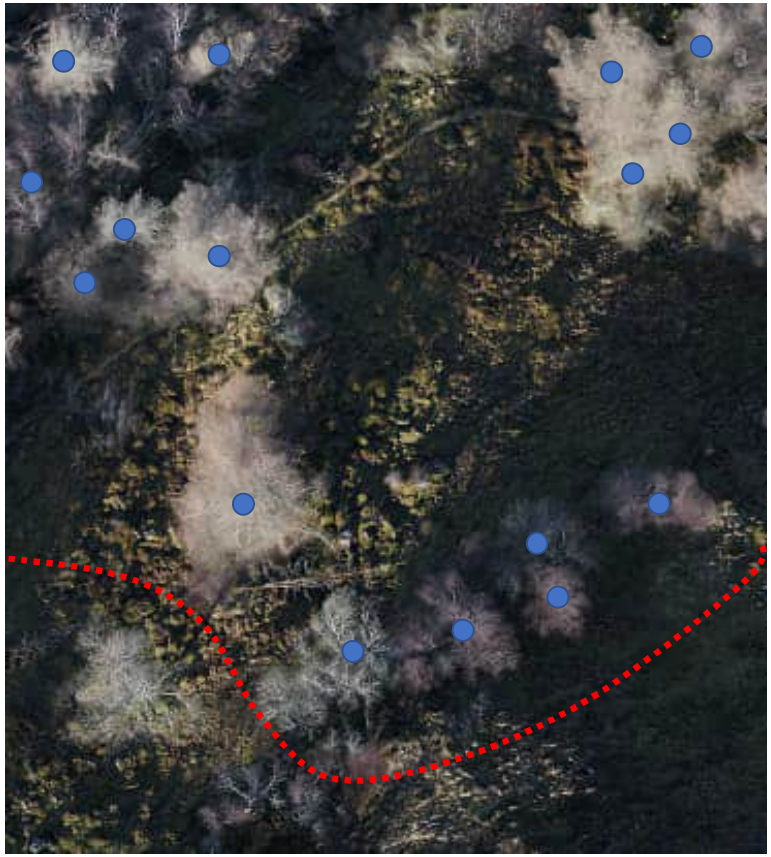
Approx. number of trees standing in 2020: 12

Approx. number of trees standing in 2023: 11

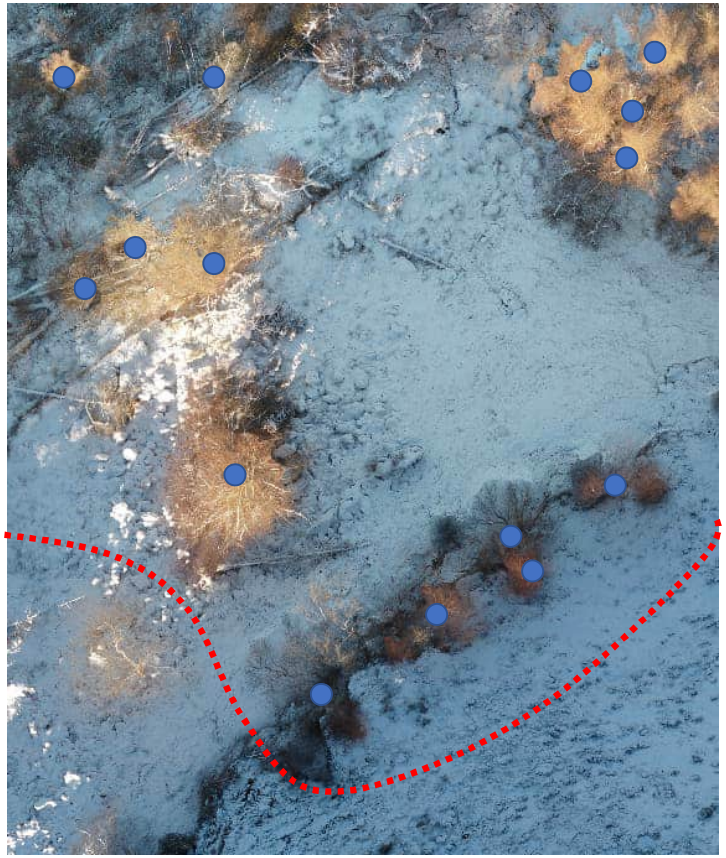
Approx. number of fallen trees between 2020 to 2023: 1

% of trees that have fallen: 8.3%

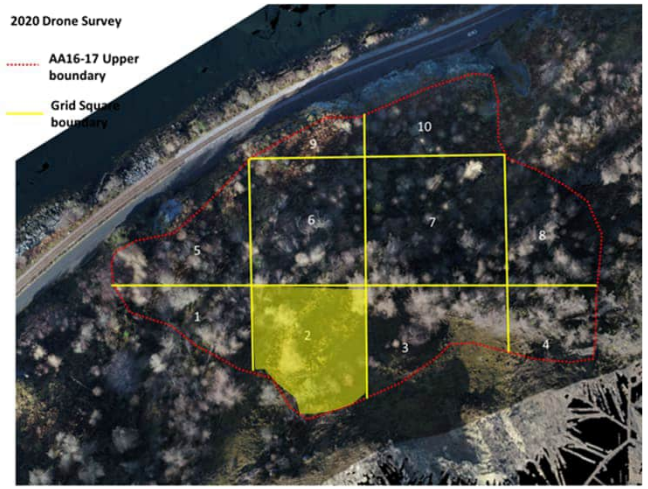
2020 Drone Survey



2023 Drone Survey



Grid Square 2



● Tree

Approx. number of trees standing in 2020: 16*

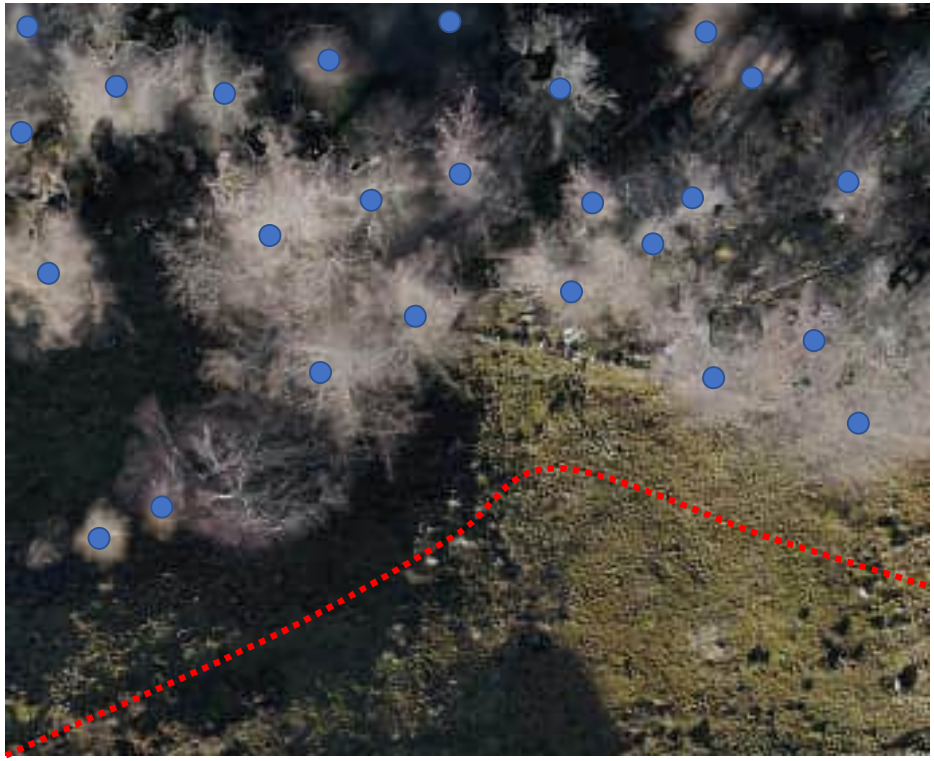
Approx. number of trees standing in 2023: 15

Approx. number of fallen trees between 2020 to 2023: 1

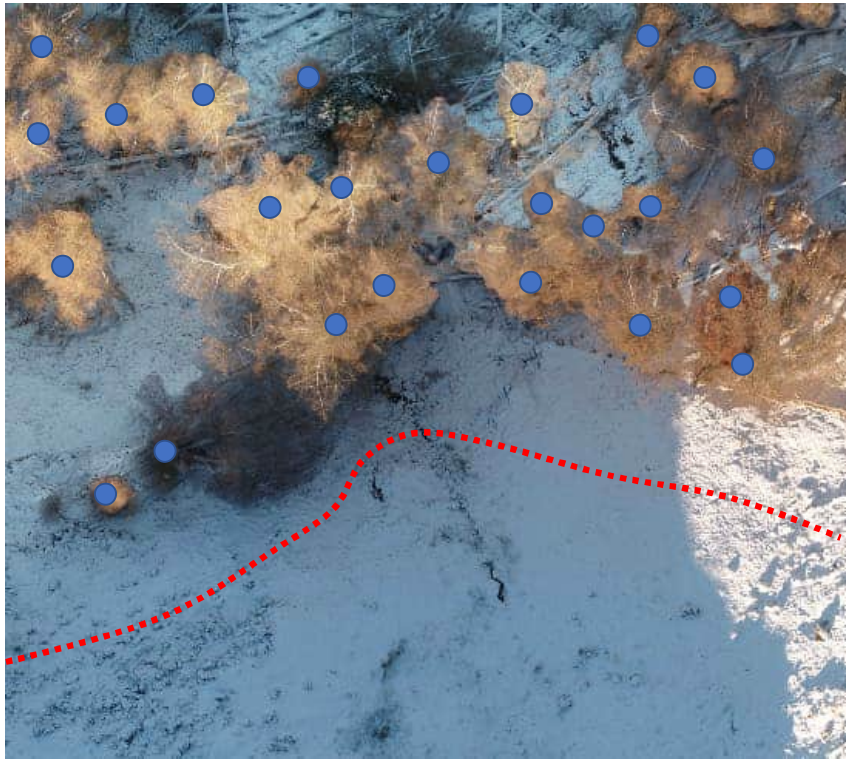
% of trees that have fallen: 6.3%

*Note this is 2 less than what was provided in the 2020 annual report – these two trees are counted in grid square 3.

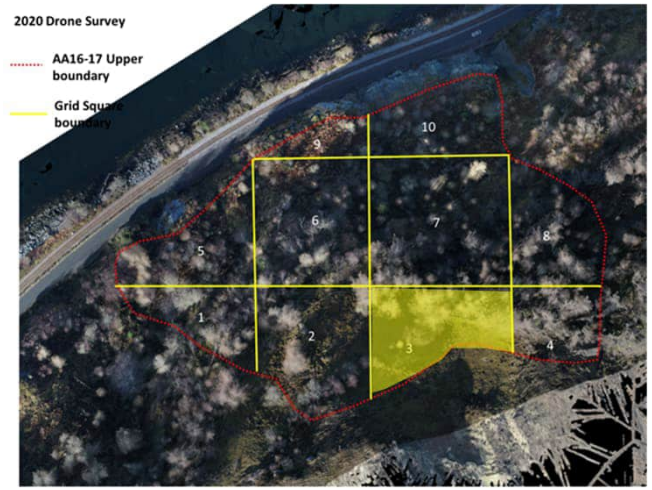
2020 Drone Survey



2023 Drone Survey



Grid Square 3



- Tree

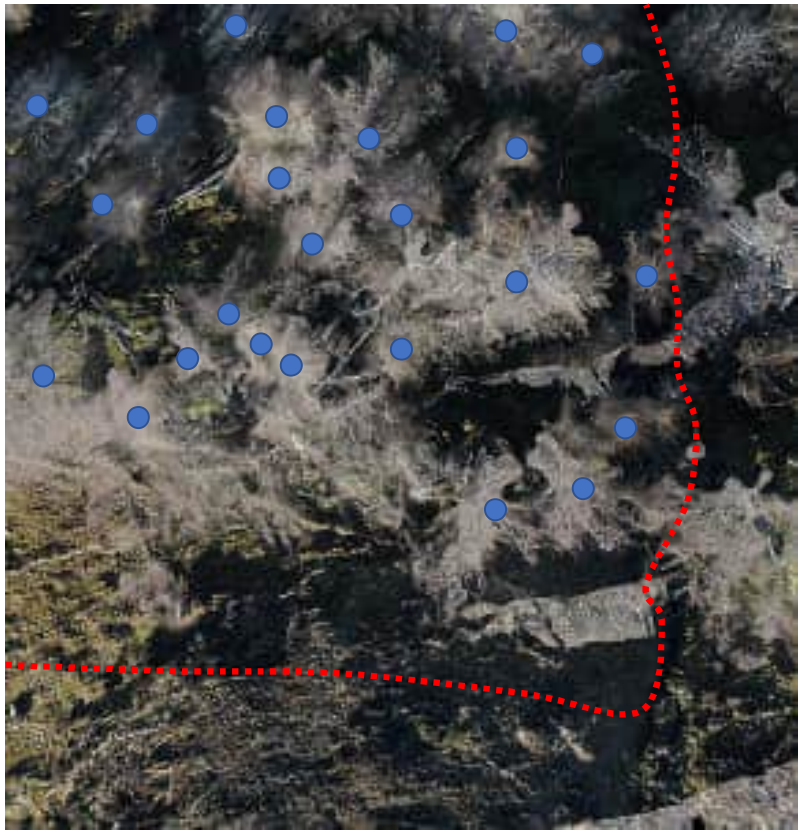
Approx. number of trees standing in 2020: 25

Approx. number of trees standing in 2023: 24

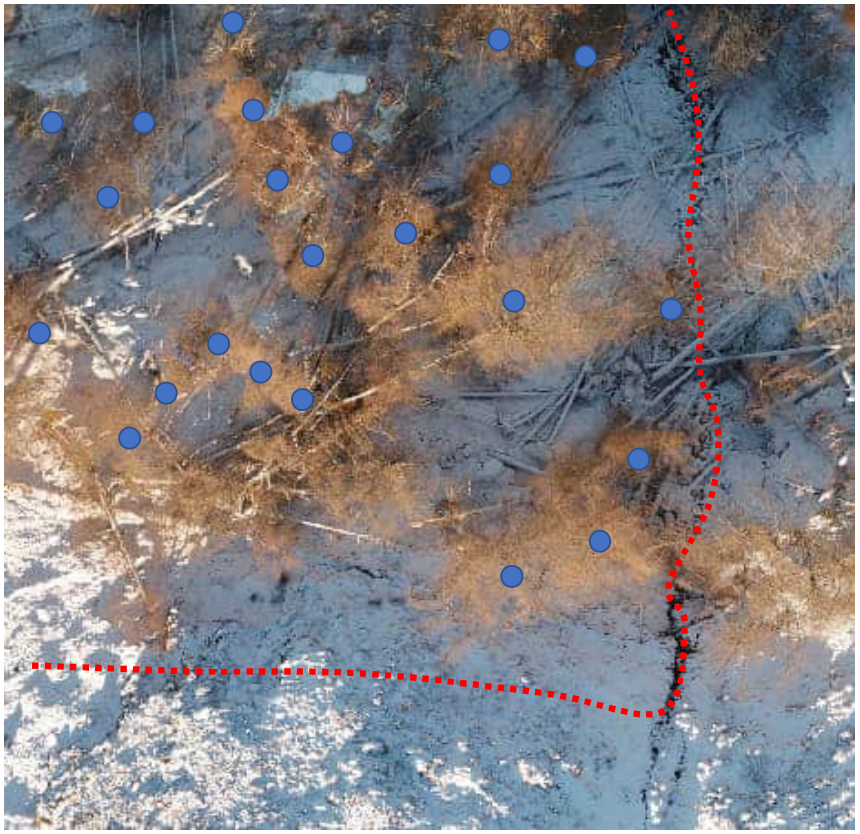
Approx. number of fallen trees between 2020 to 2023: 1

% of trees that have fallen: 4%

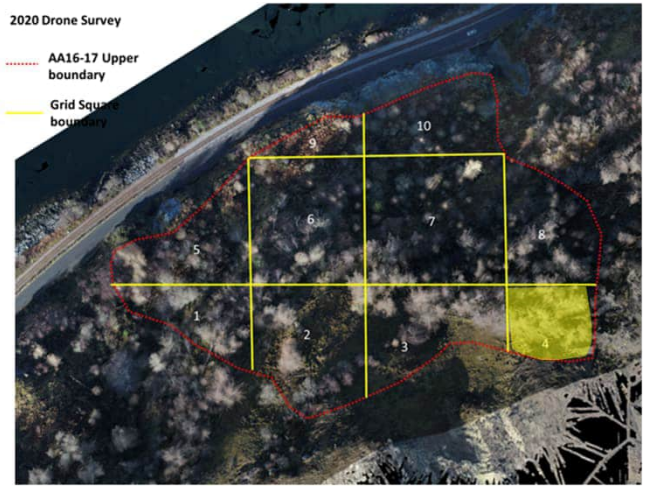
2020 Drone Survey



2023 Drone Survey



Grid Square 4



● Tree

Approx. number of trees standing in 2020: 24

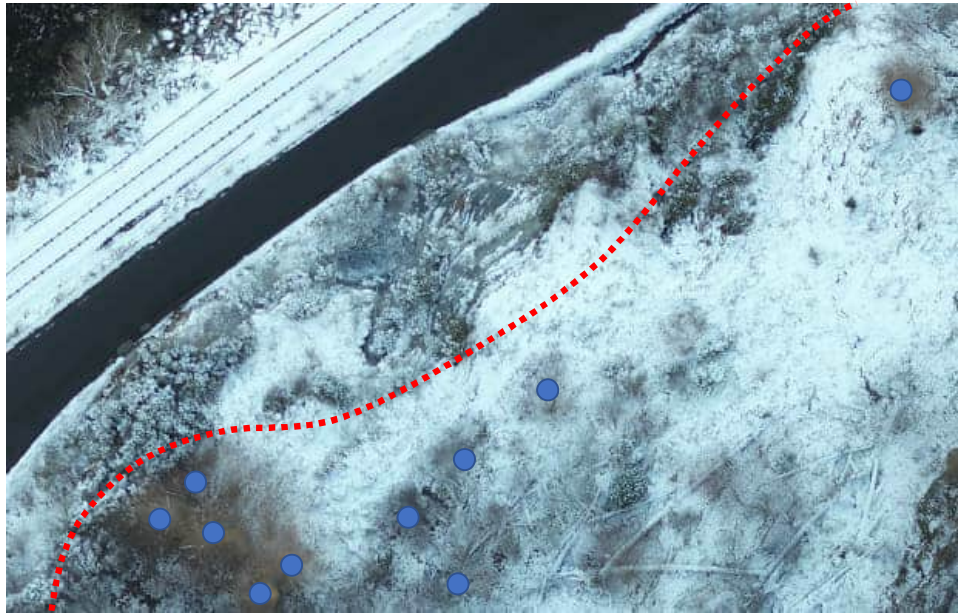
Approx. number of trees standing in 2023: 23

Approx. number of fallen trees between 2020 to 2023: 1

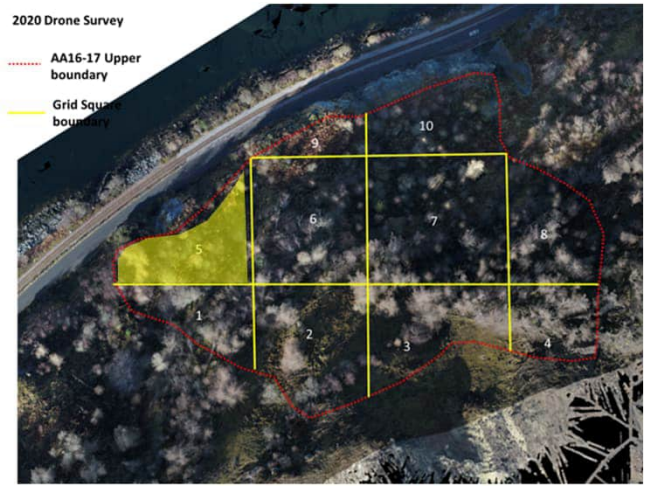
% of trees that have fallen: 4.2%

2020 Drone Survey

2023 Drone Survey



Grid Square 5



- Tree

Approx. number of trees standing in 2020: 18

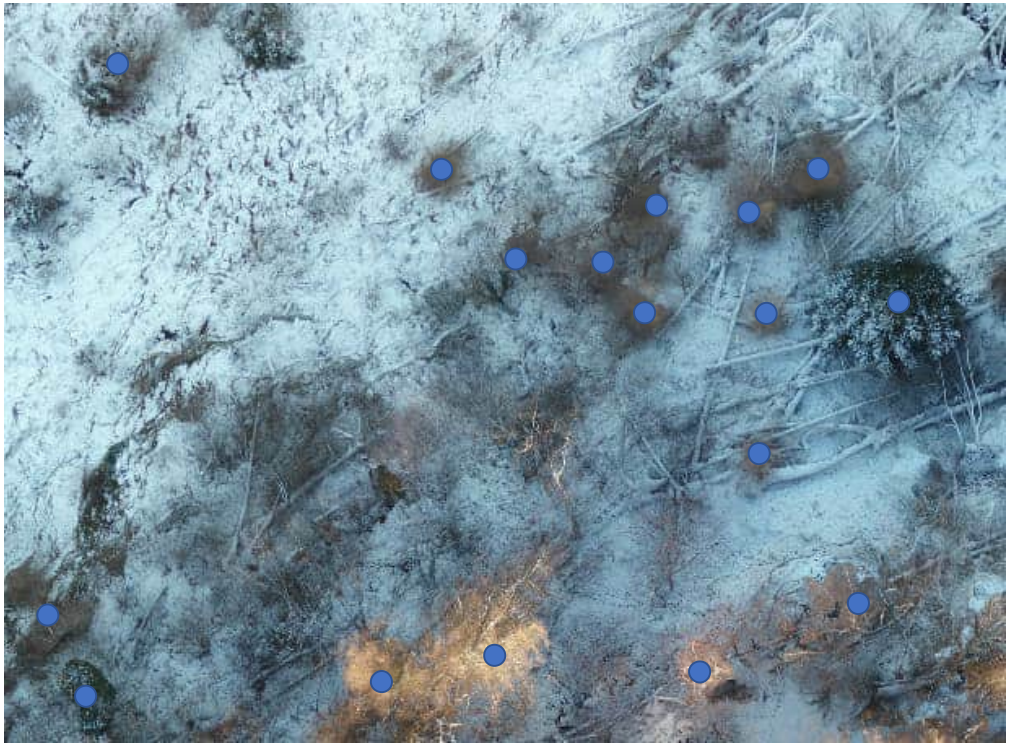
Approx. number of trees standing in 2023: 10

Approx. number of fallen trees between 2020 to 2023: 8

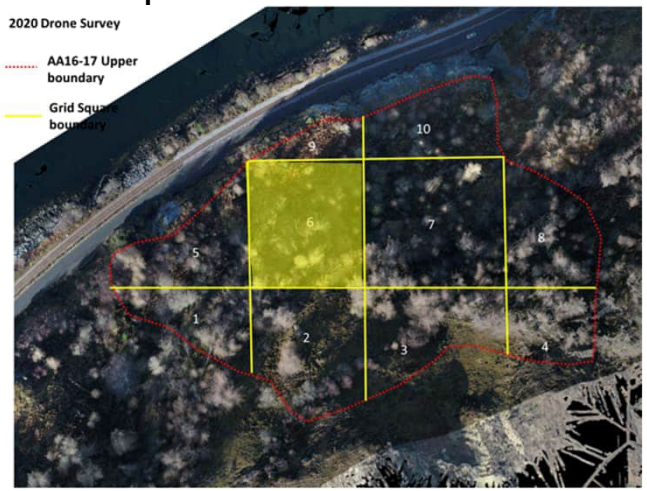
% of trees that have fallen: 44.4%

2020 Drone Survey

2023 Drone Survey



Grid Square 6



- Tree

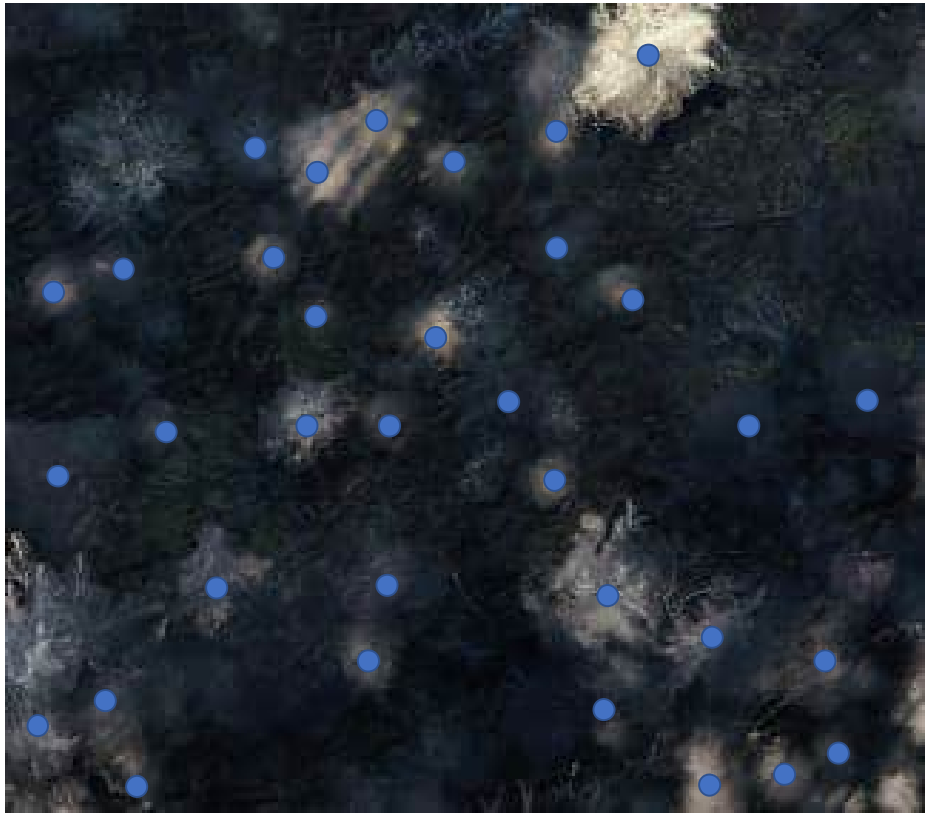
Approx. number of trees standing in 2020: 20

Approx. number of trees standing in 2023: 17

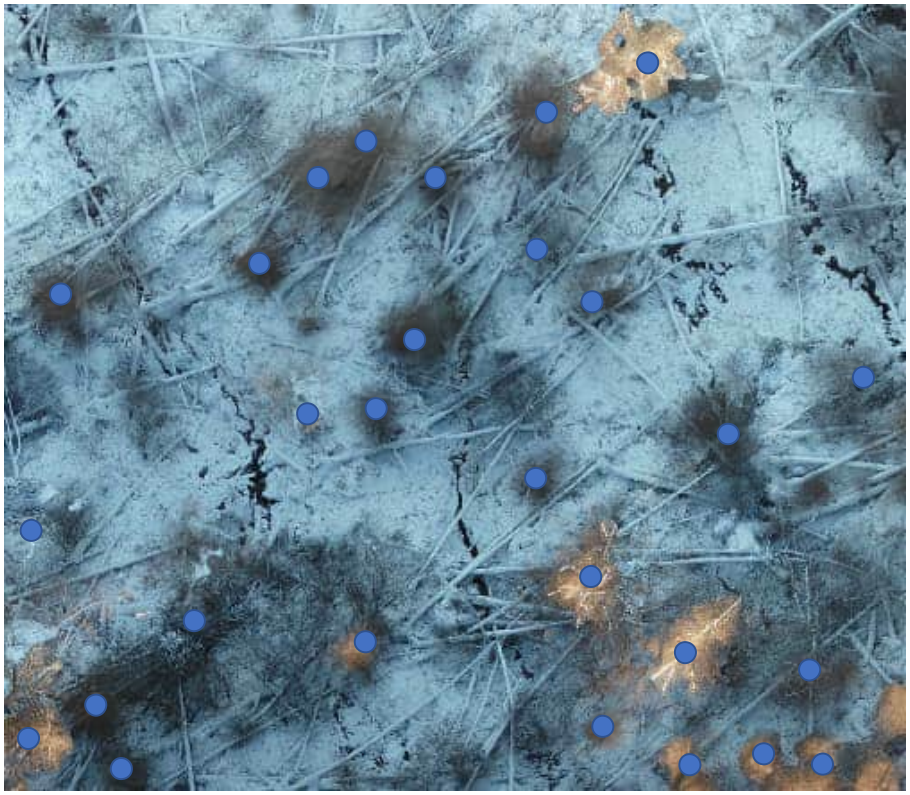
Approx. number of fallen trees between 2020 to 2023: 3

% of trees that have fallen: 15%

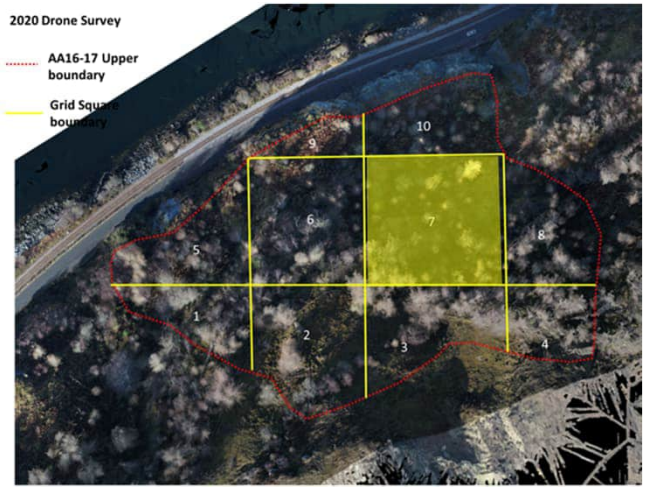
2020 Drone Survey



2023 Drone Survey



Grid Square 7



- Tree

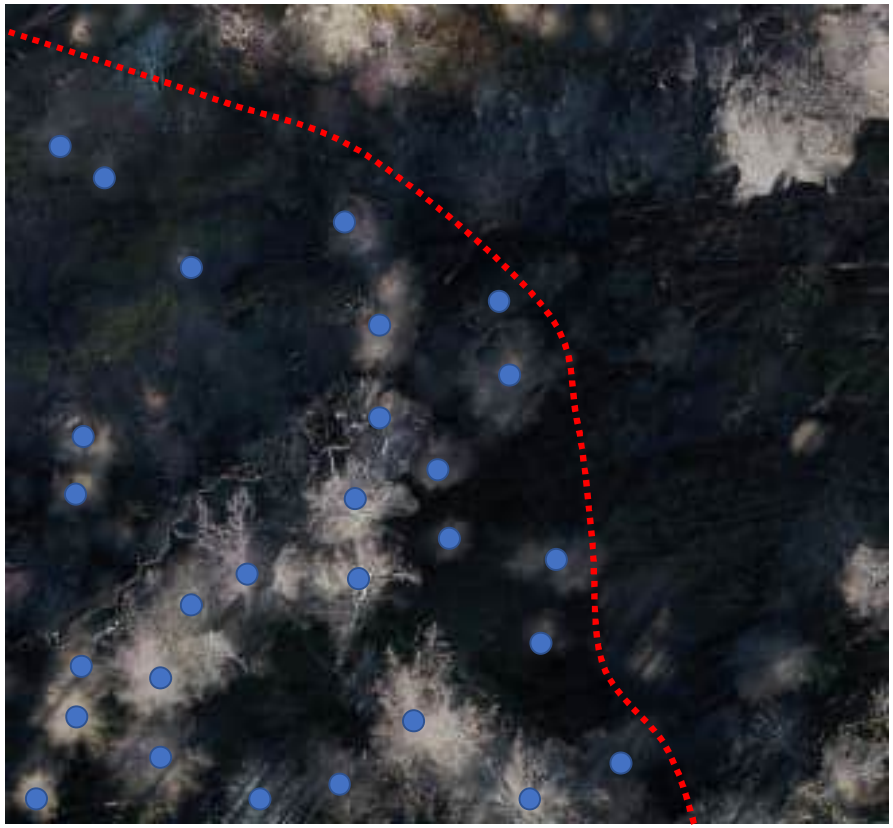
Approx. number of trees standing in 2020: 34

Approx. number of trees standing in 2023: 28

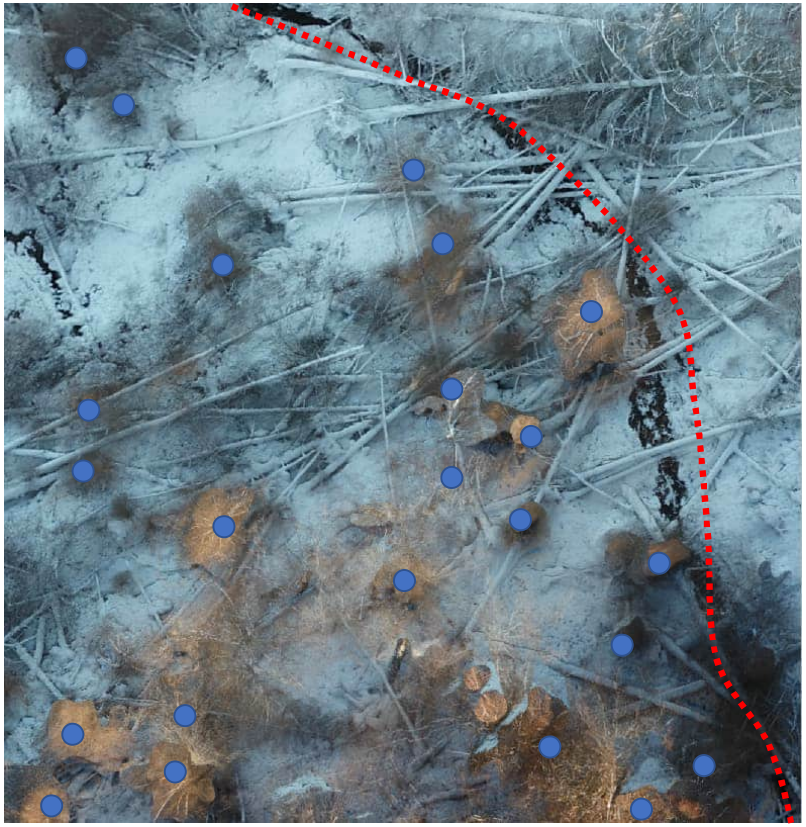
Approx. number of fallen trees between 2020 to 2023: 6

% of trees that have fallen: 17.6%

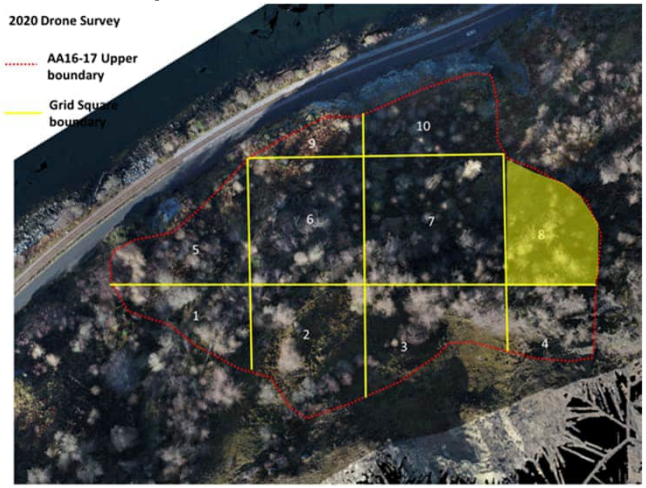
2020 Drone Survey



2023 Drone Survey



Grid Square 8



● Tree

Approx. number of trees standing in 2020: 28

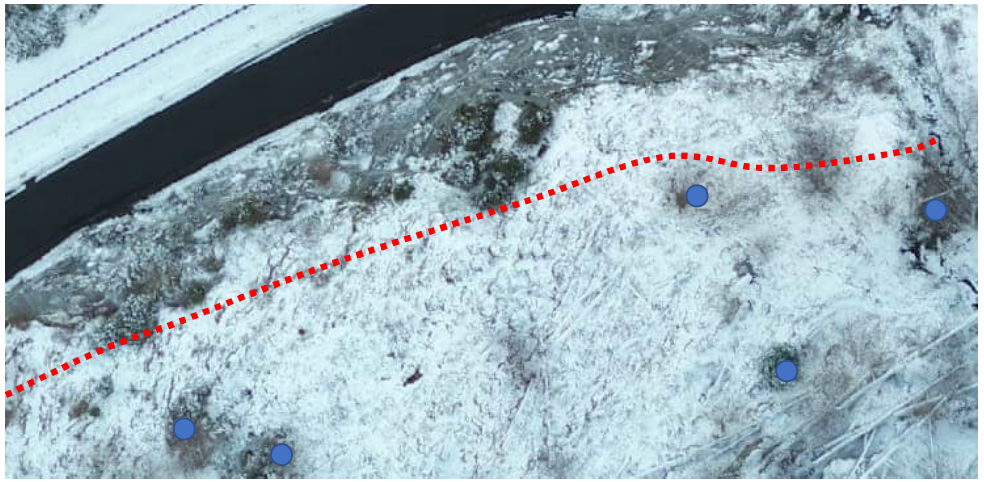
Approx. number of trees standing in 2023: 23

Approx. number of fallen trees between 2020 to 2023: 5

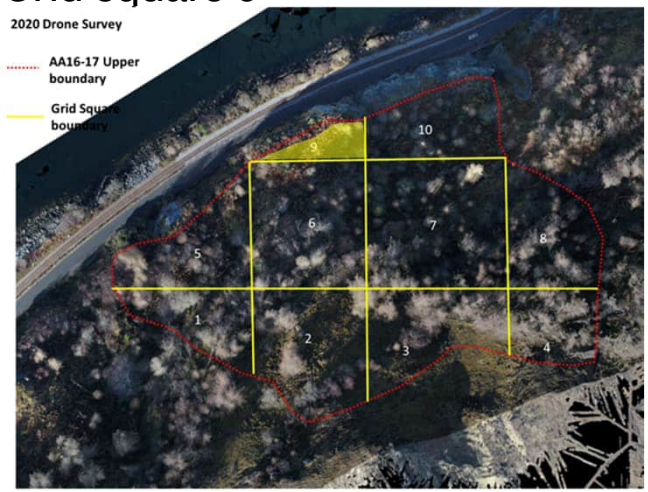
% of trees that have fallen: 17.6%

2020 Drone Survey

2023 Drone Survey



Grid Square 9



- Tree

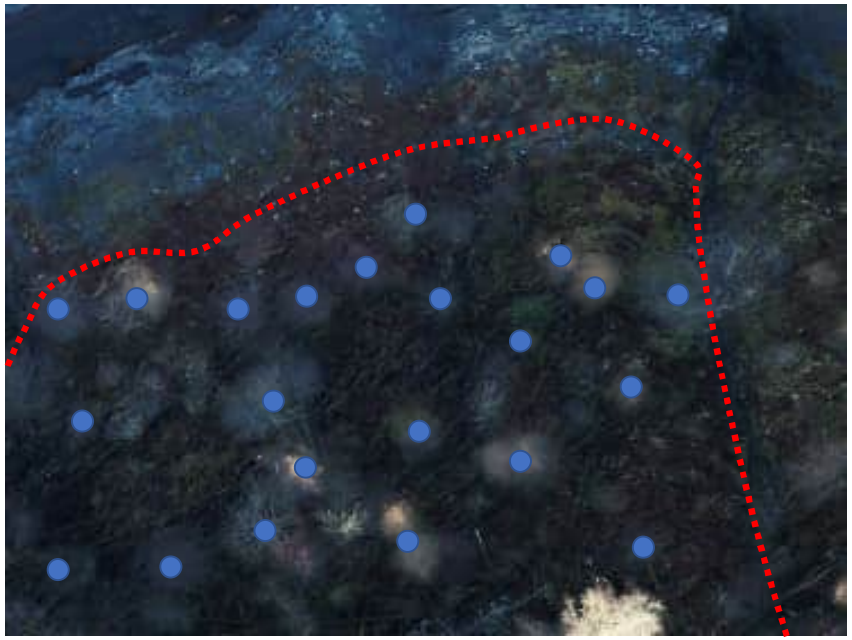
Approx. number of trees standing in 2020: 8

Approx. number of trees standing in 2023: 5

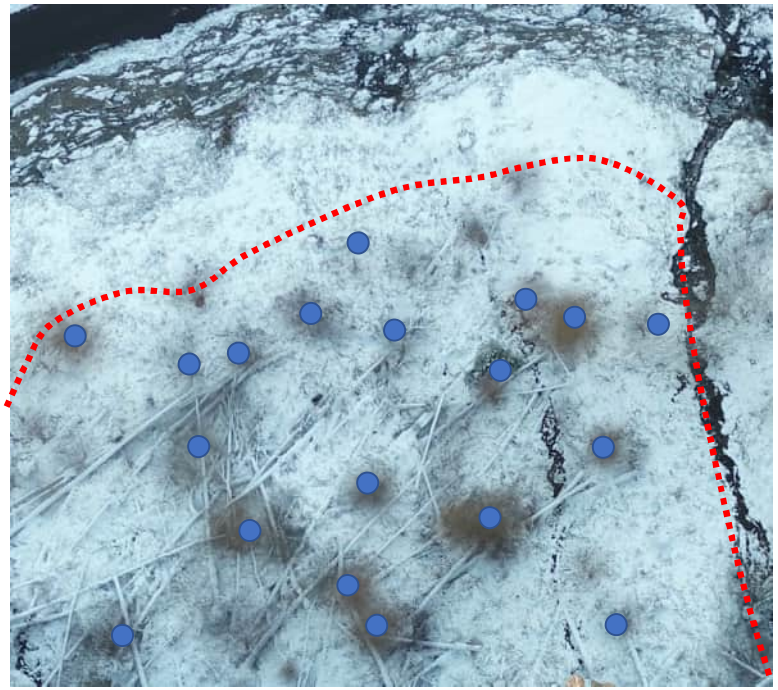
Approx. number of fallen trees between 2020 to 2023: 3

% of trees that have fallen: 37.5%

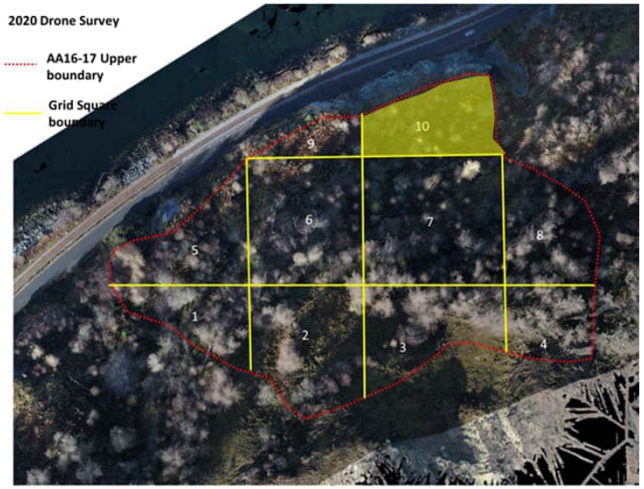
2020 Drone Survey



2023 Drone Survey



Grid Square 10



- Tree

Approx. number of trees standing in 2020: 22*

Approx. number of trees standing in 2023: 19

Approx. number of fallen trees between 2020 to 2023: 3

% of trees that have fallen: 13.6%

*Note this is 1 less than what was provided in the 2020 annual report – this one tree is counted in grid square 9

AA16-17 Upper Summary Table

Grid Square	Approx. number of trees standing in 2020	Approx. number of trees standing in 2023	Approx. number of fallen trees between 2020 to 2023	% of trees that have fallen
1	12	11	1	8.3%
2	16	15	1	6.3%
3	25	24	1	4.0%
4	24	23	1	4.2%
5	18	10	8	44.4%
6	20	17	3	15.0%
7	34	28	6	17.6%
8	28	23	5	17.6%
9	8	5	3	37.5%
10	22	19	3	13.6%
ALL (total)	207	175	32	15.5%

Appendix C Photographs

Photograph AA1-1	At Ch. 70 – A block fall (c.0.3m x 0.2m x 0.2m) which has landed in the ditch, source c.3m above toe of slope.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA1-2	At Ch. 150 – Small accumulation of blocks on ledge behind TECCO netting c.8m above toe of slope.	Year observation first noted: 2021

Photographs taken on 18 and 21 April 2023

Photograph AA1-3	Above AA1 - Upslope box culvert/bridge spanning across small watercourse, slight debris accumulation under bridge (granular cobble/boulder size) at NG 89408 36019.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA1-4	Above AA1 - Small waterfalls and localised accumulations of debris against fallen branches and trees forming debris dams.	Year observation first noted: 2023

Photograph AA2-1	Slight corrosion of Maccaferri netting and bottom cable around small waterfall.	Year observation first noted: 2021

Photographs taken on 18 and 21 April 2023

Photograph AA2-2	Trees at eastern edge of gully at crest of rock face are overhanging and at risk of falling and dislodging blocks.	Year observation first noted: 2016

Photographs taken on 18 and 21 April 2023

Photograph AA2-3	At Ch. 273 – Debris previously caught behind netting in 2017 has now fallen out of base of netting and into ditch.	Year observation first noted: 2021

Photograph AA2-4	Above AA2 - Upslope box culvert/bridge spanning across small watercourse, slight debris accumulation under bridge (granular cobble/boulder size) at NG 89199 35816.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA2-5	Above AA2 - Small waterfalls and localised accumulations of debris against fallen branches and trees forming debris dams.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA2-6	Above AA2 - Across slope are branches/fallen trees and there are some leaning trees in sidewalls.	Year observation first noted: 2023

Photograph AA2A-1	At Ch. 425 – Location of soil wash-out which occurred in February 2023.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA2A-2	At Ch. 390 - Several blocks up to 0.4m x 0.3m x 0.2m in ditch. Source not obvious.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA2A-3	At Ch. 400 - Large overhanging boulder 5m above road level	Year observation first noted: 2016

Photographs taken on 18 and 21 April 2023

Photograph AA2A-4	At Ch. 415 - Two small blocks in the roadside ditch. No obvious upslope source but within area where tree falls / root jacking poses a risk.	Year observation first noted: 2021

Photograph AA2A-5	Above AA2A - There is a lobe of soil sitting on rock (c.4-5m length x 2m wide x 0.5m deep) at the source area of the Feb 2023 event (NG 89385 35998).	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA2A-6	Above AA2A – Soil washout (i.e. debris flow) event eroding the Old Forest Track.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA2A-7	Above AA2A – Downslope of source area, the channel has been stripped down to bedrock.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA3-1	At Ch. 575 - Potential for toppling/block fall up to $2m^3$ originating from 5-8m above road level	Year observation first noted: 2016

Photographs taken on 18 and 21 April 2023

Photograph AA3-2	At Ch. 600 - Large block / slab of rock with dilated fractures and potential for root jacking at crest of rock slope.	Year observation first noted: 2021

Photographs taken on 18 and 21 April 2023

Photograph AA4-1	At Ch. 810 – Minor soil slip occurred and was contained by verge/drain. Originated from c.8m upslope. Slight overhang of vegetation at crest of failure slope remains.	Year observation first noted: 2021

Photographs taken on 18 and 21 April 2023

Photograph AA4-2	At Ch. 788 - Overhanging block at crest of slope with release joint and only partial overlap keying block in place.	Year observation first noted: 2016

Photograph AA4-3	At Ch. 830 - A block fall (0.5m x 0.3m x 0.2m) has landed in ditch. Fallen from 1m above toe in area of high water flow.	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023

Photograph AA4-4	At Ch. 842 - Ditch would benefit from clearance	Year observation first noted: 2023

Photographs taken on 18 and 21 April 2023