

Cairn Gorm – the construction site at the heart of the National Park (2)

Description



View of middle section of funicular repair work showing temporary access tracks on righthand side of track and extensive earthworks by and above the mid-station. Photo credit George Paton mid-June

Following my post on the construction of the tube slides in the Lower Coire Cas car park ([see here](#)), this post takes a look at the repair work to the funicular. Parkswatch has previously raised a number of significant concerns about the decision to repair the funicular, including the business case and likely costs, the adequacy of the planning process and whether the repairs would work ([see here](#) for links to seven posts by Graham Garfoot). There is now a growing body of evidence to support these concerns further: the response from the new owners of Morrison's Construction to Highland and Island's Enterprise's attempt to sue them for flaws in the original construction; the latest plans for the repairs submitted to the Cairngorms National Park Authority and the evidence of what is happening on the ground.

Who was responsible for the funicular design failure?

It comes as it has been confirmed that HIE is proceeding with a claim for £14.5m damages plus interest and expenses against the now-owner of Morrison Construction, Galliford Try Infrastructure Limited, and Inverness-based AF Cruden Associates Limited, the civil and structural engineers for the scheme who have now been taken over by Glasgow-based Arch Henderson.

'Pressures'

HIE, which auditors say "faces significant financial pressures", has included a provision of £14.3m for the cost to it of reinstating the funicular which is expected to take two years.

The agency is making claims over defects in the design and construction of the railway, and breaches of contracts which emerged after the funicular shut in October 2018.

HIE has already commissioned expert reports for the action which is currently before Lord Ericht in the Court of Session.

A HIE source said: "The failure

of key aspects of the Cairngorm funicular railway infrastructure after less than 17 years of operation raised serious questions about the quality of the original project.

"Reinstatement works require significant expenditure and we have a clear duty to do all we can to reduce the burden of these costs on the public purse.

"As legal proceedings are now under way, it would not be appropriate to comment further at this stage."

Catherine MacColl for Galliford Try said HIE had not yet made clear what the breaches were.

Jonathan Brown for AF Cruden said the action was of "significant complexity" with a claim for "unspecified remedial works" which needed to be worked out on a contested basis "proactively and sensibly".

"Forgive the bad pun, but we are in the foothills of this action," he said. "There is a lot of working out to be done. It is by no means a straightforward situation.

"It is a complicated exercise and a considerable degree of uncertainty about what the nature of the defect is and where responsibility for it lies."

£16m repairs

THE Scottish Government has already pumped in £16m towards the cost of fixing the railway which connects a base station with a restaurant and a ski area 3,599ft up Cairn Gorm mountain near Aviemore.

But it has also had to pay a penalty of £85,989 to the EU over flawed tendering procedures.

It has emerged that in 2003/04, the EU reviewed HIE's procurement procedures for the



Sir Fra Morris, former chairman of Highland and Islands Enterprise, which awarded the contract to build the funicular.

Cairngorm funicular and after lengthy negotiations, ministers accepted an EU auditor's decision that HIE did not follow some aspects of the EU's procurement procedures.

According to documents seen by this newspaper, the EU found that HIE "had not identified in its tender documentation" all the criteria to be used or detailed the weighting for the criteria.

According to Audit Scotland documentation: "It also did not follow correct procedure when it used contractors' experience as a criterion in the final stages of the competition."

It also reveals that the shutting down of the funicular would result in a refund to the EU and that the 2007 cost of reinstatement, and adjusted for inflation to 2020 prices, is at least £42.5m to £71m.

"In addition to the reinstatement costs, HIE would need to repay the EU funding of £2.6m if the funicular ceased to operate and cover potential redundancy costs," the document said.

A HIE spokesman said reinstatement will not apply in the event it is "out of operation for the purpose of maintenance and repair".



The failure of key aspects of the Cairngorm funicular railway after less than 17 years of operation raised serious questions about the quality of the original project

Extract from article by Martin Williams in the Herald on Sunday yesterday.

The headline of this article ([see here](#)) presented the story about HIE's attempt to sue the now owners of Morrison's Construction and Cruden's for £14.5m as an "Exclusive" when this information has been in the public realm for a long time. But the information that HIE paid the EU an £85,989 penalty for flawed tendering processes appears to be new. More importantly, given the vast sums of money being spent on the funicular current repairs, Martin Williams extracted quotes (highlighted) from the new owners of A.F. Cruden and Morrison's. Both indicate that HIE still does not know why the funicular failed.

As Parkswatch has argued for some time, without establishing what has gone wrong and given that it was HIE who decided to change the from steel to concrete support beams as part of cost-cutting measures, it is very difficult to see how any legal action could be successful. But this also means that there is a considerable degree of uncertainty about how long the repair work currently underway is likely to work. Perhaps, the reports that HIE has commissioned and now lie before Lord Ericht in the Court of Session are NEW and do reveal why the funicular failed? But if so, where does that leave the repairs granted planning permission? These were designed on the basis of engineering reports that were extremely limited in scope, for example because no ground investigations were carried out.

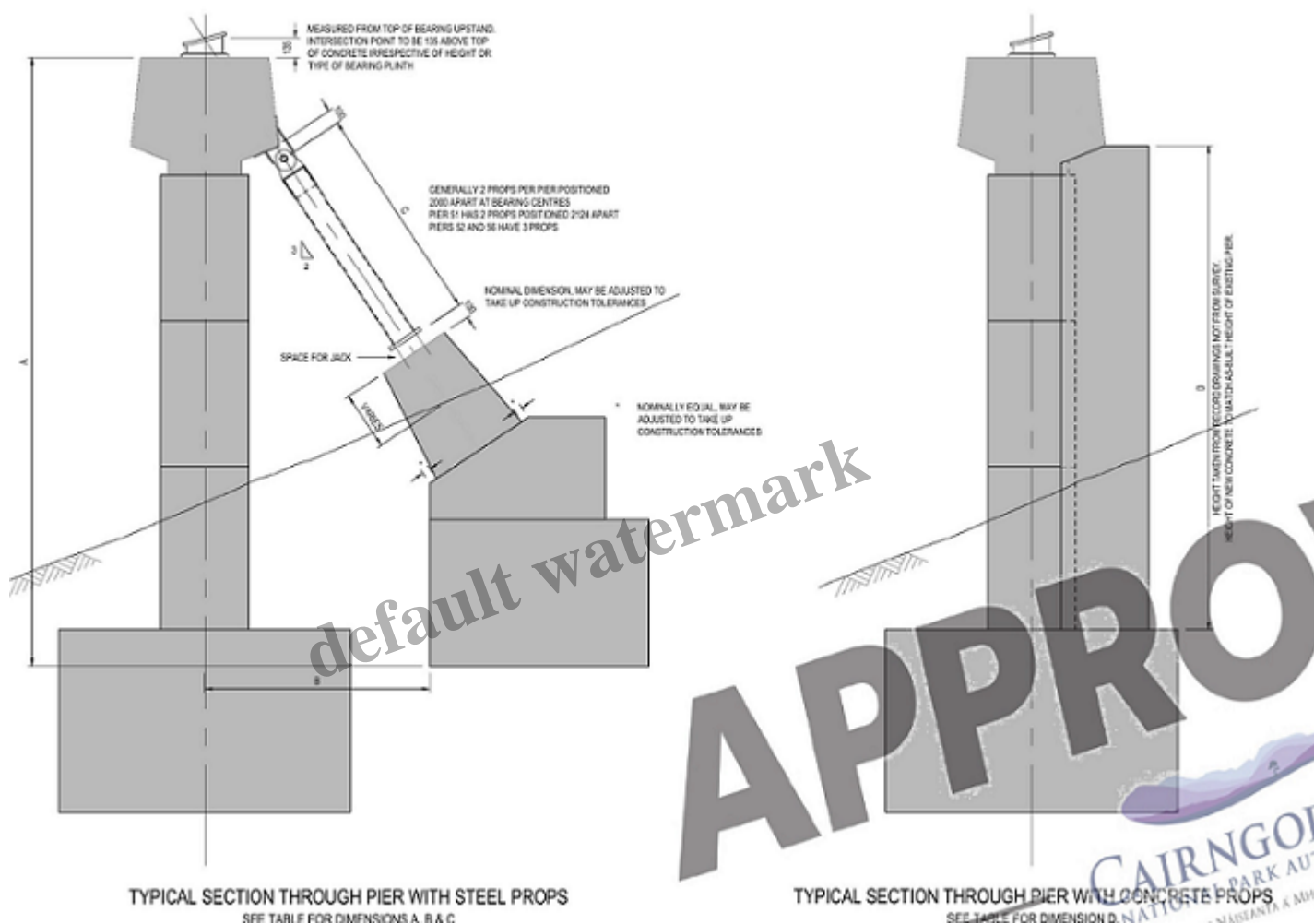
The Herald article also states the repair work, which started last November, *"is expected to take two years"*. This contradicts HIE's news release of 2nd June ([see here](#)) which stated the funicular is *"due to come back into service in winter 2021-22 following completion of strengthening works that are currently underway"*. If the Herald is right, that raises significant questions about the potential costs of the works and also their alleged benefits, with another ski season potentially lost.

Changes to the repair plans



The minor earth works at the passing area earlier today

In the report to the Cairngorms National Park Authority Planning Committee last May, drawings ([see here](#)) were included of proposals to strengthen the support beams with braces and add 63 props to the 94 piers that supported the viaduct. These, it was claimed, “will involve minor earth works to allow construction”.



Extract from the new plans. The left hand diagram appeared in the CNPA Planning Papers, the right hand one is new!

Condition 10 of the CNPA’s Planning Consent required HIE to supply details of the materials and finishes to be used in the props before work could commence. In March this year, before the repair work commenced, HIE submitted two new documents which are now on the CNPA planning portal ([see here](#)). They are quite informative, even if the finishes were not specified: instead reference was made to Clause 1708 of the Specification for Highway Works ([see here](#)) which leaves questions of colour and texture open. We know what the trapezoid blocks which will connect the steel props to the new foundations will look like, however, because they were pre-cast and stored in the car park



What the documents do show that is instead of adding props supported by new foundations to all 63 piers, the plan now is to reinforce 19 of the piers with additional concrete supports, as in the diagram on the right and, in three cases, to strength the piers with short concrete jackets.

PIER NUMBER	TYPE OF PROPPING	DIMENSION	DIMENSION	DIMENSION	DIMENSION	DIMENSION	DIMENSION
		A	B	C	C	C	D
				NORTH	MIDDLE	SOUTH	
ON HOLD							
	1	??	0	0	0	0	
	2	??	0	0	0	0	
	3	??	0	0	0	0	
No Propping required for Piers 4 to 33							
34	Steel props with symmetric deep foundation	4891	2096	2500	-	2500	-
35	Steel props with symmetric deep foundation	4475	1818	2000	-	2000	-
36	Steel props with symmetric deep foundation	4142	1596	1600	-	1600	-
37	Steel props with symmetric deep foundation	4142	1596	1600	-	1600	-
38	Steel props with symmetric deep foundation	4058	1541	1500	-	1500	-
39	Steel props with symmetric deep foundation	3975	1486	1400	-	1400	-
40	Steel props with symmetric deep foundation	3809	1375	1200	-	1200	-
41	Steel props with symmetric deep foundation	4142	1596	1600	-	1600	-
42	Steel props with symmetric deep foundation	3892	1430	1300	-	1300	-
43	Steel props with asymmetric foundation	4359	1541	1861	-	1500	-
44	Steel props with asymmetric foundation	4858	1874	2461	-	2100	-
45	Steel props with asymmetric foundation	5357	2207	3061	-	2700	-
46	Steel props with asymmetric foundation	5607	2373	3361	-	3000	-
47	Concrete prop	-	-	-	-	-	1535
48							
49	Short concrete jacket	-	-	-	-	-	390
50	Concrete prop	-	-	-	-	-	1230

Extract from latest plans. Foundations for the supports hold the steel props are described as symmetric or asymmetric and as “deep foundation”, “foundation”, “shallow foundation” or “triple foundation”.

(As an aside, note how in the case of the first three piers, the props are described as being “on hold”. That hardly inspires one with confidence that HIE has got to the bottom of what has gone wrong).

The revised proposal to install 22 concrete props/jackets suggests that in these cases the problem has not been that the piers are tilting, but rather they are not strong enough to support the viaduct above.

Given that the other piers appear to be tilting and need propping up due to inadequate foundations, one wonders at the wisdom of adding a lot more weight to the foundations of these 22 piers. How does Liff know that the new concrete props won't make the foundations tilt or slide?

CONSTRUCTION SEQUENCE - STEEL PROPS

STAGE 1 - EXCAVATION. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF EXCAVATIONS. IT SHALL BE NOTED THAT EXCAVATION FOR THE PROP FOUNDATIONS COULD POTENTIALLY REDUCE THE STABILITY OF THE EXISTING PIER FOUNDATIONS. THE DESIGNER HAS DETERMINED THAT THE PIER FOUNDATIONS WILL REMAIN STABLE PROVIDING EXCAVATION DOES NOT PROCEED BELOW THE LEVEL OF THE UNDERSIDE OF PIER FOUNDATIONS AND THERE ARE NO LIVE LOADS ON THE RAILS. IF THESE CONDITIONS CANNOT BE MET THEN REFER TO THE DESIGNER. EXCAVATED MATERIAL SHALL BE STORED LOCALLY FOR RE-USE.



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nem:

STAGE 2 - FORMATION. FORMATION ACCEPTANCE CRITERIA ARE GIVEN IN THE GENERAL NOTES. ANY SOFT SPOTS SHALL BE DUG OUT AND BACKFILLED WITH ST1 CONCRETE. A MINIMUM OF 50 THK ST1 BLINDING CONCRETE SHALL BE LAID. BACK BLINDING ON SIDE FACES MAY BE USED IF DESIRED.

STAGE 3 - FOUNDATION CONSTRUCTION. ALL FACES SHALL BE FORMED OR CAST AGAINST BLINDING, AND NOT CAST AGAINST SOIL. ALL INSITU CONCRETE SHALL BE AT LEAST 200mm BELOW FINISHED GROUND LEVEL, WITH ONLY PRE-CAST CONCRETE PROJECTING ABOVE GROUND.

STAGE 4 - BACKFILL. BACKFILL SHALL USE 6N FILL OR SELECTED EXCAVATED MATERIAL AS DESCRIBED ON DRAWING A132354-CFV-STR-DWG-210. ANY SURPLUS EXCAVATED MATERIAL SHALL BE SPREAD LOCALLY OR STOCKPILED, AND NOT REMOVED FROM THE SITE. BACKFILL SHALL BE COMPLETE BEFORE PROPS ARE PRE-LOADED.

STAGE 5 - STEELWORK INSTALLATION. INSTALL FIXINGS & TOP BRACKET WITH BEDDING MORTAR. INSTALL PROP. ALLOW MORTAR TO GAIN STRENGTH BEFORE PRE-LOADING PROP, SEE GENERAL NOTES.

STAGE 6 - PRE-LOAD PROPS. AFTER BEDDING MORTAR HAS GAINED STRENGTH, PROPS SHALL BE PRE-LOADED TO 50 kN PER PROP. THIS SHALL BE ACHIEVED BY JACKING WITH A LOAD CALIBRATED JACK BETWEEN BASEPLATE AND PRE-CAST CONCRETE PLINTH, SEE GENERAL NOTES. PRE-LOAD SHALL BE LOCKED IN PLACE BY ADJUSTING THE BASEPLATE FIXINGS.

The basic problem, that the

foundations of funicular piers were never secured to the bedrock but were laid on glacial deposits, has never been addressed. Those deposits are slowly moving downhill through force of gravity and the action of groundwater. There is some acknowledgement of this in the latest plans which require geotechnical tests of ground stability:

(D) Foundations and backfill

1. Pier prop formations shall be tested to determine suitability by a minimum of 3 No Dynamic Probe Super Heavy (DPSH) Tests per prop foundation.
2. Super Heavy Dynamic Probing to utilise 63.5kg hammer dropped over 760mm with cone area 20cm². Testing to be carried out from a level working platform established 1m above proposed formation level with continuous probing to refusal or maximum depth of 6m. Number of blows for every 20cm (N20 Value) of penetration to be recorded. Refusal is defined as N20>30.
3. Acceptance Criteria:

Zone	Formation	Piers	N20 (DPSH)
A	Glacial Deposits	P1-P3 & P51-P57	18
B	Alluvial Deposits	P34-P46	8
C	Head Deposits	P58-P62 & P72-P76	23

4. Where acceptance criteria is not shown to be met at depths up to 1m below the proposed formation level, unsuitable material shall be excavated and replaced with ST1 concrete.
5. In addition to Dynamic Probe testing, at the location of all new prop foundations, visual examination of the exposed formation by an experienced Geotechnical Engineer is required prior to casting of blinding concrete to verify the characteristics of the formation.
6. For Piers P89-P93 founded on Ground Type D Weathered Rock, visual examination of the exposed formation is sufficient to verify assumption regarding suitability of formation material for new prop foundations.

How this fits with the

instructions to the building engineers to keep the bottom of the new foundations (known as the “formation level”) ABOVE the existing foundations is unclear. I am not an engineer but 6m deep probes and instructions to excavate out any unsuitable material up to 1m below the formation level appear inconsistent with that. Nothing is said either about the risk of a hydraulic hammer / breaker to test the ground conditions causing vibration damage to the existing structure and the ground below helping to destabilise the existing piers still further.

HIE’s hope appears to be that if they pay for enough concrete that will stabilise the funicular structure. With proper ground investigations it appears just as likely that all the extra weight may just increase the forces that are making the funicular slide slowly downhill! There is no explanation of how the new foundations which do sit on bedrock (piers 89 – 93) will be secured to it.

What’s happening on the ground



View of repair work above the mid-station to the funicular tunnel, top left, with sections of walkway in on the far side of the funicular. Diggers are visible top left and centre. Photo credit George Paton mi

The section of the funicular where the repairs are having least impact at present is above the mid-station on the steeper ground. Above pier 62 materials are being flown in by helicopter and there is no sign of temporary construction tracks (though these were mentioned in the planning documents). A pedestrian walkway has been installed to prevent ground damage. The CNPA will be pleased.

However, the piles of excavated material will have a significant impact on ground vegetation. The latest plans state that for the foundations supporting the steel props *“any surplus excavated material may be spread locally or stockpiled”*. Where the stockpile will be taken and how the ground beneath it will be restored is still not clear. What should be obvious though is that any material “spread locally” will be simply be washed downhill.



George apologises for the slightly blurry photo but it helps show the extent of the “minor earthworks” approved by the CNPA! Photo Credit George Paton

The area around the double track passing place and loading station appears far worse: huge holes, a large excavated “temporary” access track (on the far side) and piles of excavated material.

On the lower half of the funicular, where less repair work is planned, the main impact so far is the construction tracks:

SunKid 2021-06-22 16:27:08



Looking down the Shielling “SunKid” Rope tow. Photo credit CMSL webcam

The track on the left was constructed unlawfully as part of the installation of the SunKid tow ([see here](#)) but then granted retrospective planning permission by the CNPA. It has now been “temporarily” upgraded and a further new temporary track created parallel to the funicular to provide access for the repair work. A geotextile, visible on the left of the screenshot, has been placed below the new surface. This appears to follow a recommendation from SEPA that *“all temporary tracks where peat would otherwise be excavated comprise of geotextile or plastic track matting unless there is a significant technical reason why this is not feasible.”*

While the ground by the funicular is very peaty, any peat under the sunkid track was destroyed during its construction (see link above for photos). All the geotextile matting will do therefore is kill the vegetation below. Where the track needed to be widened temporarily it would have been far less damaging to have excavated and saved the surface vegetation and then replaced this. The photos provide no evidence that such protection and restoration techniques are happening at Cairn Gorm, whether on the temporary access tracks or around the pits that have been excavated for the new piers. My guess is that is far too expensive and instead HIE will re-seed the damaged areas in due course.

What will happen next?

Parkswatch intends to monitor the repair work quite closely over the coming months, not least because the potential for ecological catastrophe at Cairn Gorm now appears very high. During the thunderstorms on Sunday the rain gauges at Cairn Gorm show there were only a few mm of precipitation. Imagine, however, that the 5cm of water which fell at Grantown had fallen on the

construction site.....in granting planning permission for the repair of the funicular the CNPA has allowed HIE to embark on a massive gamble the true costs of which are still to be seen.

Category

1. Cairngorms

Tags

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