Appendix 9.2: Catchment Areas Draining to Access Tracks and Initial SUDS Sizing

Appendix 9.2: Catchment Areas Draining to Access Tracks and Initial SUDS Sizing

Introduction

9.2.1 The new overhead line (OHL) connections forming part of the Kendoon to Tongland 132 kilovolt Reinforcment Project ('the KTR Project') route cover a length of approximately 46km and a number of access tracks have been identified along the route to enable tower construction, the stringing of the OHLs, and other ancillary works such as construction laydown areas. There is also considerable use of existing forestry tracks and other tracks off the public road to access the route of the OHL. The total length of access tracks (new and existing) is just over 100km. The OHL route tends to follow the western side of the Water of Ken/River Dee valley and there are numerous small watercourses draining down the hillslopes towards the accesses.

9.2.2 Kaya Consulting was commissioned by SP Energy Networks (SPEN) to delineate catchments along the route of the KTR Project, identifying catchment areas and overland flow areas that flow toward the access tracks along the entire route. Key locations with sensitive receptors downstream (e.g. watercourses and/or private water supplies (PWS)) and areas where the topography funnels flow towards a sensitive receptor have been identified.

9.2.3 The scope of work is as follows:

- Catchment delineation along route using best available terrain data.
- Desk-based identification of key areas where issues may arise as a result of pollution to the water environment from access tracks (e.g. watercourses/sensitive receptors down gradient of tracks or large upstream catchment areas over a threshold size or with steep slopes).
- Site visit to ground truth selected catchments.
- Desk-based hydrological analysis of catchments (using standard methods) to estimate flows and volumes of water generated in catchments during different rainfall events. The results of this analysis will be used to inform sizing of Sustainable Drainage Systems (SUDS) required.
- Initial sizing of SUDS and land-take required. It is recommended that upstream clean water is diverted away from access tracks to minimise the amount of surface water run-off entering the working area (and thus becoming dirty).
- Preparation of this summary report and accompanying GIS files, reporting methodology, results of catchment delineation and mapping and indicative sizing of SUDS to inform the EIA Report.

9.2.4 It should be noted that this report is not an outline drainage strategy for the KTR Project but summarises the findings of the catchment delineation and makes initial recommendations for the locations and types of SUDS required for the accesses associated with the KTR Project

9.2.5 This report does not cover the temporary access tracks used for the removal of existing OHLs as part of the KTR Project (N and R routes). These will only be used for short periods of time during tower removal, which takes approximately ten days per tower. Where possible, access for tower removal will be undertaken using low ground pressure plant and vehicles to avoid the requirements for stone roads. This report only considers existing tracks and new access tracks that are off the public road.

Methodology

9.2.6 The best available topographic data covering the access routes and catchment areas draining to them was used. This comprised a mix of 1m LiDAR digital terrain data (available from Scottish Remote Sensing Portal) and Ordnance Survey (OS) 5m digital terrain data. The 1m LiDAR data is more accurate and better suited for watershed analysis and catchment delineation; the LiDAR data covers approximately 30% of the route.

9.2.7 The terrain data was loaded into Global Mapper GIS software, with project infrastructure, showing access track locations. Watershed analysis was carried out in the GIS software to delineate the catchments draining to each access track. Due to the volume and complexity of data, around two weeks of continuous model runs was required to delineate the catchment data for the entire KTR route. Model runs were set up overnight for short sections of access tracks and the results checked each day.

9.2.8 The terrain data was quality checked; the OS 5m terrain data was found to closely replicate contours shown on 1:25000 OS maps. However, it was noted that the 1m LiDAR data was out by up to 8m at tower GT13. This could be a result of the filtering of terrain data in forestry areas, making it difficult to accurately define ground levels.

9.2.9 The initial results of the automated catchment delineation provided the total catchment area draining to each section of access track and provided detailed surface water flow paths. This was checked with constraints mapping collected in the field (e.g. watercourses, wetlands, marshes) and Ordnance Survey 1:10000 mapping.

Results

9.2.10 Using information on existing watercourses and drains shown on the 1:10000 maps and verified in the field, the catchment areas draining to tracks were split manually in the GIS to reflect natural catchments and drainage divides (i.e. at watercourse crossing points). Upstream of watercourse crossings, surface water run-off would tend to be channelled into a watercourse which would pass under the track via an appropriately sized culvert. In these cases, surface water run-off upstream of the track will not necessarily be a problem, as clean upstream water should be able to pass under the track without being affected by the construction works, assuming culverts and bridges are sized appropriately.

9.2.11 By delineating catchments at watercourse crossings and removing them from subsequent analysis, the catchments remaining are those draining directly to the tracks, which could result in pollution and sedimentation entering the downstream water environment. Based on the terrain, these areas were manually spilt into smaller areas based on flow paths.

9.2.12 The catchments draining to watercourses and the catchment areas draining to the access tracks are shown in **Figures 1.1-1.18** and indicate that, due to the topography of the KTR Project, the access tracks often intercept and cut across natural surface flow paths and small, ephemeral watercourses, which ideally should not be blocked or constrained.

9.2.13 The areas draining to the access tracks were numbered sequentially from 1 in the north to 312 in the south. Small areas less than 0.5ha were removed from the analysis. Slope statistics were calculated for each area using the terrain data in the GIS and the catchment area (in hectares) and average slope (in degrees) are presented on the figures and shown in the **Table 1** below.

9.2.14 Flows were estimated for each catchment area using the both the Institute of Hydrology IH 124 method and the FSR method, both of which are suitable for estimating design flows for small, rural ungauged catchments. The FSR method takes into account the slope of the catchment area. Flows were calculated using regional values of catchment characteristics, combined with the catchment area and average slope of each catchment. The 1 in 200-year flow estimated using each method is presented in **Table 1** for each catchment. The results of the two flow estimation methods are comparable, with very little difference between each method. The final design flow for each catchment was taken as the higher of the two methods, usually the Institute of Hydrology IH 124 method (**Table 1**).

9.2.15 Estimated 1 in 200-year flows from the catchments are relatively low and range from 0.02m^3/s (Area 258) to 2.18m^3/s (Area 108), with an average of 0.22 m^3/s.

Initial Drainage and SUDS Recommendations

9.2.16 Constraints data were loaded into the GIS and reviewed together with catchments and flow-paths to help identify the level of embedded SUDS required for each drainage area. The constraints data includes watercourses, watercourse crossings, PWS (sources and supply properties) and environmental designations including Site of Special Scientific Interest (SSSIs).

9.2.17 Each area draining to the tracks was coded in terms of the embedded mitigation (i.e. SUDS) required and the potential impact if the mitigation failed.

9.2.18 The type of embedded mitigation/SUDS required was classed as either 'standard' or 'complex' depending on the catchment area and slope of the area draining to the track and the downstream receptor. Embedded 'standard' mitigation for the new and existing (upgraded) access tracks is described in **Chapter 5: Felling, Construction, Operational Maintenance and Decommissioning** and **Chapter 9: Geology, Hydrology, Hydrogeology, Water Resources and Peat** of the EIA Report and would typically include:

- If the access tracks intercept natural surface flow paths, drainage measures will be incorporated which will include adequately sized culverts under the access track that do not restrict flow and which allow watercourses, intercepted field drains and ephemeral streams/surface water flow to pass. The location of culverts required will be identified by the drainage design contractor, informed by the detailed flow path analysis undertaken for this report, the locations of watercourse crossings, and from detailed site identification of field drains prior to construction. Watercourses and intercepted field drains should be allowed to pass under the track and should ideally not be captured by either the upgradient or downgradient ditches to avoid potential contamination of this 'clean' water.
- Drainage ditches, with check-dams, running parallel to the access track on the upslope side to intercept surface water run-off draining towards the track. The drainage ditch will be set a sufficient distance back from the access track, to avoid contamination of the intercepted water from construction/operation of the access track. A width of around 5-10m on the upslope side of the access tracks should be allowed for construction of drainage ditches.
- Drainage ditches will have adequate capacity to reduce the chance of water overtopping into open ground.
- Drain lengths will be limited to reduce increased discharge rates associated with artificial drains, and culverts provided at appropriate distances along the drain to allow un-impacted surface water to pass under the track. 'Clean' drainage should be kept separate from 'dirty' drainage. 'Clean' drainage and watercourse can pass under the track and pass onwards without being treated/attenuated.
- Ditches in the form of swales will be located parallel to the downslope side of the access track to capture run-off and sedimentation from the access tracks. Temporary check dams/silt fences can be installed in the informal channel to slow flows and provide further silt removal, if required. This would be for treatment of 'dirty' drainage. Discharge from the ditches/swales would be able to discharge over ground at regular intervals along the ditch. Anti-scour measures would also be incorporated. Recommendations for sizing of swales is set out below.

9.2.19 Embedded 'complex' mitigation will comprise a second level of SUDS treatment and could include silt traps and settlement ponds at the discharge location of the downstream swale. These will be constructed at key locations (i.e. upstream of watercourses and private water supplies (PWS) and at surface water discharge points) to intercept and contain sediment and to attenuate surface water runoff to greenfield rates. Settlement ponds will be provided to treat 'dirty' water before discharge to a watercourse. Design details of the SUDS measures during construction will be provided in the Pollution Prevention Plan (PPP) which will be submitted to SEPA prior to construction to obtain a Construction Site Licence (CSL) under the CAR Regulations.

9.2.20 The impact of potential failure of mitigation was classified for each area draining to the track as either:

- low impact (e.g. failure of SUDS is upstream of an area where the 'dirty' runoff would flow across an area of grassland or land and would disperse/settle naturally before entering the water environment); or
- high impact (e.g. failure of SUDS could directly impact a watercourse, PWS, SSSI or designated site).

9.2.21 Thus, each area was classified as either 1, 2 or 3 below and colour coded on the figures as outlined below:

- 1 – standard embedded mitigation with low impact if fails (green);
- 2 – standard embedded mitigation with high impact if fails (amber); and
- 3 – complex embedded mitigation with high impact if fails (red).

9.2.22 The classification above was used in combination with the flow estimates for each area to define the level of mitigation required (and the area to be set aside for embedded SUDS), as follows and shown in **Table 1**.

- **200-year flow <0.8 m^3/s and Class 1 (low impact if fails):** Swale 1 - a swale with dimensions 1m depth, 1m base channel width and side slopes of 1 in 3. This will require a swale of total width 7m. To provide access for maintenance a strip of land around 12m width should be provided on the downstream side of the track to accommodate the swale.
- **200-year flow >0.8 m^3/s and Class 1 (low impact if fails):** Swale 2 – in order to accommodate larger flows a wider swale channel will be required. Flows will be accommodated within a swale with dimensions 1m depth, 2m base channel width and side slopes of 1 in 3. This will require a swale of total width 8m. Again, to provide access for maintenance, a strip of land around 12m width should be provided on the downstream side of the track.
- **Class 2 or 3 (high impact if fails):** Swale 3 – it is recommended that the larger swale (i.e. 2m base channel width) is used for class 2 and 3 areas. This wider flow/settlement area will allow additional attenuation and settling of pollutants before release. In these areas, it is recommended that a total width of approximately 20m is set aside for SUDS to allow embedded mitigation (e.g. check dams, silt fences and settlement ponds in sequence) to be put in place.

Watercourse crossings

9.2.23 As discussed above, flows draining to watercourses should pass under the existing and new access tracks via appropriately sized crossings, sized to pass the 1 in 200-year flood flow. Once constructed and operational drainage from upstream should pass under the access tracks with no impact.

9.2.24 However, during construction, temporary construction SUDS will be put in place at each watercourse crossing to ensure no sedimentation from construction works or pollution from plant or machinery can enter the watercourse. This could be a series of settlement ponds or settlement tanks and silt fences. Watercourse crossings of existing and new access tracks are shown in **Figures 1.1-1.18**. An area of 20m width either side of the watercourse and 20m upstream and downstream of the crossing (i.e. 40m x 40m) will allow for sufficient temporary SUDS to be put in place during construction as good practice embedded mitigation. This should be sufficient for all crossings and is likely to be an over-estimate of the area required for small watercourses. It will also allow an area to be set aside for SUDS measures at the discharge location of swales into watercourses during permanent operation of the drainage system, if required.

Table 1: Summary of catchment areas draining to tracks, classification and mitigation

ID	Area (ha)	Avg. Slope (°)	Mitigation	Level of Impact if fails	Reason for impact	Class	Flow FSR Method	Flow IH124 Method	1 in 200-year flow (m^3/s)	Type of Embedded Mitigation
1	3.4	5.7	Standard	Low		1	0.110	0.135	0.135	Swale1
2	1.3	2.7	Standard	Low		1	0.041	0.053	0.053	Swale1
3	3.6	4.5	Standard	Low		1	0.114	0.146	0.146	Swale1
4	0.7	4.1	Standard	High	Watercourse	2	0.024	0.028	0.028	Swale3
5	3.1	5.3	Standard	Low		1	0.101	0.125	0.125	Swale1
6	0.6	6.7	Standard	Low		1	0.023	0.025	0.025	Swale1
7	3.2	4.4	Standard	Low		1	0.100	0.127	0.127	Swale1
8	9.5	8.4	Standard	Low		1	0.313	0.381	0.381	Swale1
9	1.3	13.4	Standard	Low		1	0.052	0.052	0.052	Swale1
10	1.0	13.8	Standard	Low		1	0.042	0.041	0.042	Swale1
11	3.8	7.4	Standard	Low		1	0.128	0.151	0.151	Swale1
12	2.0	6.7	Standard	Low		1	0.071	0.082	0.082	Swale1

ID	Area (ha)	Avg. Slope (°)	Mitigation	Level of Impact if fails	Reason for impact	Class	Flow FSR Method	Flow IH124 Method	1 in 200-year flow (m³/s)	Type of Embedded Mitigation
13	1.0	9.7	Standard	Low		1	0.038	0.039	0.039	Swale1
14	1.2	6.3	Standard	Low		1	0.044	0.049	0.049	Swale1
15	0.7	8.2	Standard	Low		1	0.026	0.027	0.027	Swale1
16	3.6	7.1	Standard	Low		1	0.123	0.146	0.146	Swale1
17	5.8	6.9	Standard	Low		1	0.190	0.232	0.232	Swale1
18	0.6	4.3	Standard	High	Watercourse	2	0.020	0.023	0.023	Swale3
19	1.0	6.2	Standard	High	Watercourse	2	0.037	0.041	0.041	Swale3
21	0.9	7.8	Standard	High	Watercourse	2	0.034	0.037	0.037	Swale3
22	1.3	6.2	Standard	High	Watercourse	2	0.045	0.051	0.051	Swale3
23	0.6	5.3	Standard	Low		1	0.020	0.022	0.022	Swale1
26	0.6	4.4	Standard	Low		1	0.022	0.026	0.026	Swale1
27	0.7	7.9	Standard	Low		1	0.026	0.027	0.027	Swale1
28	0.5	7.3	Standard	High	Watercourse	2	0.021	0.022	0.022	Swale3
29	0.7	8.5	Standard	High	Watercourse	2	0.026	0.027	0.027	Swale3
30	3.3	9.7	Standard	Low		1	0.119	0.134	0.134	Swale1
31	0.8	10.1	Standard	Low		1	0.031	0.032	0.032	Swale1
32	9.3	9.9	Standard	High	PWS	2	0.313	0.371	0.371	Swale3
33	5.2	14.0	Standard	Low		1	0.191	0.207	0.207	Swale1
34	3.2	12.8	Standard	Low		1	0.118	0.126	0.126	Swale1
35	3.5	14.0	Standard	High	PWS	2	0.132	0.140	0.140	Swale3
36	4.3	15.7	Standard	High	PWS	2	0.162	0.170	0.170	Swale3
37	1.0	11.7	Standard	Low		1	0.040	0.040	0.040	Swale1
38	0.8	14.5	Standard	Low		1	0.035	0.034	0.035	Swale1
39	6.6	13.7	Standard	Low		1	0.241	0.266	0.266	Swale1
40	0.8	10.4	Standard	Low		1	0.031	0.032	0.032	Swale1
41	8.5	10.7	Standard	Low		1	0.292	0.340	0.340	Swale1
42	2.4	12.7	Standard	High	Main Road/Loch	2	0.091	0.096	0.096	Swale3
43	1.2	16.5	Complex	High	Construction laydown area within catchment; very steep; watercourse downstream	3	0.049	0.047	0.049	Swale3
44	2.4	9.8	Standard	Low		1	0.087	0.095	0.095	Swale1
45	3.0	9.6	Standard	Low		1	0.107	0.119	0.119	Swale1
46	1.0	8.8	Standard	High	Main Road/Small watercourse	2	0.039	0.042	0.042	Swale3
47	0.5	9.1	Standard	Low		1	0.020	0.020	0.020	Swale1
49	5.3	8.1	Standard	High	Main Road/Small watercourse	2	0.178	0.211	0.211	Swale3
50	2.5	2.7	Standard	High	Watercourse	2	0.074	0.100	0.100	Swale3
51	3.4	7.9	Standard	High	Watercourse	2	0.118	0.137	0.137	Swale3
52	8.9	11.5	Standard	High	Watercourse	2	0.309	0.357	0.357	Swale3
53	1.2	7.7	Standard	Low		1	0.043	0.047	0.047	Swale1
54	2.1	8.8	Standard	Low		1	0.077	0.085	0.085	Swale1
55	5.7	6.9	Standard	High	PWS property	2	0.187	0.228	0.228	Swale3
56	0.6	7.0	Standard	Low		1	0.024	0.025	0.025	Swale1
57	0.6	4.9	Standard	Low		1	0.022	0.024	0.024	Swale1
58	4.7	8.9	Standard	Low		1	0.162	0.188	0.188	Swale1
59	1.0	9.2	Standard	Low		1	0.039	0.041	0.041	Swale1
60	1.1	8.7	Standard	Low		1	0.042	0.045	0.045	Swale1
61	0.7	13.5	Standard	High	Watercourse	2	0.029	0.028	0.029	Swale3
62	0.9	10.2	Standard	High	Watercourse	2	0.033	0.034	0.034	Swale3
63	3.5	13.9	Standard	Low		1	0.131	0.138	0.138	Swale1
64	1.6	13.2	Standard	Low		1	0.064	0.065	0.065	Swale1
65	2.7	12.7	Standard	Low		1	0.102	0.108	0.108	Swale1
66	4.6	12.6	Standard	Low		1	0.168	0.184	0.184	Swale1
67	1.7	10.7	Standard	Low		1	0.065	0.068	0.068	Swale1
68	2.6	11.3	Standard	Low		1	0.098	0.105	0.105	Swale1
69	1.4	9.5	Standard	Low		1	0.053	0.057	0.057	Swale1
70	3.0	11.5	Standard	Low		1	0.112	0.121	0.121	Swale1
71	1.1	10.9	Standard	Low		1	0.044	0.046	0.046	Swale1
72	0.8	7.1	Standard	Low		1	0.030	0.032	0.032	Swale1
73	0.8	8.3	Standard	Low		1	0.029	0.030	0.030	Swale1
75	1.7	12.1	Standard	Low		1	0.064	0.066	0.066	Swale1
76	1.9	5.7	Standard	High	Watercourse	2	0.063	0.075	0.075	Swale3
77	0.7	9.1	Standard	High	Watercourse	2	0.026	0.026	0.026	Swale3
78	4.7	19.1	Standard	Low		1	0.186	0.190	0.190	Swale1
79	2.1	18.0	Standard	Low		1	0.087	0.086	0.087	Swale1
80	1.0	15.9	Standard	Low		1	0.042	0.040	0.042	Swale1
81	1.6	14.5	Standard	Low		1	0.064	0.064	0.064	Swale1
82	0.6	15.3	Standard	High	PWS source	2	0.025	0.024	0.025	Swale3
83	4.8	16.2	Standard	Low		1	0.181	0.190	0.190	Swale1
84	3.2	13.6	Standard	Low		1	0.119	0.126	0.126	Swale1
85	1.0	17.2	Standard	Low		1	0.042	0.039	0.042	Swale1
86	0.5	14.9	Standard	Low		1	0.023	0.022	0.023	Swale1
87	8.1	16.2	Standard	Low		1	0.298	0.323	0.323	Swale1
88	*17.2*	*9.1*	*Standard*	*High*	*Watercourse*	*2*	*0.551*	*0.688*	*0.688*	*Swale3*
89	4.3	13.2	Standard	High	Watercourse	2	0.158	0.171	0.171	Swale3
90	*18.7*	*12.6*	*Standard*	*Low*		*1*	*0.628*	*0.748*	*0.748*	*Swale1*
91	*4.7*	*14.8*	*Standard*	*High*	*Watercourse*	*2*	*0.176*	*0.188*	*0.188*	*Swale3*

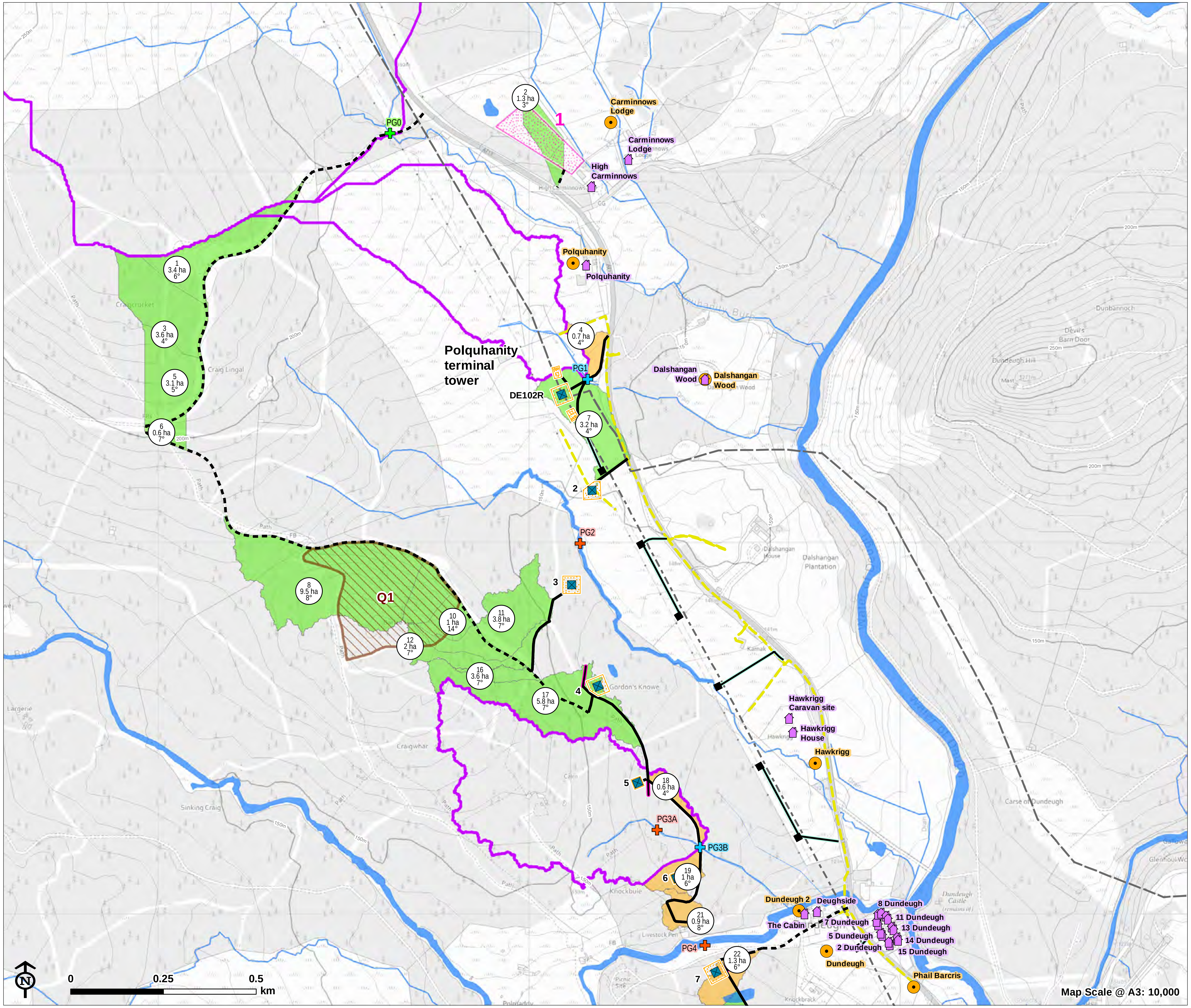
ID	Area (ha)	Avg. Slope (°)	Mitigation	Level of Impact if fails	Reason for impact	Class	Flow FSR Method	Flow IH124 Method	1 in 200-year flow (m^3/s)	Type of Embedded Mitigation
92	14.2	6.7	Standard	Low		1	0.438	0.568	0.568	Swale1
93	20.0	6.8	Standard	Low		1	0.604	0.798	0.798	Swale1
94	11.8	6.9	Standard	Low		1	0.369	0.471	0.471	Swale1
95	16.3	6.8	Standard	Low		1	0.500	0.652	0.652	Swale1
96	4.7	6.8	Standard	Low		1	0.155	0.187	0.187	Swale1
97	52.7	5.3	Standard	Low		1	1.445	2.096	2.096	Swale2
98	6.9	7.5	Standard	Low		1	0.225	0.275	0.275	Swale1
99	0.5	7.9	Standard	Low		1	0.021	0.022	0.022	Swale1
100	20.1	5.4	Complex	High	Quarry working area within catchment; catchment and track falls to watercourse	3	0.587	0.805	0.805	Swale3
101	1.3	10.4	Standard	Low		1	0.050	0.052	0.052	Swale1
102	4.2	8.7	Standard	Low		1	0.144	0.166	0.166	Swale1
103	5.7	6.7	Standard	Low		1	0.186	0.229	0.229	Swale1
104	6.2	11.0	Standard	Low		1	0.218	0.248	0.248	Swale1
105	4.2	10.6	Standard	Low		1	0.152	0.170	0.170	Swale1
106	0.6	12.7	Standard	Low		1	0.027	0.026	0.027	Swale1
107	4.4	7.9	Standard	Low		1	0.150	0.177	0.177	Swale1
108	55.3	6.0	Standard	Low		1	1.544	2.188	2.188	Swale2
109	2.9	6.7	Standard	Low		1	0.097	0.115	0.115	Swale1
110	12.8	5.6	Standard	Low		1	0.388	0.514	0.514	Swale1
111	3.2	7.6	Standard	Low		1	0.110	0.128	0.128	Swale1
112	16.2	6.2	Standard	Low		1	0.489	0.646	0.646	Swale1
113	2.5	10.1	Standard	Low		1	0.093	0.102	0.102	Swale1
114	6.3	5.6	Standard	Low		1	0.198	0.252	0.252	Swale1
115	1.6	5.5	Standard	Low		1	0.056	0.065	0.065	Swale1
116	2.9	3.8	Standard	Low		1	0.091	0.118	0.118	Swale1
117	3.0	4.9	Standard	Low		1	0.097	0.121	0.121	Swale1
118	10.0	8.4	Standard	High	Watercourse	2	0.326	0.400	0.400	Swale3
119	2.5	10.8	Standard	Low		1	0.094	0.101	0.101	Swale1
120	9.6	8.9	Standard	Low		1	0.318	0.385	0.385	Swale1
121	6.6	8.9	Standard	Low		1	0.223	0.264	0.264	Swale1
122	21.1	3.6	Standard	Low		1	0.575	0.844	0.844	Swale2
123	7.8	10.9	Standard	Low		1	0.271	0.313	0.313	Swale1
124	3.5	8.0	Standard	Low		1	0.121	0.141	0.141	Swale1
125	4.0	9.2	Standard	Low		1	0.140	0.160	0.160	Swale1
126	4.5	10.2	Standard	Low		1	0.158	0.179	0.179	Swale1
127	3.8	5.7	Standard	Low		1	0.125	0.154	0.154	Swale1
128	6.1	8.2	Standard	Low		1	0.204	0.244	0.244	Swale1
129	2.1	7.3	Standard	Low		1	0.073	0.084	0.084	Swale1
130	2.7	6.9	Standard	Low		1	0.094	0.110	0.110	Swale1
131	22.0	7.5	Standard	Low		1	0.674	0.881	0.881	Swale2
132	2.0	5.7	Standard	High	Watercourse parallel to track	2	0.067	0.079	0.079	Swale3
133	9.3	6.3	Standard	High	Watercourse parallel to track	2	0.290	0.371	0.371	Swale3
134	42.2	4.8	Standard	High	Watercourse parallel to track	2	1.156	1.690	1.690	Swale3
135	27.8	6.9	Standard	Low		1	0.826	1.112	1.112	Swale2
136	1.0	5.4	Standard	High	Watercourse parallel to track	2	0.036	0.041	0.041	Swale3
137	20.0	4.3	Standard	High	Watercourse parallel to track	2	0.564	0.801	0.801	Swale3
138	15.1	10.0	Standard	High	Watercourse parallel to track	2	0.495	0.604	0.604	Swale3
139	2.7	8.9	Standard	Low		1	0.097	0.109	0.109	Swale1
140	0.8	7.0	Standard	High	Watercourse parallel to track	2	0.030	0.032	0.032	Swale3
141	7.3	3.4	Standard	High	Watercourse parallel to track	2	0.211	0.293	0.293	Swale3
142	6.4	9.3	Standard	Low		1	0.219	0.257	0.257	Swale1
143	0.7	7.9	Standard	Low		1	0.026	0.028	0.028	Swale1
144	6.8	10.0	Standard	Low		1	0.233	0.271	0.271	Swale1
145	1.2	11.5	Standard	High	Watercourse parallel to track	2	0.045	0.046	0.046	Swale3
146	3.2	4.3	Standard	Low		1	0.102	0.129	0.129	Swale1
147	9.9	4.4	Standard	Low		1	0.291	0.395	0.395	Swale1
148	1.7	7.8	Standard	Low		1	0.063	0.070	0.070	Swale1
149	5.2	6.7	Standard	Low		1	0.170	0.208	0.208	Swale1
150	16.5	5.1	Standard	Low		1	0.482	0.660	0.660	Swale1
151	16.0	3.9	Standard	Low		1	0.450	0.640	0.640	Swale1
152	31.2	4.2	Standard	Low		1	0.850	1.249	1.249	Swale2
153	22.8	5.5	Standard	Low		1	0.662	0.912	0.912	Swale2
154	16.6	9.8	Standard	Low		1	0.538	0.662	0.662	Swale1
155	5.0	9.5	Standard	Low		1	0.175	0.201	0.201	Swale1
156	3.8	8.1	Standard	Low		1	0.131	0.152	0.152	Swale1
157	13.1	7.6	Standard	Low		1	0.414	0.523	0.523	Swale1
158	3.5	12.0	Standard	Low		1	0.129	0.139	0.139	Swale1

ID	Area (ha)	Avg. Slope (°)	Mitigation	Level of Impact if fails	Reason for impact	Class	Flow FSR Method	Flow IH124 Method	1 in 200-year flow (m^3/s)	Type of Embedded Mitigation
159	4.7	8.8	Standard	Low		1	0.161	0.187	0.187	Swale1
160	3.4	9.7	Standard	Low		1	0.120	0.135	0.135	Swale1
161	26.1	14.9	Standard	Low		1	0.886	1.045	1.045	Swale2
162	1.3	12.1	Standard	Low		1	0.050	0.051	0.051	Swale1
163	4.5	7.5	Standard	Low		1	0.151	0.180	0.180	Swale1
164	3.8	8.0	Standard	Low		1	0.130	0.152	0.152	Swale1
165	2.7	6.7	Standard	Low		1	0.091	0.106	0.106	Swale1
166	0.9	8.1	Standard	Low		1	0.032	0.034	0.034	Swale1
167	6.6	5.7	Standard	Low		1	0.206	0.263	0.263	Swale1
168	1.0	10.1	Standard	Low		1	0.038	0.039	0.039	Swale1
169	3.9	5.6	Standard	Low		1	0.126	0.156	0.156	Swale1
170	5.1	5.0	Standard	Low		1	0.158	0.202	0.202	Swale1
171	2.9	4.8	Standard	Low		1	0.092	0.115	0.115	Swale1
172	4.9	4.2	Standard	Low		1	0.149	0.195	0.195	Swale1
173	1.2	3.7	Standard	Low		1	0.038	0.047	0.047	Swale1
174	2.6	2.7	Standard	Low		1	0.077	0.104	0.104	Swale1
175	1.3	1.8	Standard	Low		1	0.036	0.050	0.050	Swale1
176	1.0	3.8	Standard	Low		1	0.032	0.039	0.039	Swale1
178	4.1	3.1	Standard	Low		1	0.121	0.165	0.165	Swale1
179	5.7	8.1	Standard	Low		1	0.190	0.227	0.227	Swale1
180	1.8	11.4	Standard	Low		1	0.070	0.073	0.073	Swale1
181	0.8	10.2	Standard	Low		1	0.032	0.033	0.033	Swale1
182	5.2	5.6	Standard	Low		1	0.164	0.206	0.206	Swale1
183	7.2	7.1	Standard	Low		1	0.234	0.288	0.288	Swale1
184	1.0	3.4	Standard	Low		1	0.033	0.041	0.041	Swale1
185	4.0	2.5	Standard	Low		1	0.114	0.160	0.160	Swale1
186	6.4	3.4	Standard	Low		1	0.186	0.257	0.257	Swale1
187	2.8	4.3	Standard	Low		1	0.088	0.111	0.111	Swale1
188	3.0	6.0	Standard	Low		1	0.101	0.122	0.122	Swale1
189	0.6	5.0	Standard	Low		1	0.023	0.026	0.026	Swale1
190	1.2	5.4	Standard	Low		1	0.041	0.048	0.048	Swale1
191	1.8	5.3	Standard	Low		1	0.062	0.073	0.073	Swale1
192	3.7	6.5	Standard	Low		1	0.123	0.148	0.148	Swale1
193	7.3	3.8	Standard	Low		1	0.214	0.292	0.292	Swale1
194	3.7	8.7	Standard	High	Watercourse	2	0.129	0.147	0.147	Swale3
195	15.6	10.7	Standard	Low		1	0.516	0.623	0.623	Swale1
196	11.4	9.2	Standard	Low		1	0.376	0.457	0.457	Swale1
197	3.9	8.9	Standard	High	Watercourse	2	0.135	0.155	0.155	Swale3
198	0.8	7.3	Standard	Low		1	0.029	0.031	0.031	Swale1
199	11.7	7.6	Standard	Low		1	0.374	0.470	0.470	Swale1
200	5.3	6.3	Standard	Low		1	0.173	0.214	0.214	Swale1

ID	Area (ha)	Avg. Slope (°)	Mitigation	Level of Impact if fails	Reason for impact	Class	Flow FSR Method	Flow IH124 Method	1 in 200-year flow (m^3/s)	Type of Embedded Mitigation
201	4.6	9.3	Standard	Low		1	0.162	0.186	0.186	Swale1
202	4.2	11.4	Standard	Low		1	0.150	0.166	0.166	Swale1
203	3.7	12.1	Standard	Low		1	0.136	0.148	0.148	Swale1
204	5.0	7.5	Standard	Low	Need to check PWS source location	1	0.168	0.201	0.201	Swale1
205	2.9	9.3	Standard	Low		1	0.103	0.116	0.116	Swale1
206	2.9	7.1	Standard	Low		1	0.099	0.115	0.115	Swale1
207	0.5	6.0	Standard	Low		1	0.019	0.021	0.021	Swale1
208	9.1	6.3	Standard	Low		1	0.284	0.362	0.362	Swale1
209	5.5	5.8	Standard	Low		1	0.176	0.220	0.220	Swale1
210	9.4	6.5	Standard	Low		1	0.297	0.377	0.377	Swale1
211	7.3	7.4	Standard	Low		1	0.237	0.291	0.291	Swale1
212	1.8	5.9	Standard	Low		1	0.063	0.074	0.074	Swale1
213	22.8	7.3	Standard	High	PWS source	2	0.693	0.913	0.913	Swale3
214	2.2	4.7	Standard	High	PWS source	2	0.072	0.088	0.088	Swale3
215	0.7	5.3	Standard	Low		1	0.023	0.026	0.026	Swale1
216	10.2	7.1	Standard	Low		1	0.325	0.409	0.409	Swale1
217	5.5	5.1	Standard	Low		1	0.172	0.221	0.221	Swale1
218	9.2	5.0	Standard	Low		1	0.277	0.367	0.367	Swale1
219	2.9	7.1	Standard	Low		1	0.100	0.117	0.117	Swale1
220	7.5	6.7	Standard	Low		1	0.240	0.300	0.300	Swale1
221	9.7	6.4	Standard	Low		1	0.303	0.386	0.386	Swale1
222	8.3	4.6	Standard	Low		1	0.248	0.331	0.331	Swale1
223	8.5	8.9	Standard	Low		1	0.284	0.341	0.341	Swale1
224	1.1	6.4	Standard	Low		1	0.039	0.044	0.044	Swale1
225	8.0	7.7	Standard	Low		1	0.261	0.320	0.320	Swale1
226	9.8	4.7	Standard	High	Watercourse parallel to track	2	0.291	0.391	0.391	Swale3
227	0.7	2.5	Standard	Low		1	0.021	0.027	0.027	Swale1
228	3.3	4.6	Standard	Low		1	0.106	0.134	0.134	Swale1
229	2.6	5.2	Standard	Low		1	0.086	0.105	0.105	Swale1
230	1.3	4.7	Standard	Low		1	0.045	0.053	0.053	Swale1
231	2.4	6.8	Standard	Low		1	0.084	0.098	0.098	Swale1
232	1.7	6.9	Standard	Low		1	0.060	0.069	0.069	Swale1
233	3.7	4.3	Complex	High	Upstream of open PWS source	3	0.116	0.150	0.150	Swale3
234	1.2	2.1	Standard	Low		1	0.036	0.049	0.049	Swale1
235	21.4	6.0	Standard	Low		1	0.634	0.857	0.857	Swale2
236	1.8	9.9	Standard	Low		1	0.067	0.073	0.073	Swale1
237	2.2	7.7	Standard	Low		1	0.077	0.087	0.087	Swale1

ID	Area (ha)	Avg. Slope (°)	Mitigation	Level of Impact if fails	Reason for impact	Class	Flow FSR Method	Flow IH124 Method	1 in 200-year flow (m^3/s)	Type of Embedded Mitigation
238	11.6	14.7	Standard	Low		1	0.413	0.466	0.466	Swale1
239	1.9	14.2	Standard	Low		1	0.073	0.074	0.074	Swale1
240	1.9	2.8	Standard	Low		1	0.058	0.076	0.076	Swale1
241	3.9	2.7	Standard	Low		1	0.111	0.155	0.155	Swale1
242	3.6	1.9	Standard	High	Watercourse	2	0.098	0.144	0.144	Swale3
243	2.4	13.1	Standard	Low		1	0.090	0.094	0.094	Swale1
244	3.4	12.1	Standard	Low		1	0.125	0.135	0.135	Swale1
245	1.5	5.8	Standard	Low		1	0.053	0.062	0.062	Swale1
246	7.0	3.7	Standard	Low		1	0.205	0.280	0.280	Swale1
247	4.9	7.0	Standard	Low		1	0.163	0.197	0.197	Swale1
248	17.4	7.9	Standard	Low		1	0.544	0.694	0.694	Swale1
249	3.1	8.5	Standard	Low		1	0.109	0.124	0.124	Swale1
250	4.3	8.0	Standard	Low		1	0.147	0.173	0.173	Swale1
251	16.6	4.9	Standard	High	Watercourse and PWS	2	0.481	0.662	0.662	Swale3
252	1.8	7.4	Standard	Low		1	0.064	0.072	0.072	Swale1
253	3.0	3.6	Standard	Low		1	0.093	0.122	0.122	Swale1
255	4.7	3.7	Standard	Low		1	0.141	0.188	0.188	Swale1
256	7.2	8.6	Standard	Low		1	0.240	0.287	0.287	Swale1
257	14.5	9.7	Standard	Low		1	0.473	0.579	0.579	Swale1
258	0.5	2.1	Standard	Low		1	0.017	0.021	0.021	Swale1
259	0.6	2.9	Standard	Low		1	0.019	0.024	0.024	Swale1
260	2.6	3.3	Standard	Low		1	0.079	0.103	0.103	Swale1
261	3.8	1.5	Standard	Low		1	0.099	0.151	0.151	Swale1
262	2.3	4.2	Standard	Low		1	0.072	0.090	0.090	Swale1
263	2.2	4.0	Standard	Low		1	0.069	0.086	0.086	Swale1
264	17.2	5.0	Standard	Low		1	0.500	0.688	0.688	Swale1
265	1.1	4.4	Standard	Low		1	0.036	0.043	0.043	Swale1
266	6.8	2.5	Standard	Low		1	0.188	0.273	0.273	Swale1
267	3.9	2.4	Standard	Low		1	0.109	0.155	0.155	Swale1
268	1.5	3.2	Standard	Low		1	0.047	0.060	0.060	Swale1
269	5.1	5.0	Standard	Low		1	0.158	0.202	0.202	Swale1
270	1.4	7.1	Standard	Low		1	0.050	0.056	0.056	Swale1
271	3.8	5.2	Standard	Low		1	0.122	0.152	0.152	Swale1
272	3.2	4.1	Standard	Low		1	0.100	0.128	0.128	Swale1
273	1.8	4.3	Standard	Low		1	0.058	0.072	0.072	Swale1
274	3.4	4.2	Standard	Low		1	0.106	0.137	0.137	Swale1
275	14.0	6.8	Standard	High	Watercourse	2	0.433	0.560	0.560	Swale3
277	6.3	4.9	Standard	Low		1	0.194	0.252	0.252	Swale1
278	1.8	5.3	Standard	Low		1	0.062	0.074	0.074	Swale1
281	0.6	7.3	Standard	Low		1	0.023	0.024	0.024	Swale1
283	0.8	10.4	Standard	Low		1	0.031	0.032	0.032	Swale1
285	4.8	6.1	Standard	Low		1	0.156	0.192	0.192	Swale1
286	8.8	5.6	Standard	Low		1	0.271	0.352	0.352	Swale1
287	6.9	4.2	Standard	Low		1	0.206	0.276	0.276	Swale1
289	1.5	3.7	Standard	Low		1	0.049	0.061	0.061	Swale1
291	1.3	3.6	Standard	Low		1	0.041	0.051	0.051	Swale1
292	2.9	8.3	Standard	Low		1	0.103	0.117	0.117	Swale1
293	3.5	6.0	Standard	High	Watercourse adjacent to track	2	0.115	0.139	0.139	Swale3
294	1.4	10.8	Standard	High	Watercourse	2	0.053	0.055	0.055	Swale3
295	2.1	4.0	Standard	High	Watercourse	2	0.068	0.085	0.085	Swale3
296	7.5	4.8	Standard	Low		1	0.229	0.302	0.302	Swale1
297	13.5	4.5	Standard	Low		1	0.392	0.542	0.542	Swale1
298	0.9	4.0	Standard	Low		1	0.029	0.035	0.035	Swale1
299	3.7	6.4	Standard	Low		1	0.122	0.147	0.147	Swale1
300	2.3	8.5	Standard	Low		1	0.082	0.092	0.092	Swale1
301	3.2	3.9	Standard	Low		1	0.099	0.128	0.128	Swale1
302	11.0	5.2	Standard	Low		1	0.332	0.442	0.442	Swale1
303	2.0	4.9	Standard	Low		1	0.065	0.079	0.079	Swale1
304	0.7	9.8	Standard	Low		1	0.027	0.027	0.027	Swale1
305	9.7	7.6	Standard	Low		1	0.313	0.389	0.389	Swale1
306	1.1	9.6	Standard	Low		1	0.043	0.045	0.045	Swale1
307	4.3	9.2	Standard	Low		1	0.151	0.174	0.174	Swale1
308	1.0	11.3	Standard	Low		1	0.040	0.041	0.041	Swale1
309	1.4	10.2	Standard	Low		1	0.052	0.055	0.055	Swale1
310	0.9	8.8	Standard	Low		1	0.036	0.038	0.038	Swale1
311	3.3	7.1	Standard	Low		1	0.112	0.131	0.131	Swale1
312	0.5	8.7	Standard	Low		1	0.020	0.020	0.020	Swale1

Note: Areas shown in *red italics* drain to a public road; however, they are included in the table as they are relatively large catchments draining to the road. Existing drainage provision on the public road should be checked to ensure no further mitigation is required.



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Appendix 9.2

Figure 1.1: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

- Polquhanity to Glenlee via Kendoon (steel lattice tower)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Existing network
- Proposed 11kV UGC

Access to proposed towers

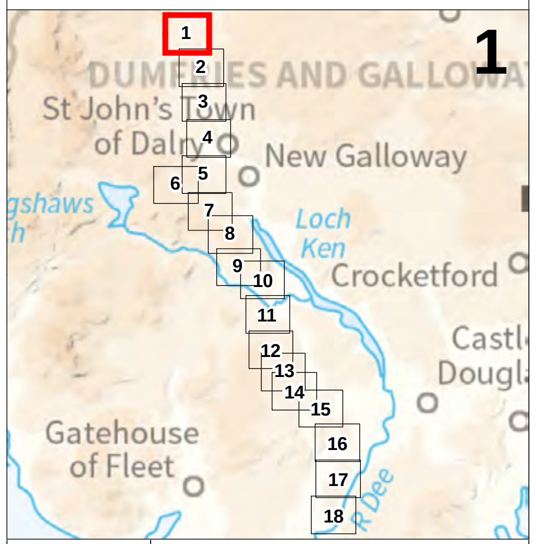
- Existing access
- New access
- Timber extraction spur

Access to towers for removal

- New access
- Working area
- Construction compound
- Potential quarry working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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SP ENERGY NETWORKS

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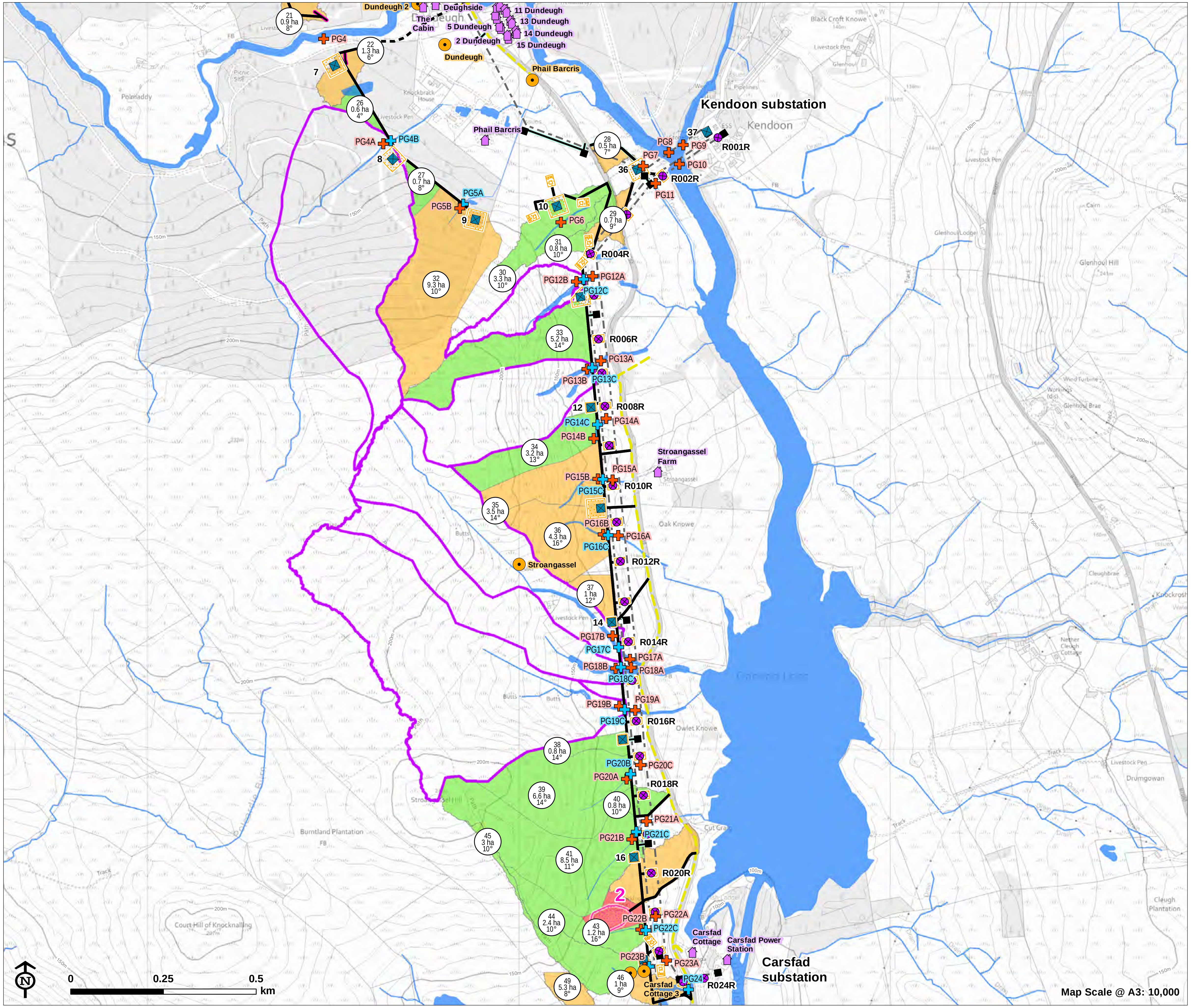

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Appendix 9.2

Figure 1.2: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

- Polquhanity to Glenlee via Kendoon (steel lattice tower)
- Carsfad to Kendoon (wood pole)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Proposed 11kV UGC

Access to proposed towers

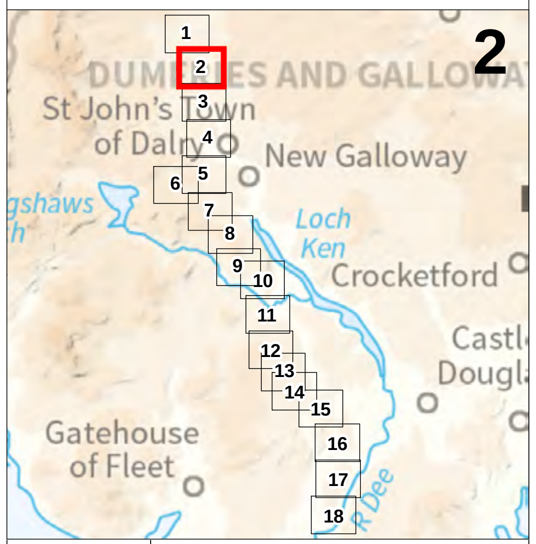
- Existing access
- New access
- Timber extraction spur

Access to towers for removal

- New access
- Working area
- Construction compound
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)
- 3 – complex embedded mitigation with high impact if fails (red)



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SP ENERGY NETWORKS

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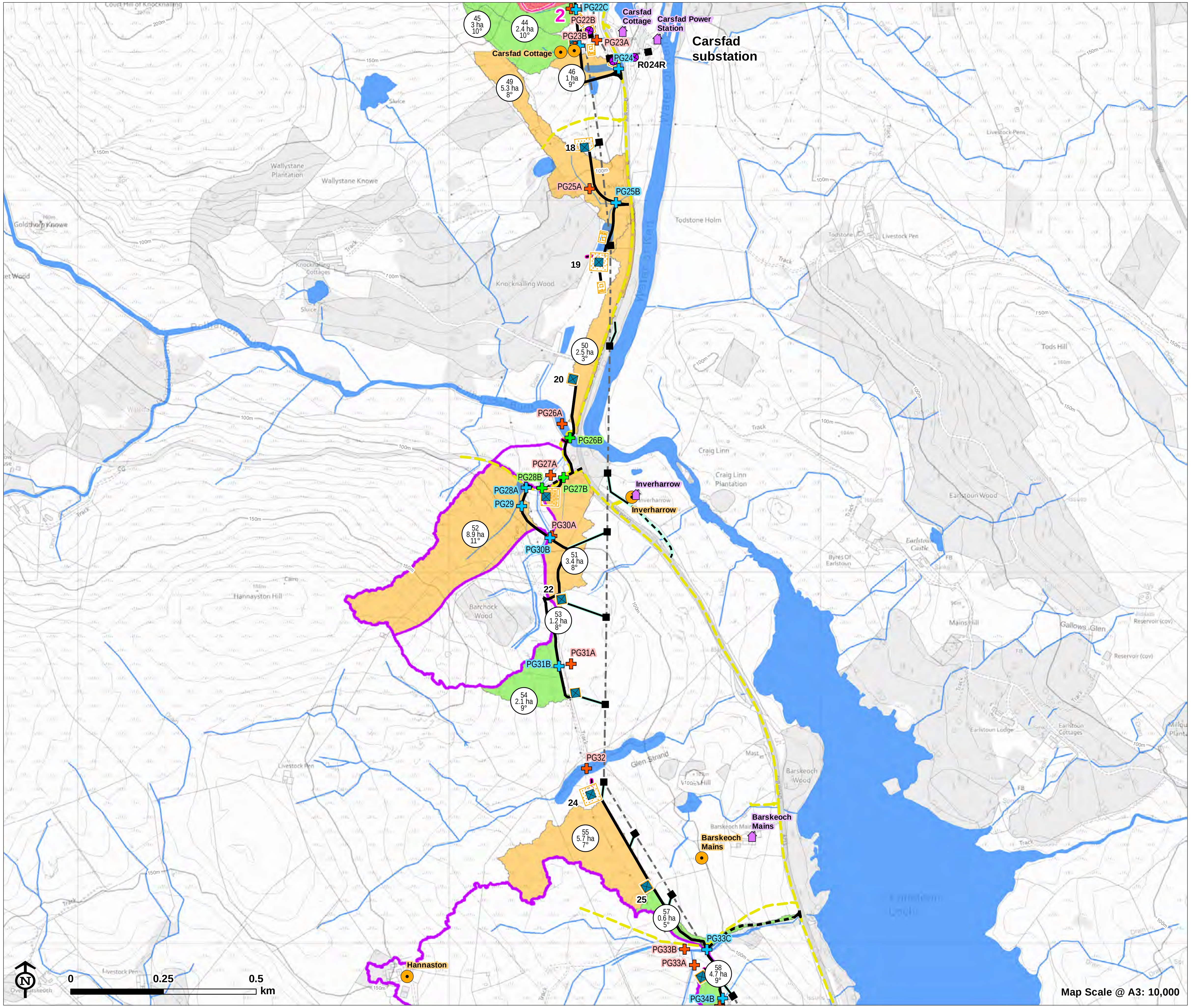
Appendix 9.2

Figure 1.3: Catchment areas draining to access tracks and classification of embedded SUDS mitigation



Overhead line infrastructure

- Polquhanity to Glenlee via Kendoon (steel lattice tower)
- Carsfad to Kendoon (wood pole)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Proposed 11kV UGC

Access to proposed towers

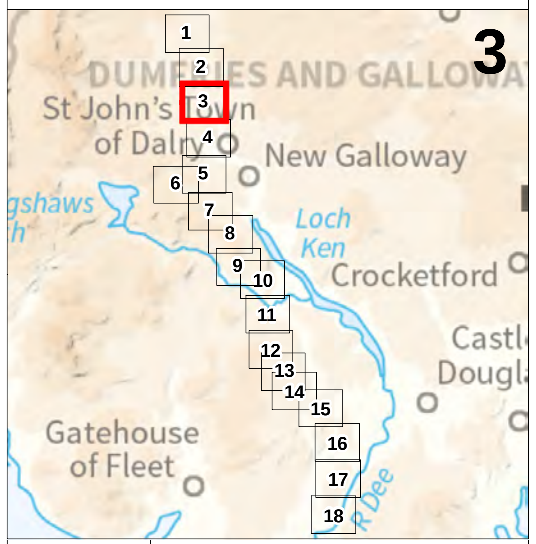
- Existing access
- New access
- Timber extraction spur

Access to towers for removal

- Existing access
- New access
- Working area
- Construction compound
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)
- 3 – complex embedded mitigation with high impact if fails (red)



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SP ENERGY NETWORKS

CB:JN EB:nunn_j LUCGLA A9-2_FIG01_6120-010-r0_KTR_Hydrology_Catchment_Delineation_10000 31/07/2020

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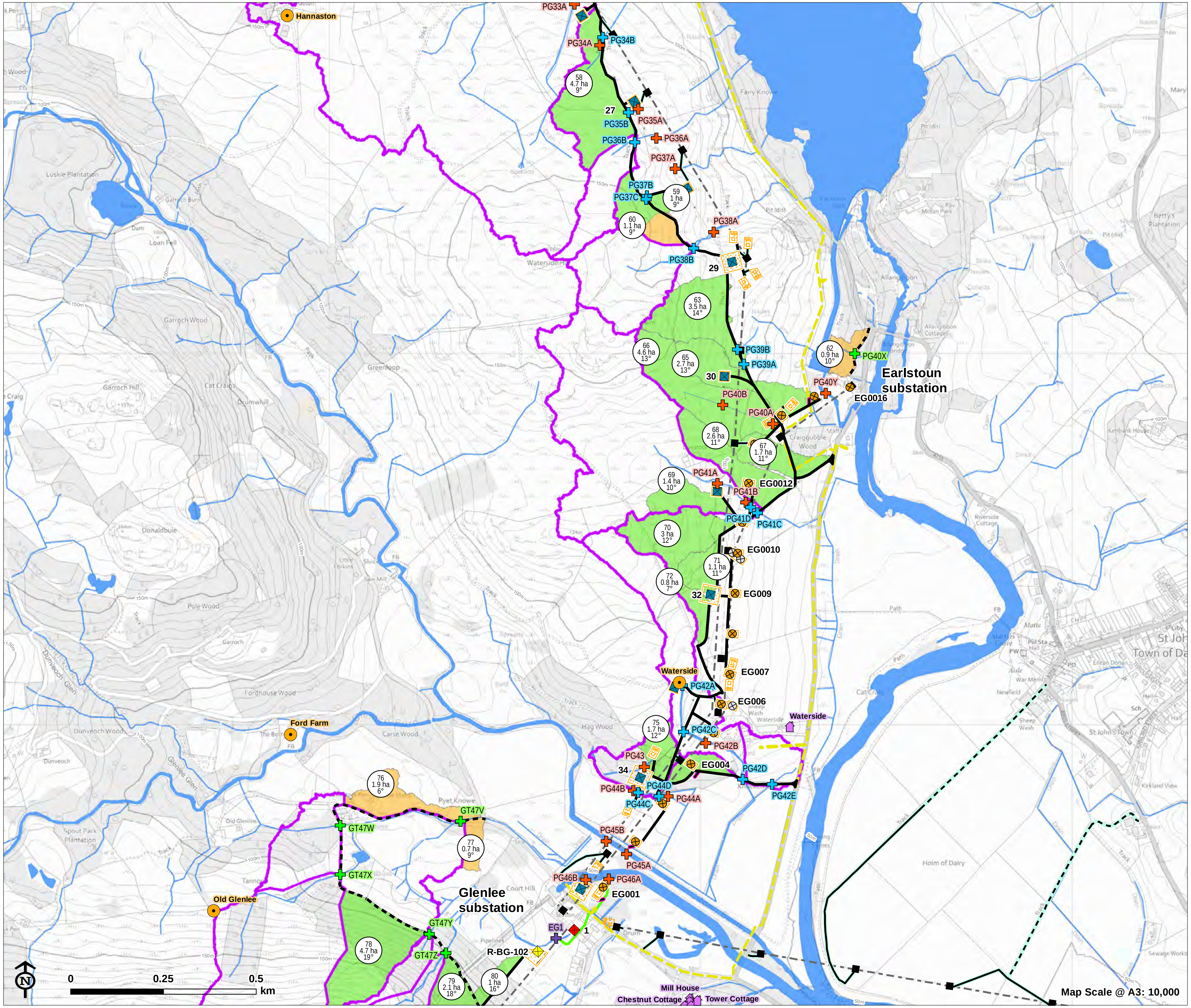
Appendix 9.2

Figure 1.4: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

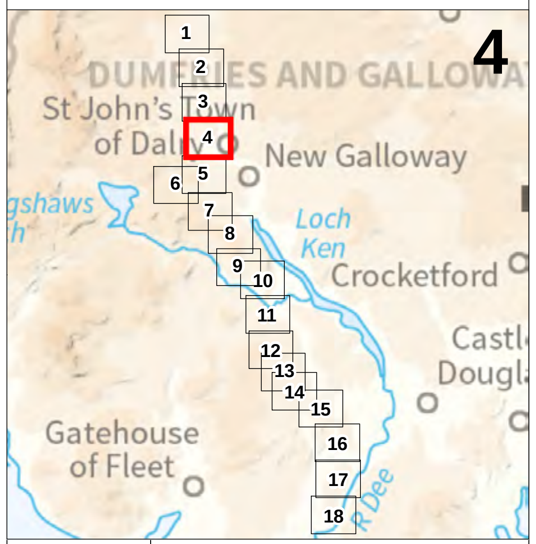


Overhead line infrastructure
- Polquhanity to Glenlee via Kendoon (steel lattice tower)
- Earlstoun to Glenlee (wood pole)
- Earlstoun to Glenlee (temporary wood pole)
- Glenlee to Tongland (steel lattice tower)
- BG route deviation (steel lattice tower)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Underground cable
- Proposed 11kV UGC

Access to proposed towers
- Existing access
- New access
- Timber extraction spur

Access to towers for removal
- Existing access
- New access
- Working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - underground cable
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks
- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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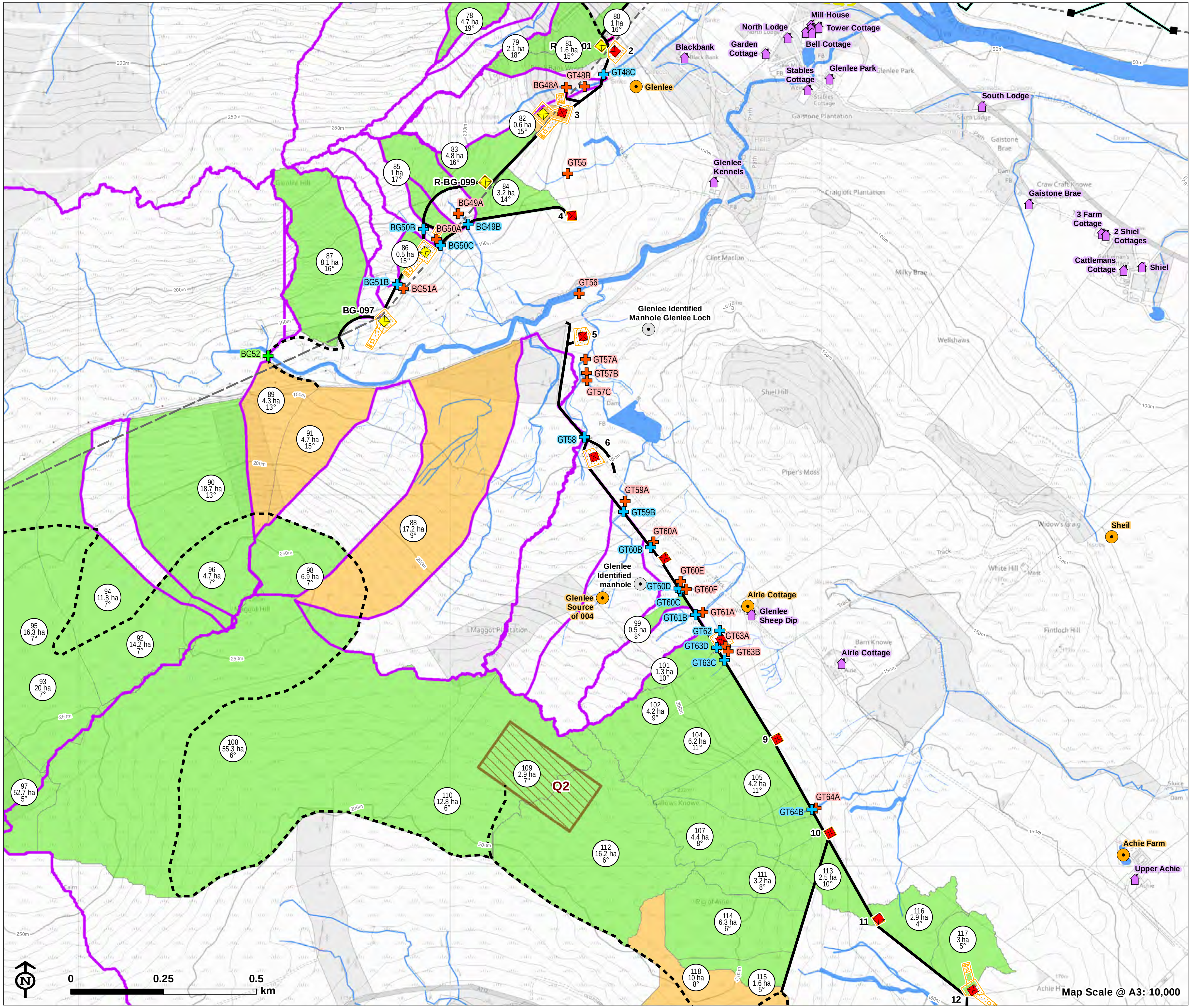

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Appendix 9.2

Figure 1.5: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

- Glenlee to Tongland (steel lattice tower)
- BG route deviation (steel lattice tower)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Existing network
- Proposed 11kV UGC

Access to proposed towers

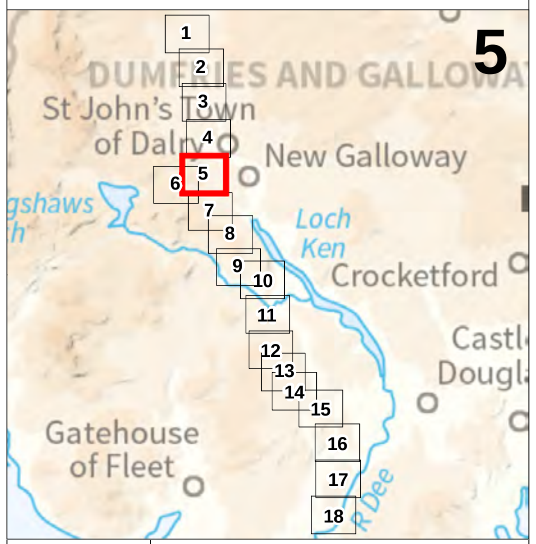
- Existing access
- New access
- Timber extraction spur

Access to towers for removal

- Existing access
- New access
- Working area
- Potential quarry working area
- PWS supplied property
- PWS source location
- PWS manhole or unknown
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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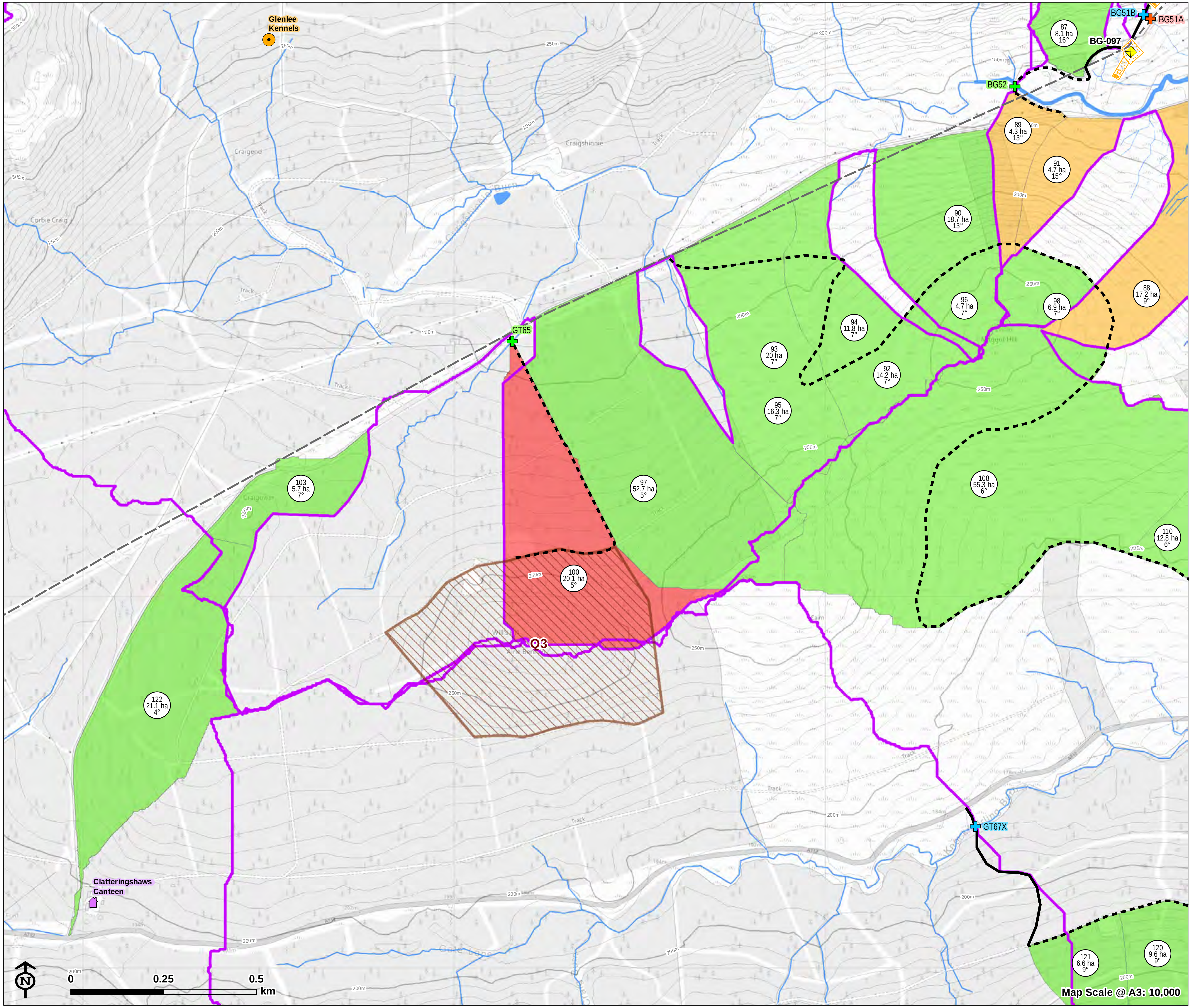

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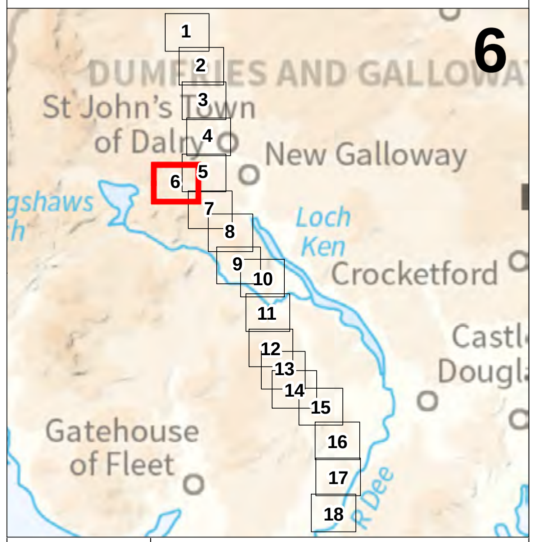
Appendix 9.2

Figure 1.6: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure
- BG route deviation (steel lattice tower)
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Existing network

Access to proposed towers
- Existing access
- New access
- Working area
- Potential quarry working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks
- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)
- 3 – complex embedded mitigation with high impact if fails (red)



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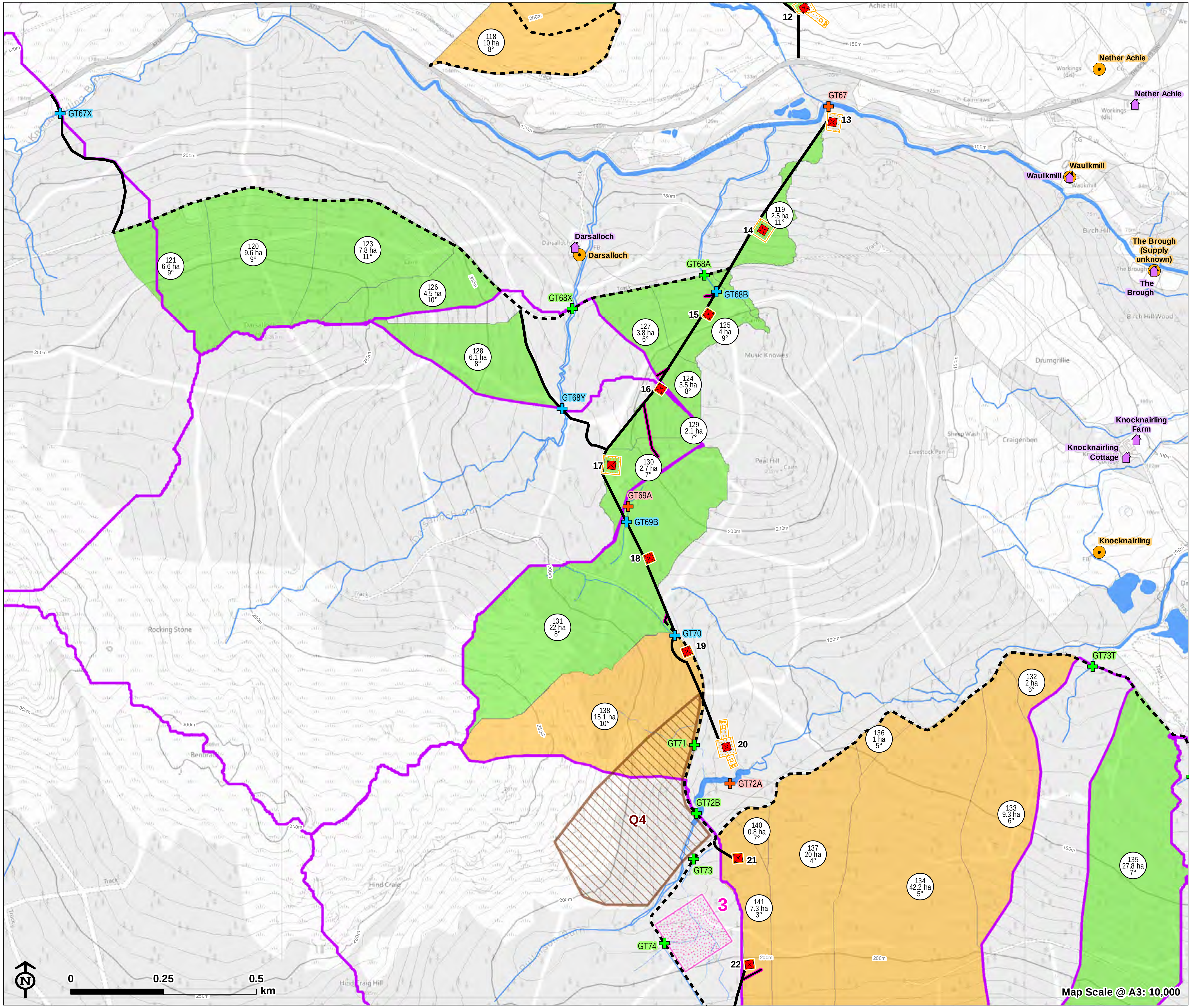

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Appendix 9.2

Figure 1.7: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

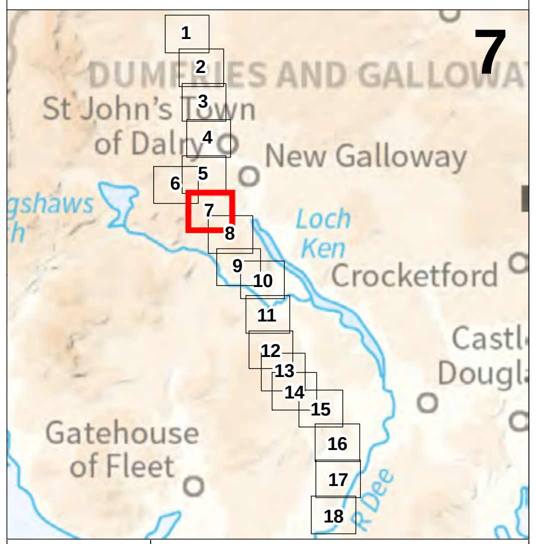
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers

- Existing access
- New access
- Timber extraction spur
- Working area
- Construction compound
- Potential quarry working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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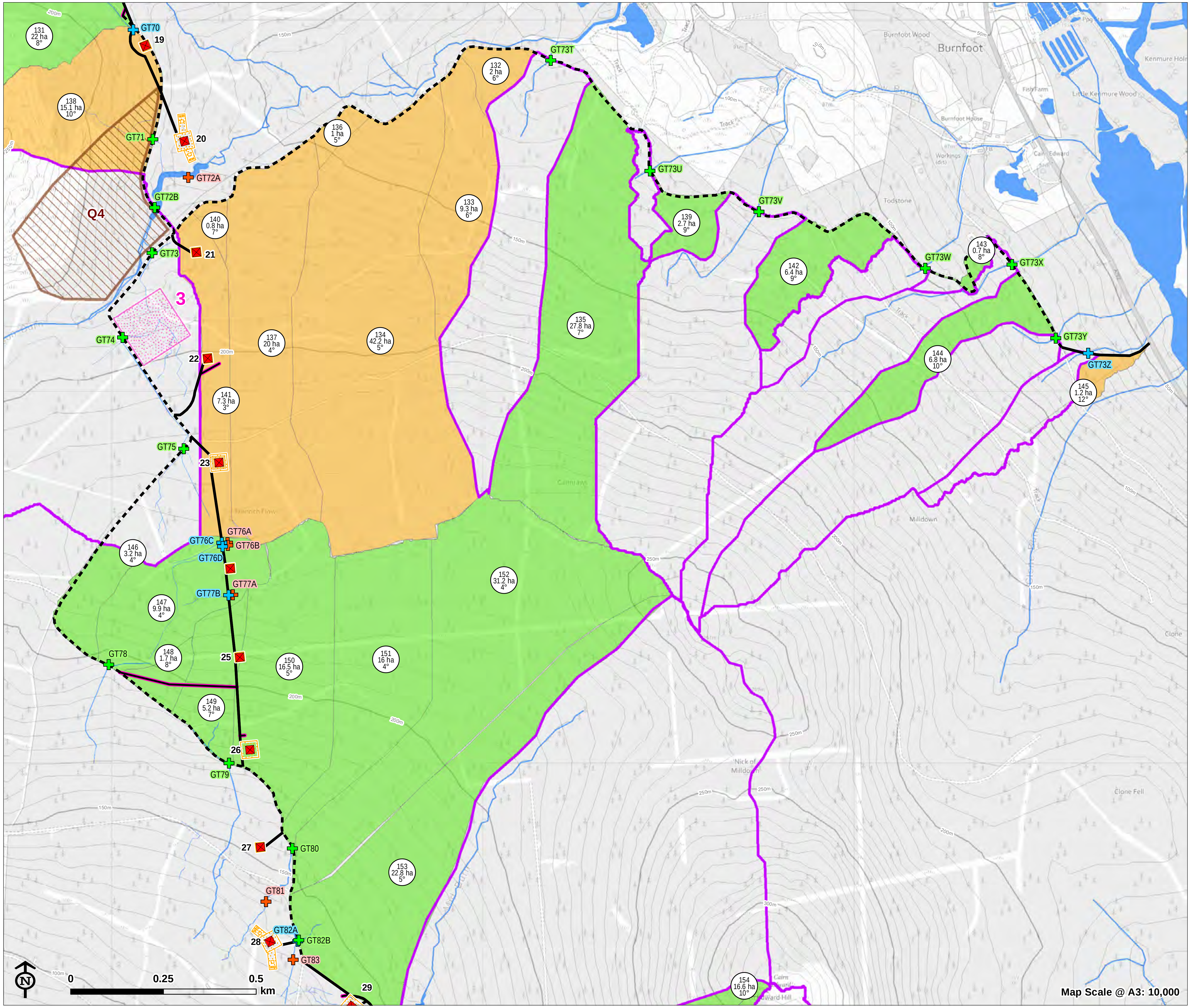

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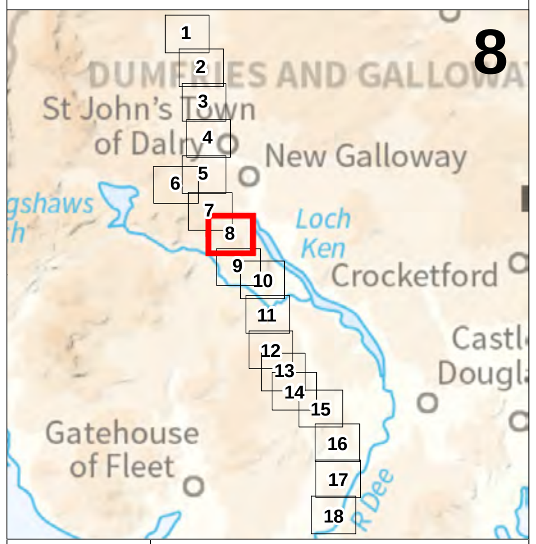
Appendix 9.2

Figure 1.8: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers
- Existing access
- New access
- Timber extraction spur
- Working area
- Construction compound
- Potential quarry working area
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks
- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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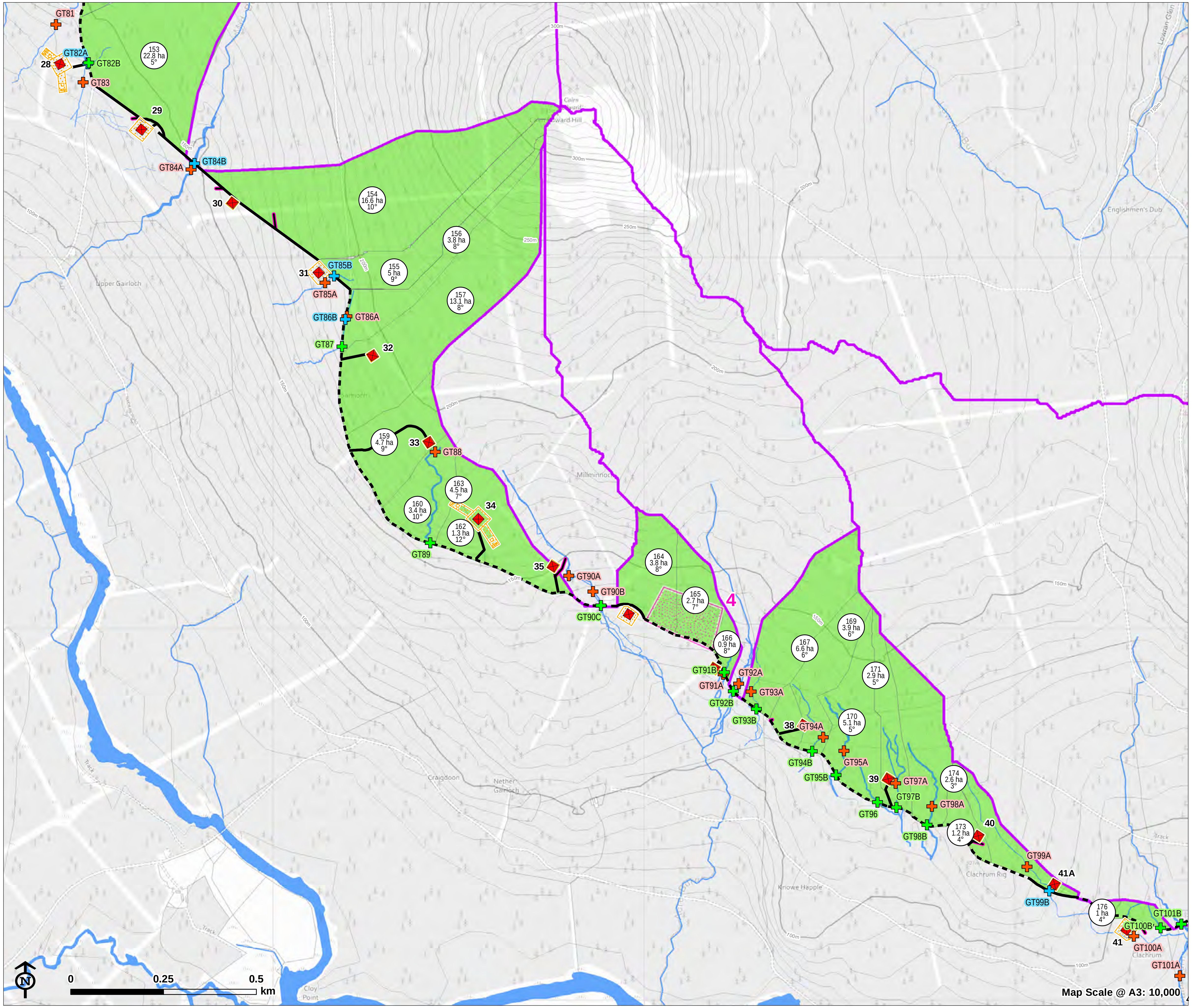

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Appendix 9.2

Figure 1.9: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

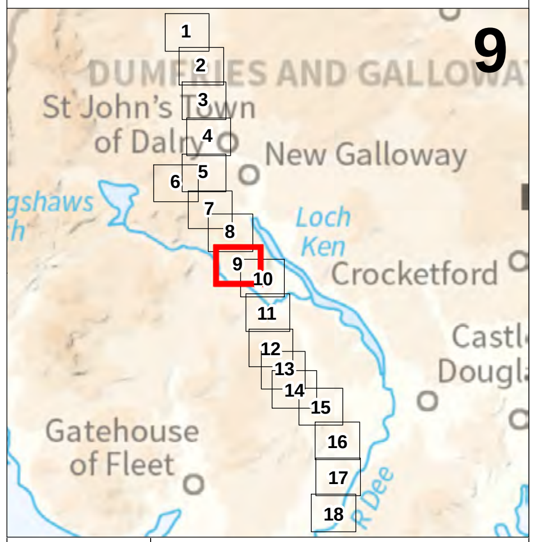
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers

- Existing access
- New access
- Timber extraction spur
- Working area
- Construction compound
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)



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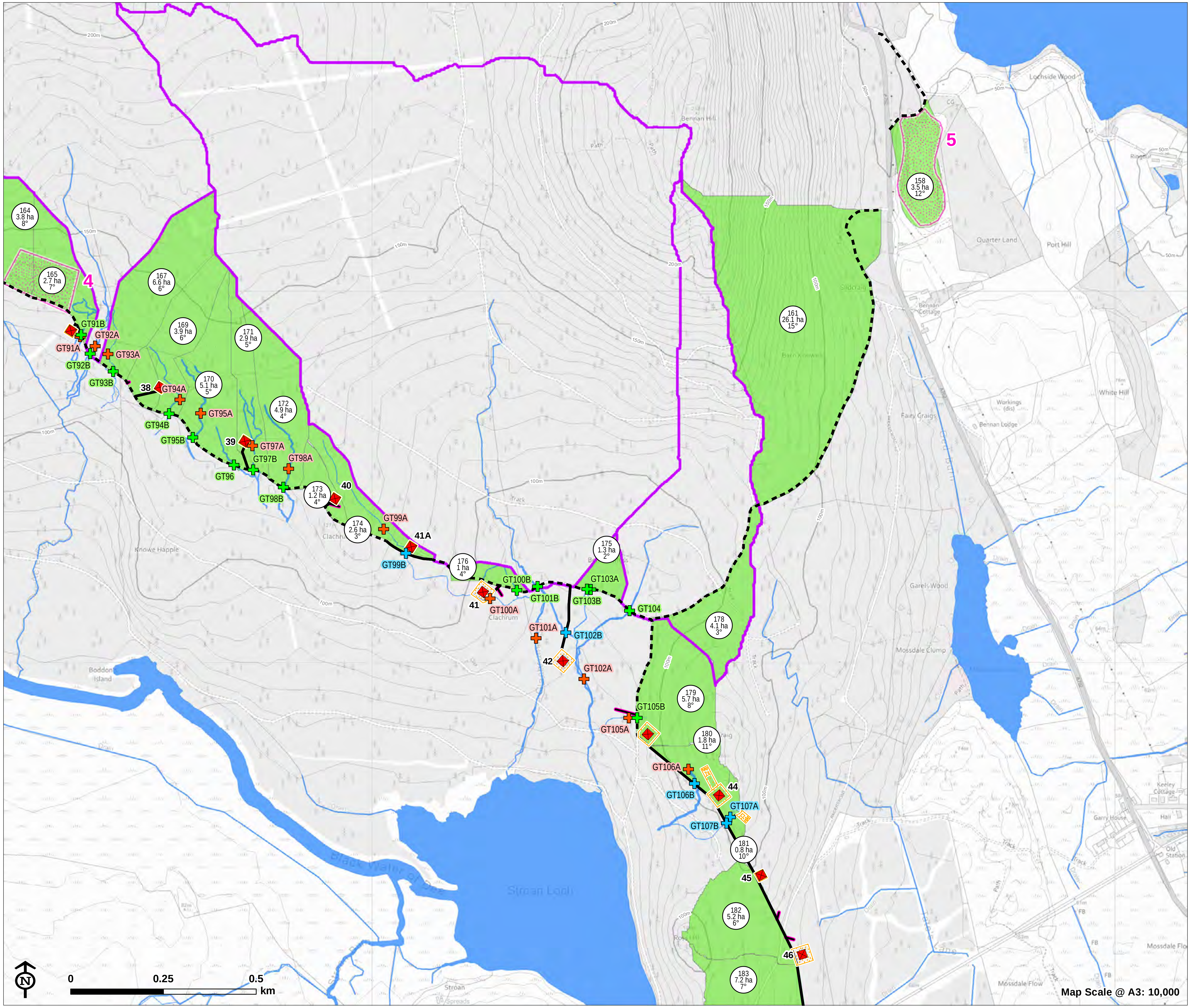

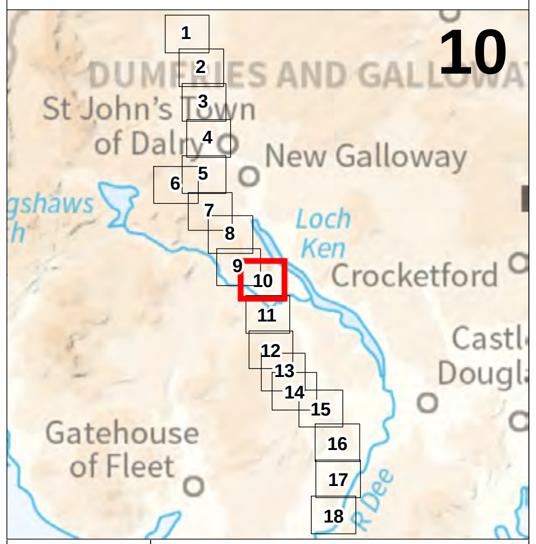

Map Scale @ A3: 10,000

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Appendix 9.2

Figure 1.10: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers
- Existing access
- New access
- Timber extraction spur
- Working area
- Construction compound
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks
- 1 – standard embedded mitigation with low impact if fails (green)

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Figure 1.11: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

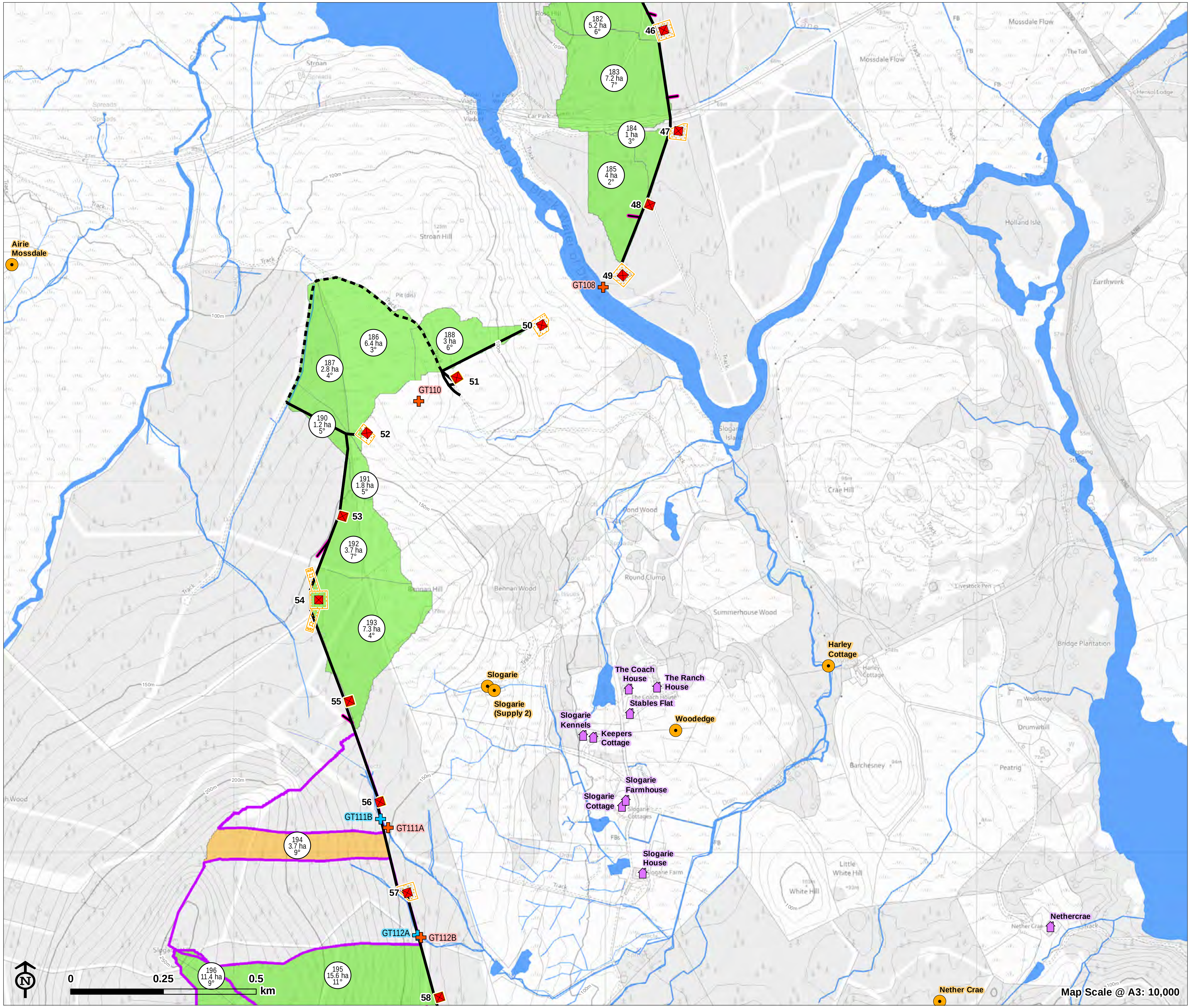
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers

- Existing access
- New access
- Timber extraction spur
- Working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



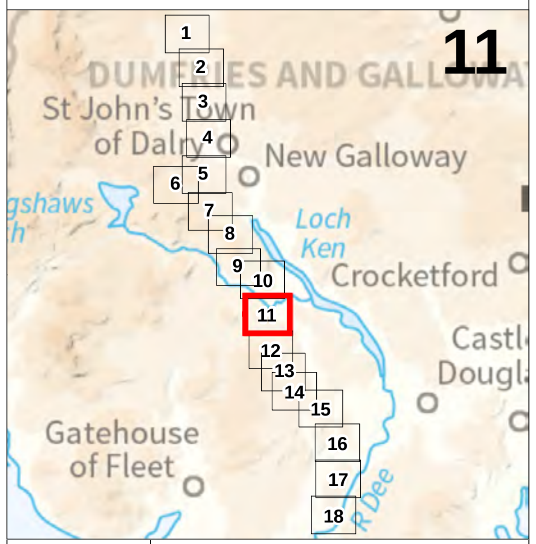


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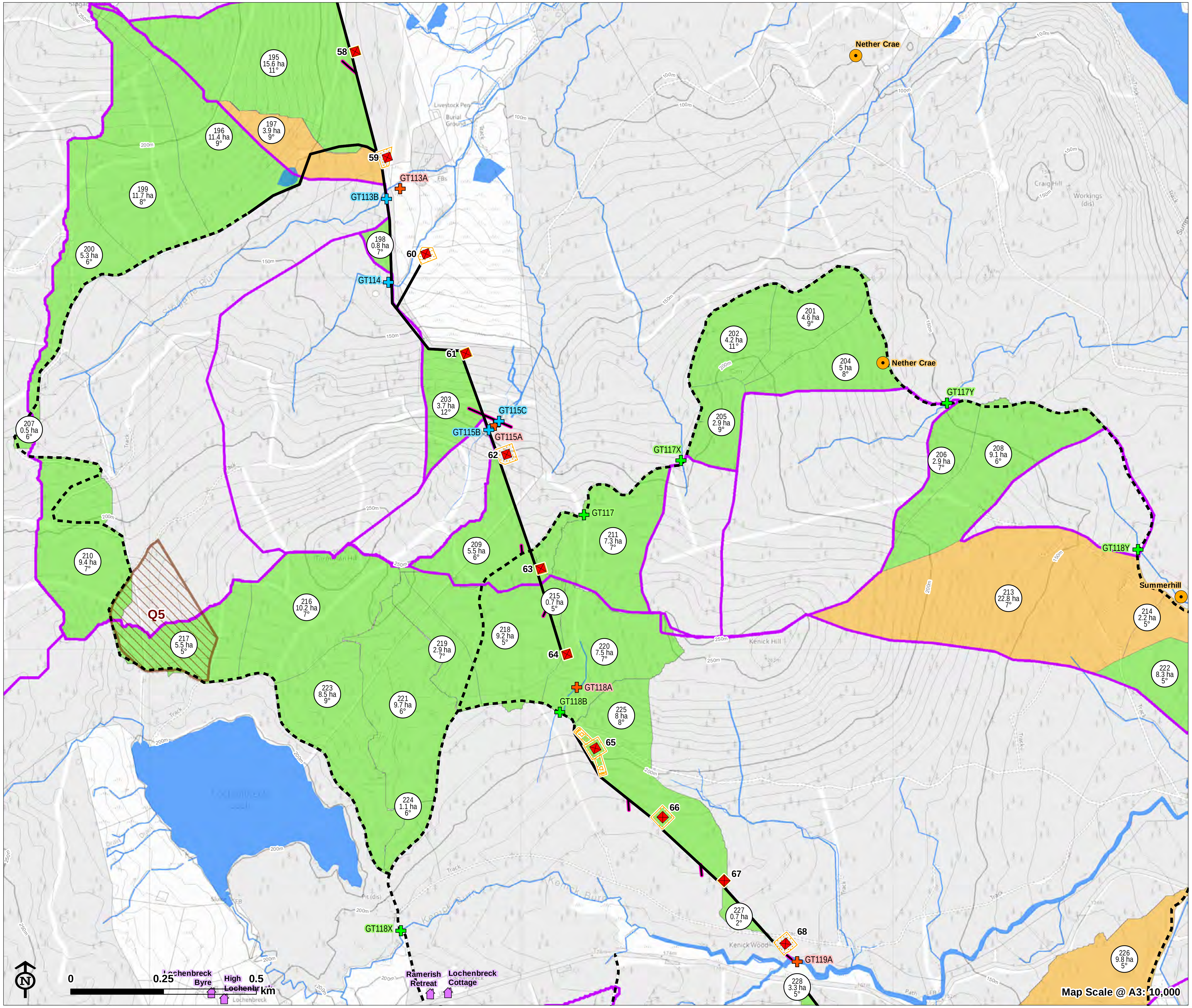
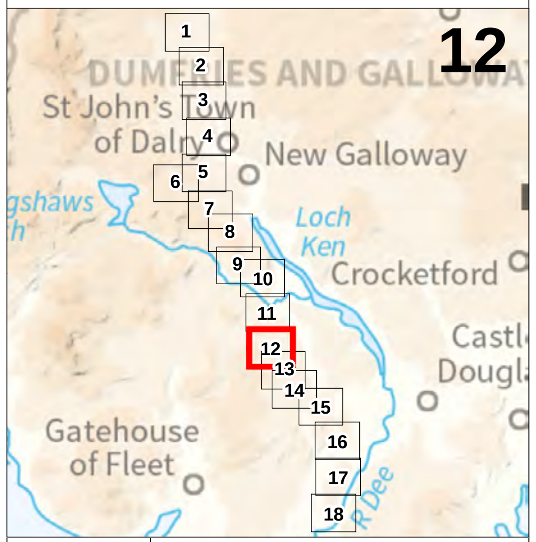
Figure 1.12: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers
- Existing access
- New access
- Timber extraction spur
- Working area
- Potential quarry working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks
- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)





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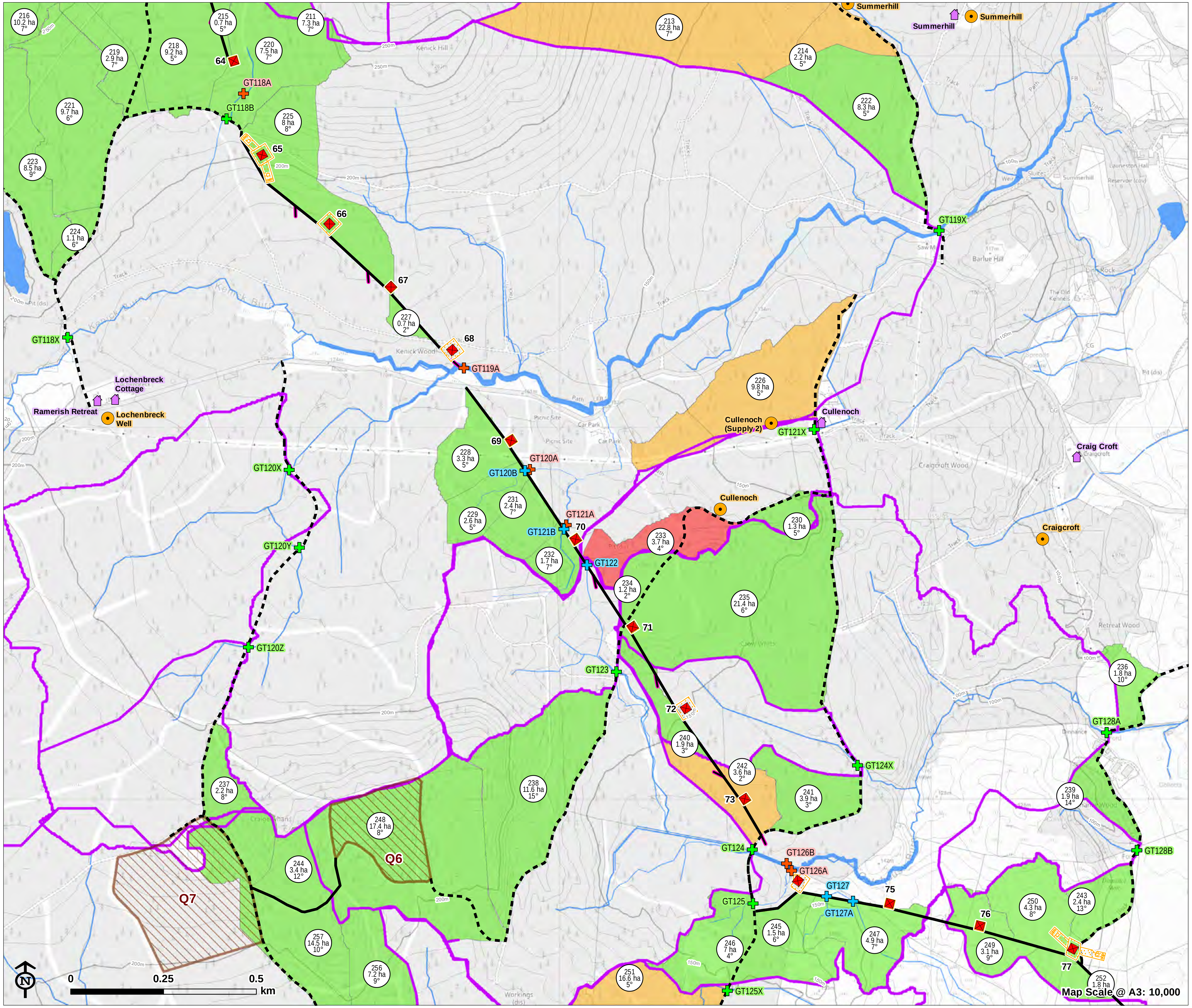

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Appendix 9.2

Figure 1.13: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

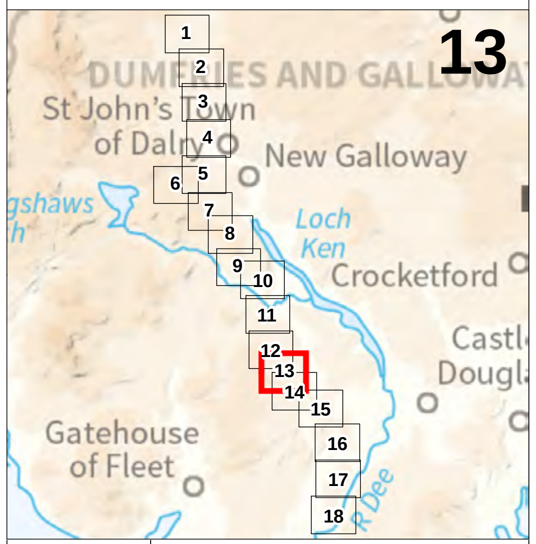
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers

- Existing access
- New access
- Timber extraction spur
- Working area
- Potential quarry working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)
- 3 – complex embedded mitigation with high impact if fails (red)



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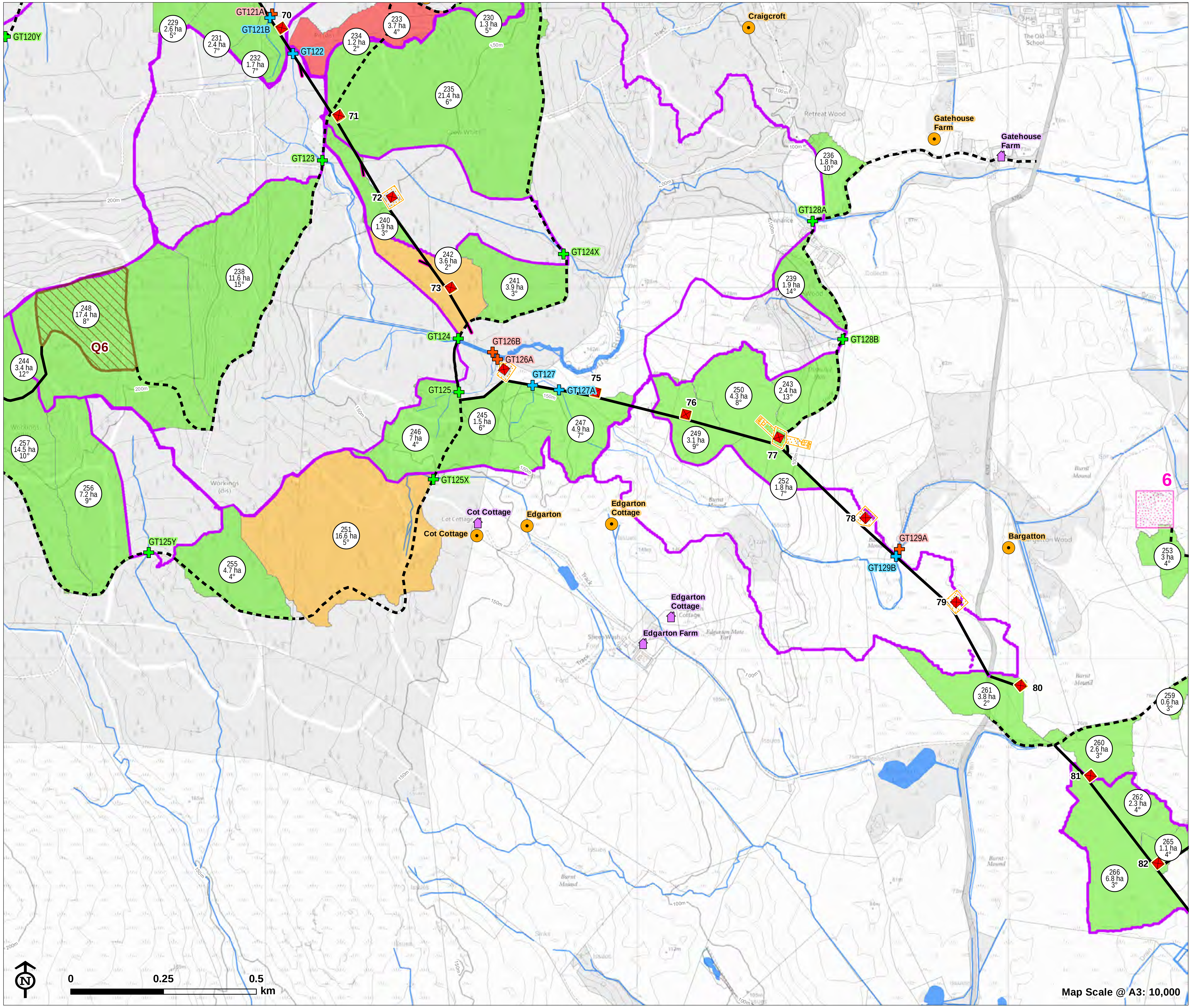

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Appendix 9.2

Figure 1.14: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

Glenlee to Tongland (steel lattice tower)

Access to proposed towers

Existing access

New access

Timber extraction spur

Working area

Construction compound

Potential quarry working area

PWS supplied property

PWS source location

Crossing - overhead line

Crossing - existing access

Crossing - new access

Watercourse/waterbody

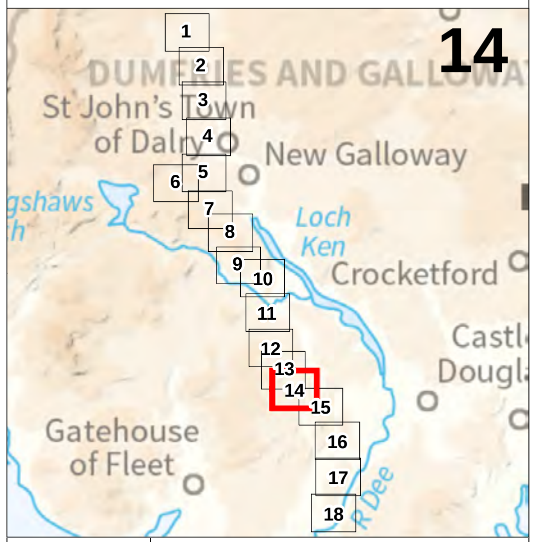
Catchments at watercourse crossings

Areas draining to tracks

1 – standard embedded mitigation with low impact if fails (green)

2 – standard embedded mitigation with high impact if fails (amber)

3 – complex embedded mitigation with high impact if fails (red)



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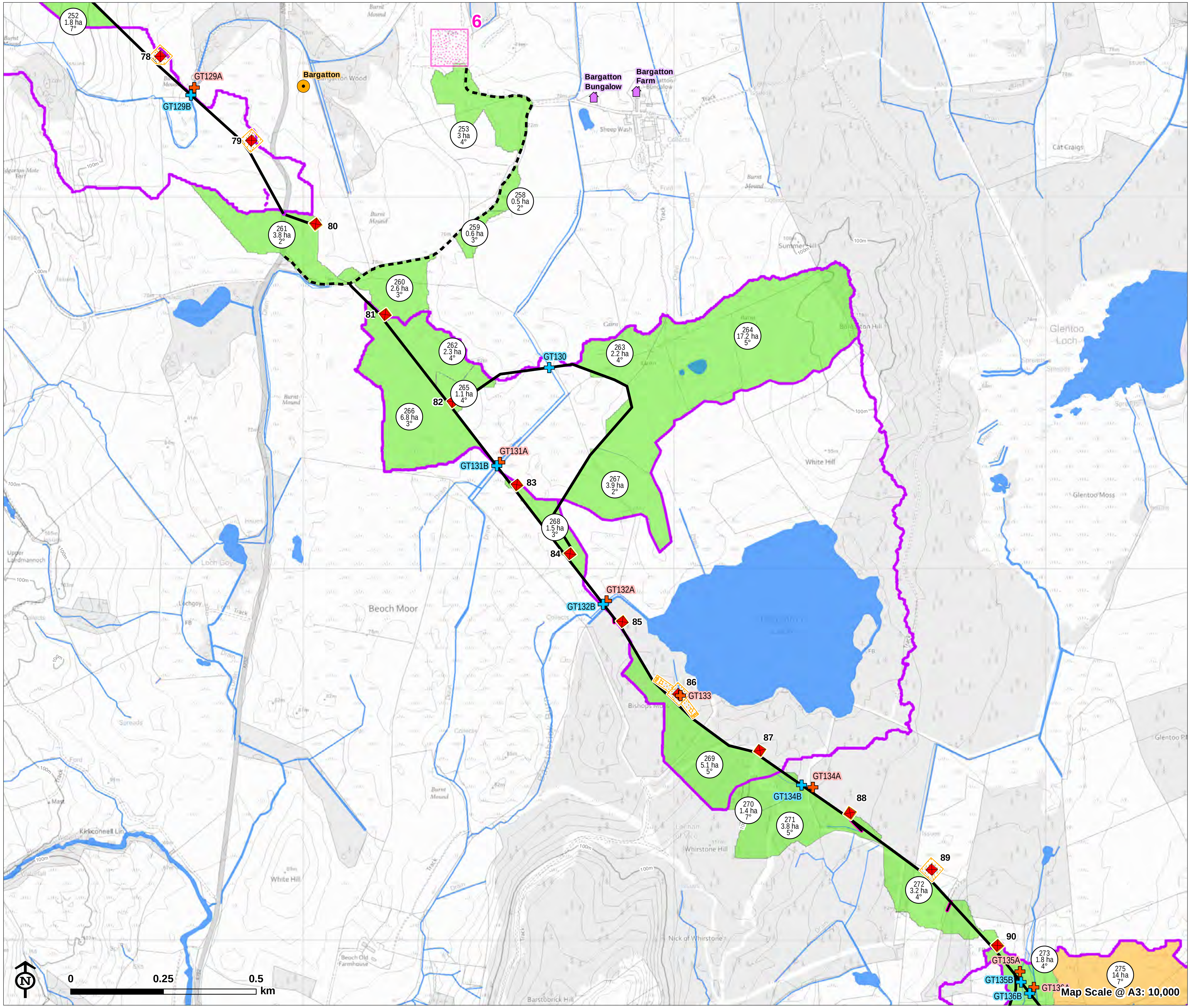

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Appendix 9.2

Figure 1.15: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

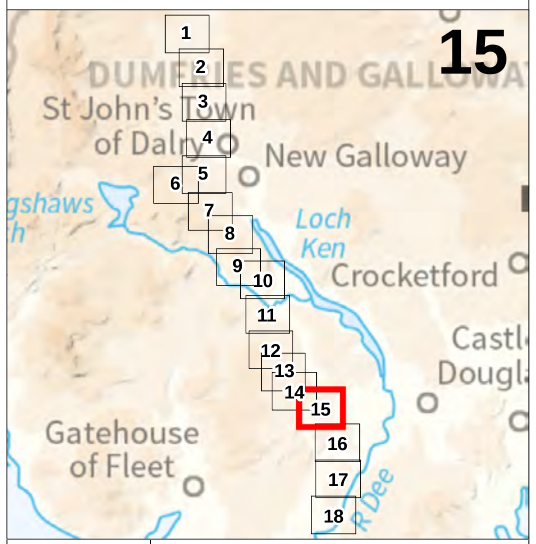
- Glenlee to Tongland (steel lattice tower)

Access to proposed towers

- Existing access
- New access
- Timber extraction spur
- Working area
- Construction compound
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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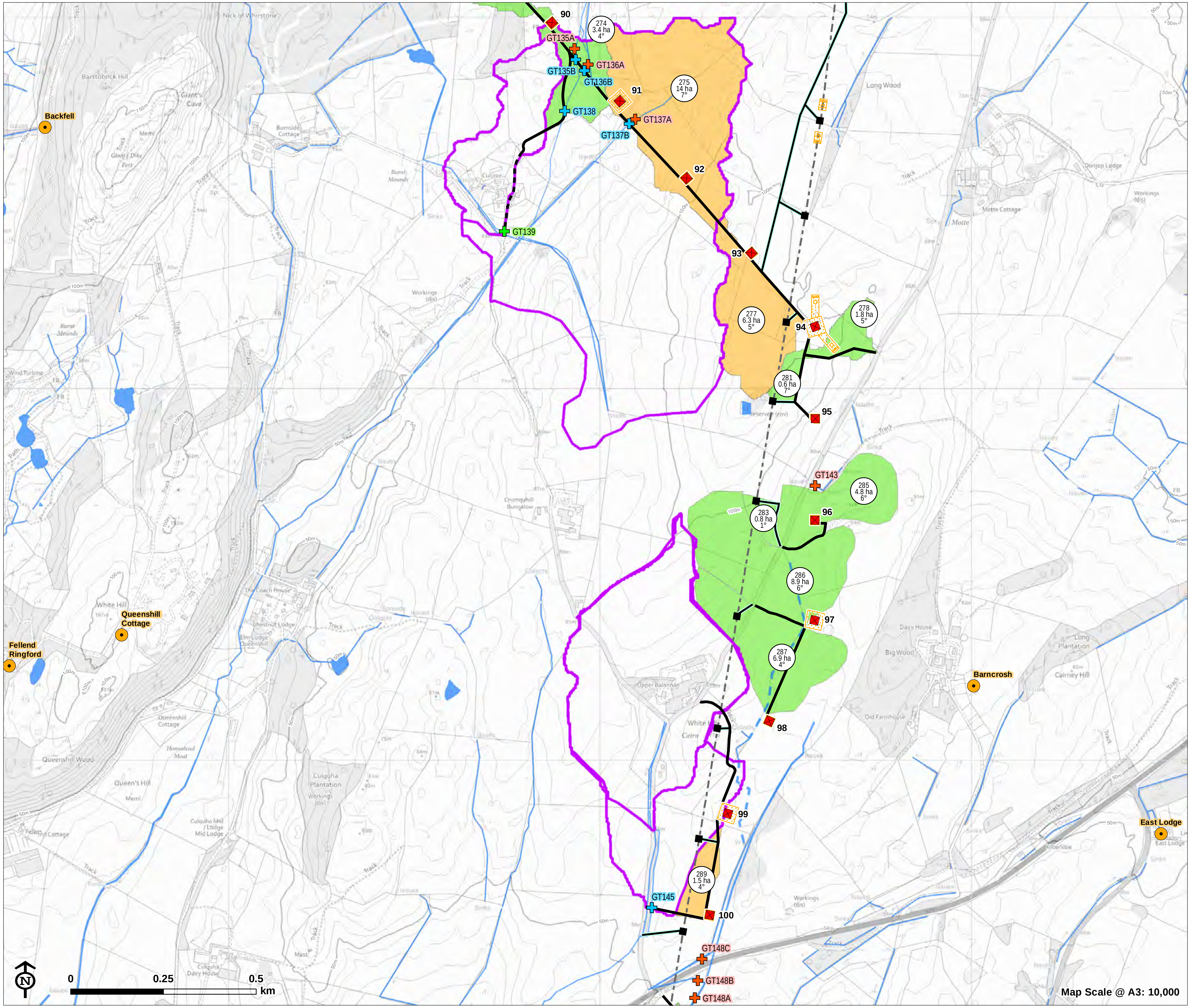

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Appendix 9.2

Figure 1.16: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

- Glenlee to Tongland (steel lattice tower)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)

Access to proposed towers

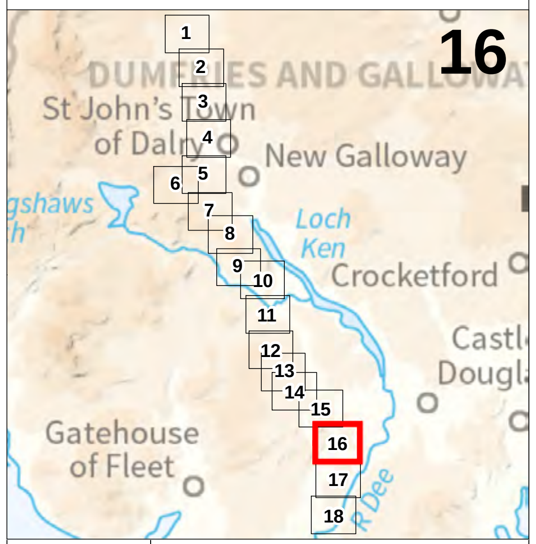
- Existing access
- New access

Access to towers for removal

- New access
- Working area
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Culverted watercourse (approximate)
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)



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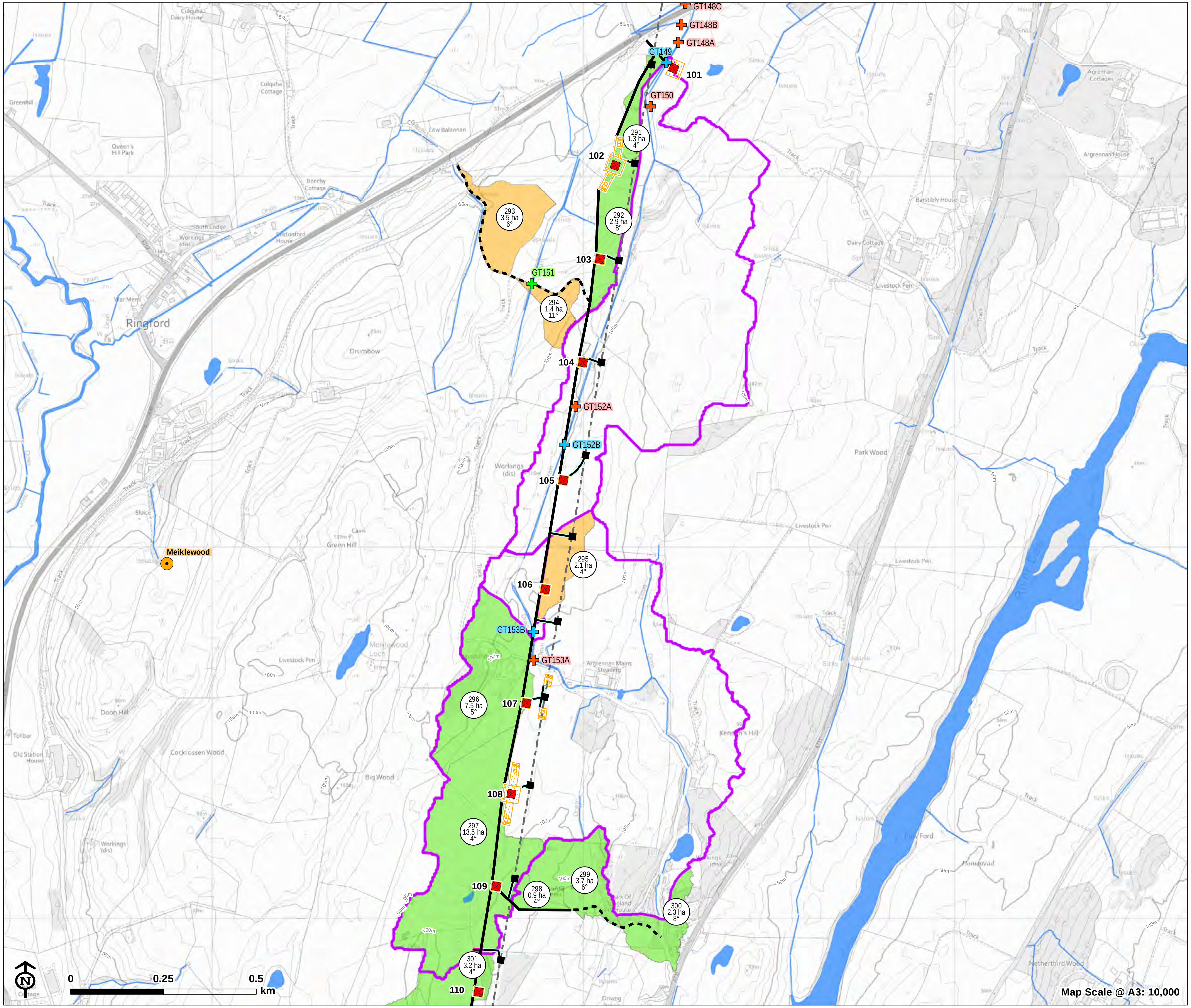

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Appendix 9.2

Figure 1.17: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure
- Glenlee to Tongland (steel lattice tower)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)

Access to proposed towers
- Existing access
- New access
- Timber extraction spur

Access to towers for removal
- New access
- Working area
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks
- 1 – standard embedded mitigation with low impact if fails (green)
- 2 – standard embedded mitigation with high impact if fails (amber)

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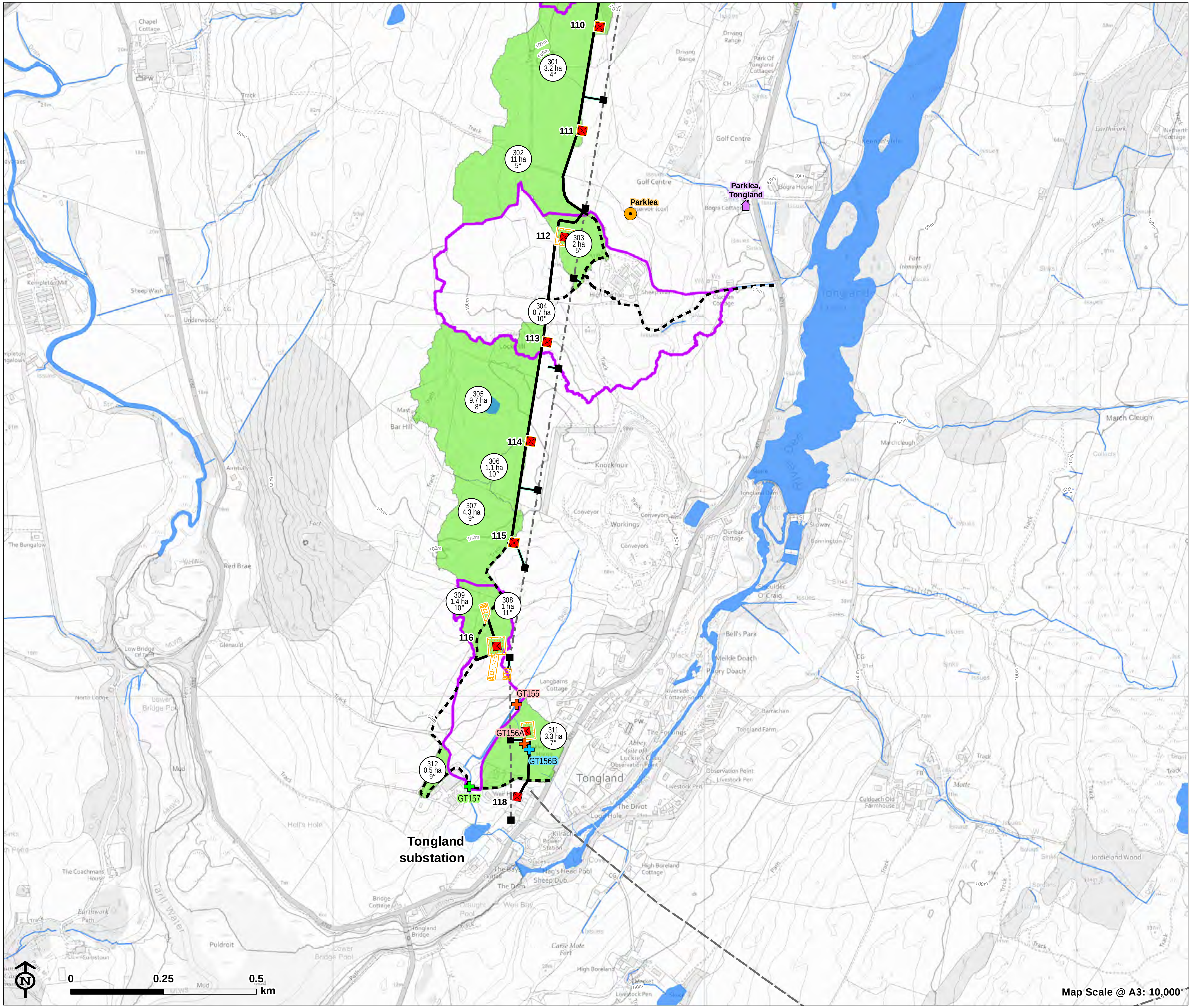

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Appendix 9.2

Figure 1.18: Catchment areas draining to access tracks and classification of embedded SUDS mitigation

Overhead line infrastructure

- Glenlee to Tongland (steel lattice tower)
- Existing tower for removal
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Existing network

Access to proposed towers

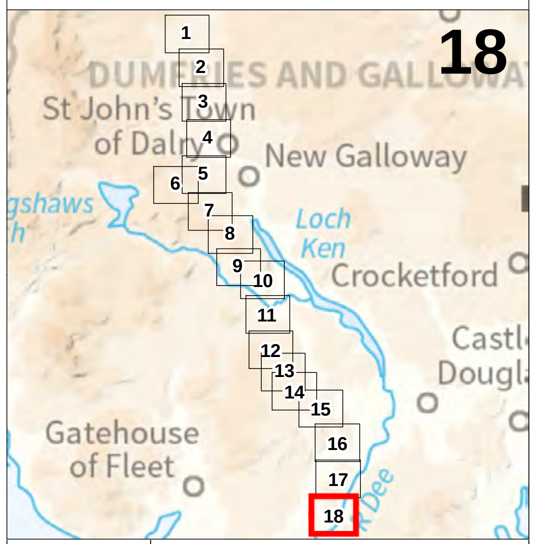
- Existing access
- New access

Access to towers for removal

- New access
- Working area
- PWS supplied property
- PWS source location
- Crossing - overhead line
- Crossing - existing access
- Crossing - new access
- Watercourse/waterbody
- Catchments at watercourse crossings

Areas draining to tracks

- 1 – standard embedded mitigation with low impact if fails (green)



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Appendix 9.3: Private Water Supply Assessment

Contents

Appendix 9.3: Private Water Supply Assessment

Introduction

9.3.1 An assessment was undertaken to identify which, if any, Private Water Supplies (PWS) and other groundwater abstractions[1] will be affected by the construction of the KTR Project (i.e., construction of access tracks, tower bases and cable installation), the removal of the existing N and R overhead lines (OHLs) and undergrounding of the existing LV cable (UGC). It is noted that the majority of the UGC route is within the existing road corridor of the A713 on the verge, which will not impact PWS. PWS and groundwater abstractions located within 1km of the KTR Project have been identified and potential risk to the source and associated properties assessed via a flow routing analysis based on topography to ascertain hydrological and hydrogeological connectivity.

9.3.2 Based on SEPA Guidance for assessing impacts of development proposals on groundwater abstractions and PWS (SEPA 2017[2]) a 250m buffer zone is used for all new infrastructure. This is a conservative approach which assumes that all ground excavations are deeper than 1m. This will be the case for the tower base installation, but not necessarily for construction/upgrade of the access tracks. A 100m buffer is used for tower removal on the N and R routes, as excavations for removal of this infrastructure are likely to be less than 1m deep.

Data Sources and Methodology

9.3.3 At the initial routeing stage, Dumfries and Galloway Council (D&GC) was approached to provide data on PWS and groundwater abstractions within 1km either side of the proposed KTR Project. Further data requests were submitted in 2018 and 2019 as the design of the KTR Project progressed.

9.3.4 D&GC initially provided data on 16 PWS sources close to the KTR Project when they were initially consulted at the routeing stage in April 2017. D&GC were consulted again in 2018 and 2019 once the design of the KTR Project was fixed and provided further information on other PWS close to the KTR Project, proposed accesses and the route of the existing R route to be removed.

9.3.5 The D&GC data is caveated as they state that the information provided cannot be guaranteed to be 100% accurate, up-to-date or comprehensive; in particular the grid references of the supplies may be approximations. In addition, D&GC noted that there may be other properties served by a PWS within 1km either side of the proposed route of the KTR Project that are not known to them. As such, D&GC recommended that the users of the PWS be contacted to establish the definitive location of the supplies and any associated infrastructure (Email from Environmental Health Officer, D&GC, 23 May 2019). Users were contacted on site where possible to supplement the field surveys and the data is therefore considered robust for the purposes of assessment.

9.3.6 Data on PWS was also obtained from the Drinking Water Quality Regulator for Scotland (DWQRS) online map[3]. This data was limited to location only, giving the PWS name and Type (A or B). Type A supplies are larger PWS and are defined as Regulated supplies, which supply either a commercial activity or 50 or more people in domestic premises. These supplies are subject to regular testing by D&GC. Type B supplies are smaller supplies that serve only domestic properties (<50 persons).

9.3.7 Data on groundwater abstractions were requested from SEPA within 1km of the KTR Project, including the existing R route to be removed. SEPA provided details of one licenced groundwater abstraction at Kenmure Fish Farm where groundwater is abstracted for the fish farm hatchery at NGR 263500 576210. This is over 2km east of the OHL route and over 900m from any access tracks, thus it will not be impacted by the development and is not considered further.

9.3.8 The data from all sources were combined to provide a database of PWS and groundwater abstractions. PWS close to the proposed KTR Project infrastructure were visited during the site walkover survey and additional information collected. Where possible, contact was made with the PWS users either on site or by telephone/public meetings to obtain further information. The PWS identified on the existing R route (eastern side of Loch Ken) were not visited on site, as the removal activities are considered to be relatively low impact and of short duration.

9.3.9 Flow routing analysis was carried out in Global Mapper GIS software using 1m Light Detection and Ranging (LiDAR) terrain data (where available) and Ordnance Survey 5m digital terrain data. In the absence of data on ground water levels and flow paths, analysis of topography, surface water flows paths and the type of PWS was used to infer hydrological and hydrogeological connectivity and identify if the KTR Project could potentially have an impact on a PWS. Figures 1–29 in this report show the surface water indicative flow paths, topography and project infrastructure close to each PWS. The local topography is shown by 5m contours derived from the Ordnance Survey 5m digital terrain data.

9.3.10 For PWS that are sourced from groundwater and/or groundwater springs, this assumes that groundwater flows paths are similar to surface water flows paths (a reasonable inference in the absence of groundwater levels and groundwater flow data). The results of the flow routing analysis were used to determine which PWS which may be impacted and which PWS require additional mitigation (e.g. water quality monitoring during construction to ensure no contamination of supply during the work). However, given the above assumption, PWS which are close to excavations for tower bases, even if they are not within a direct surface water flow path, are also recommended to be monitored during construction as a precaution, as groundwater flow paths may be slightly different. The reasons for monitoring or not monitoring a PWS are described in report text for each individual PWS.

9.3.11 The likely significant effect on the PWS was assessed based on the findings of the flow path analysis, the EIA methodology set out in Chapter 9 of the EIA Report and assumes that embedded mitigation measures (e.g. SUDS and standard construction good practice) are in place during felling operations and construction. Embedded mitigation measures that are incorporated into project design are described in detail in Appendix 5.2 and summarised in Chapter 9 of the EIA Report and are therefore not repeated here.

9.3.12 Any additional mitigation measures required for specific PWS, over and above embedded mitigation are described in this report.

PWS Along Proposed KTR Route

9.3.13 PWS sources identified within 1km either side of the proposed KTR Project are shown in Table 1. The locations are shown on Figure 9.2 within the main EIA Report. Some PWS are groundwater sources (i.e. spring or well) and others are surface watercourses; where known this is stated in Table 1.

Table 1: Details of Private Water Supplies (PWS) 1km either side of the proposed KTR Project

Nat. Grid Ref (source)	KTR Connection[1]	Source Name	Source Ref	Source Type	Type[2] (A or B)	No of Properties and Use[3]	Recent Sample/ Result[4]
NX59219 90132	PG	Carminnows Lodge	100395	Borehole	B	1 D	-
NX59167 89959	PG	High Carminnows[x]	103122	Borehole	B	1 D	
NX59118 89753	PG	Polquhanity	99844	Spring	B	1 D	-
NX59607 88800	PG	Dalshangan[x]	103096	Borehole	B	1 D	-
NX59769 88406	PG	Hawkrigg	-	Borehole	A	2 D	-
NX59800 87900	PG	Dundeugh	97986	Surface Watercourse	B	16 D	-
NX60035 87804	PG	Phail Barcris	99068	Borehole	B	1 D	-

[1] Data on private water supplies is held by local authorities (e.g. D&GC), however additional information can be obtained from the Drinking Water Quality Regulator website, local residents, SEPA and from a site walkover survey. SEPA holds data on licenced groundwater abstractions greater than 10 m^3 a day, which are licenced under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR Regulations).

[2] SEPA: Land Use Planning System, SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, 2017

[3] http://dwqr.scot/private-supply/pws-location-map/

Nat. Grid Ref (source)	KTR Connection[1]	Source Name	Source Ref	Source Type	Type[2] (A or B)	No of Properties and Use[3]	Recent Sample / Result[4]
NX60000 86500	PG & CK	Stroangassel	99962	Spring	B	1 D	None
NX60300 85400	PG & CK	Carsfad Cottage	100106	GW Spring	A	1 D, 1 C	P
NX60491 84201	PG	Inverharrow	102598	Borehole	B	1 D	-
NX60680 83230	PG	Barskeoch Mains	99037	Spring	B	1 D	None
NX59885 82911	PG	Hannaston	-	-	B	1 D	-
NX60942 81115	PG & EG	Waterside	100069	Surface Watercourse	B	1 D	None
NX59894 80974	GT & BG	Ford Farm	-	-	B	1 D	-
NX59687 80500	GT & BG	Old Glenlee	-	-	B	1 D	-
NX60500 80099	GT & BG	Glenlee	97995	GW Spring	A	10 D	P
NX57500 79500	GT & BG	Glenlee Kennels	99417	Spring	B	1 D	None
NX60409 78722	GT	Glenlee Source of 003	-	Spring	B	1 L	-
NX60800 78700	GT	Airie Cottage	98888	Spring	B	1 D	Micro: F
NX61780 78886	GT	Sheil	98376	GW Spring	B	8 D	Pass
NX61811 78030	GT	Achie Farm	98884	Spring	B	1 D	None
NX57000 76800	GT	Clatteringshaws Complex	97973	Surface Watercourse	A	1 C	P: Apr 2016 (low pH)
NX62200 77500	GT	Nether Achie	99799	Spring /Surface Watercourse	B	1 D	None
NX62120 77209	GT	Waulkmill	100075	Spring	B	1 D	None
NX62347 76957	GT	The Brough	105186	Spring	B	1 D	Micro: F, Chem: P Sep 2017 (low pH)
NX60800 77000	GT	Darsalloch	99303	Surface Watercourse	B	1 D	Micro: P Mar 2014
NX62200 76200	GT	Knocknairling	98011	Spring /Surface Watercourse	B	2 D	P: Jul 2012
NX63400 69583	GT	Airie Mossdale	-	-	A	1 D	-
NX65599 68503	GT	Harley Cottage	-	-	A	1 D	-
NX64682 68448	GT	Slogarie	98038	Spring	A	8 D	Micro: F, Chem: P (F on colour) Jan 2019
NX65188 68329	GT	Woodedge	-	-	B	1 D	-
NX65900 67600	GT	Nether Crae	99804	Spring	B	1 D	P: May 2017 (low pH)
NX67108 66107	GT	Summerhill Supply	99966	Well	B	1 D	None
NX63700 64900	GT	High Lochenbreck	98486	GW Spring	A	4 D	None
NX64782 65024	GT	Lochenbreck Well	-	Dry	-	-	-
NX66431 64779	GT	Cullenoch	99233	Surface Watercourse	B	1 D	P: Dec 2018
NX67300 64699	GT	Craigcroft	99259	Spring / Surface Watercourse	B	1 D	P
NX67800 64400	GT	Gatehouse Farm	99409	Spring	B	1 D	None
NX66703 63359	GT	Edgarton	99424	Spring / Surface Watercourse	B	1 D	None
NX66931 63364	GT	Edgarton Cottage	99425	Spring	B	1 D	None
NX66568 63332	GT	Cot Cottage	104665	Spring	A	1 D	P: Mar 2019
NX68000 63300	GT	Bargatton	98957	Spring	B	2 D	None
NX68504 60704	GT	Backfell	-	-	B	3 D	-
NX68710 59338	GT	Queenshill Cottage	-	-	B	1 D	-
NX68407 59254	GT	Fellend Ringford	-	-	A	-	-
NX71006 59201	GT	Barncrosh	-	-	A	11 D	-
NX71511 58802	GT	East Lodge	-	-	B	1 D	-
NX68877 56956	GT	Meiklewood	-	-	A	2 D	-
NX70161 56048	GT	Park of Tongland	-	-	B	1 D	-
NX69800 55300	GT	Parklea	99827	Spring	B	1 D	Lead: F

[1] KTR Connection: PG = Polquhanity to Glenlee, CK = Carsfad to Kendoon, EG = Earlstoun to Glenlee, GT = Glenlee to Tongland, BG = BG route deviation

[2]Type: Type A supplies are larger PWS, or those with a commercial activity, and are defined as Regulated supplies, which supply either a commercial activity or 50 or more people in domestic premises. These supplies are subject to regular testing by D&GC. Type B supplies are smaller supplies that serve only domestic properties (<50 persons).

[3]No of Properties and Use: D = domestic, C = commercial, L = livestock

[4]Sample Result: P = pass, F = fail

[x] The exact source locations for High Carminnows and Dalshangan are unknown and are assumed to be close to the properties

9.3.14 Of the PWS sources identified within 1km either side of the proposed KTR Project, only 25 PWS sources are within 250m of the project infrastructure, which supply 52 properties (Table 2). Given the proximity of these to the infrastructure, flow path analysis was carried out for each of these PWS sources and the results are discussed in more detail in the paragraphs below. The Slogarie PWS source is located ~360m east of the OHL infrastructure however the owner has raised concerns about the development potentially affecting the PWS, hence a flow path assessment has also been carried out for it. In addition, the Edgarton PWS source is located ~280m east of an access track, close to a surface watercourse which is crossed by the access track. Although the PWS source is outwith the 250m buffer it was noted to be a spring/surface water supply and is also assessed below to ensure there is no potential impact as a result of silt runoff into the surface watercourse crossing.

Table 2: Private Water Supplies (PWS) sources and properties within 250m of KTR infrastructure

Nat. Grid Ref	KTR Connection	Source or Property Name	Property	Source /Source Type	Type[1]	Nearby KTR Infrastructure	Distance from closest Infra-structure (m)	Flow Path Analysis Result[2]	Likely Effect
NX59219 90132	PG	Carminnows Lodge		Borehole	B	Construction Compound 1	118	No impact	None
NX59267 90032	PG	Carminnows Lodge	Property		B	Construction Compound 1	122	No impact	None
NX59167 89959	PG	High Carminnows	Source and Property	Borehole	B	Construction Compound 1	60	Potential impact	Minor
NX59130 89778	PG	Polquhanity		Spring	B	Access Track to Construction Compound 1	187	No impact	None
NX59130 89778	PG	Polquhanity	Property		B	Access Track to Construction Compound 1	223	No impact	None
NX59769 88406	PG	Hawkrigg		Borehole	A	Underground Cable	30	No impact	None
NX59710 88490	PG	Hawkrigg House	Property		A	Underground Cable	86	No impact	None
NX59700 88527	PG	Hawkrigg Caravan Site	Property		A	Underground Cable	88	No impact	None
NX59796 87894	PG & N	Dundeugh		Surface Water	B	Access Track to Tower 7, Tower 7, Underground Cable	80, 269, 130	Potential impact	None
NX59726 88009	PG & N	Dundeugh 2*		Source Infrastructure	B	Access Track to Tower 7, Tower 7, Underground Cable	54, 252, 118	Potential impact	None
Various (see Figure 9.2.1)	PG & N	16 Properties supplied by Dundeugh	16 Properties		B	Access Track to Tower N236, Underground Cable	Within 100m of access track, 36	Potential impact	None
NX59908 87642	PG & N	Phail Barcris	Property	Borehole	B	Access Track between towers 8 and 9, Tower 9, Underground Cable	170, 180, 3	Potential impact	None
NX60000 86500	PG & CK	Stroangassel		Spring	B	Access Track to Tower 13, Tower 13	247, 222	No impact	None
NX60374 86749	PG & CK	Stroangassel Farm	Property		B	Access Track, Wood Pole 10R, Underground Cable	150, 110, 70	Potential impact	None
NX60300 85400	PG, CK & R	Carsfad Cottage		GW Spring (well)	A	Access Track to Tower 17, Tower 17, Underground Cable	52, 31, 132	Potential impact	None
NX60335 85404	PG, CK & R	Carsfad Cottage 2*		Source infrastructure (tank)	A	Access Track to Tower 17, Tower 17, Underground Cable	16, 17, 98	Potential impact	None
NX60467 85456	PG, CK & R	Carsfad Cottage	Property		A	Access Track to Tower 17, Tower, Underground Cable	116, 28	Potential impact	None
NX60561 85436	PG, CK & R	Carsfad Power Station	Commercial Property		A	Access Track to Tower 17, Tower, Underground Cable	208, 125	Potential impact	None
NX60491 84201	PG & R	Inverharrow		Borehole	B	Access Track to Tower 10R, Tower 21, Underground Cable	20, 196, 28	Potential impact	Minor
NX60503 84209	PG & R	Inverharrow	Property		B	Access Track to Tower 10R, Tower 21, Underground Cable	35, 211, 43	Potential impact	Minor
NX60680 83230	PG & R	Barskeoch Mains		Spring	B	Access Track to Tower 25, Tower 25, Underground Cable	150, 203	Potential impact	None
NX60816 83288	PG & R	Barskeoch Mains	Property		B	Access Track to Tower 25, Tower 25, Underground Cable	236, 85	Potential impact	None
NX60942 81115	PG, EG & R	Waterside		Surface Water	B	Access Track to Tower 33, Tower 33, Underground Cable	6, 3, 280	Potential impact	Minor
NX61240 80996	PG, EG & R	Waterside	Property		B	Access Tracks, Tower EG6, Underground Cable	198, 151, 48	Potential impact	Minor
NX59894 80974	GT & BG	Ford Farm		Source – Type unknown	B	Access Track to BG deviation and several GT towers	226	No impact	None
NX60500 80099	GT & BG	Glenlee		GW Spring	A	Access Track between towers 2 and 3 Tower 2	84, 100	Potential impact	Minor
Various (see Figure 9.2.5)	GT & BG	10 Properties supplied by Glenlee	10 Properties		A	Access Track between towers 2 and 3 Tower 2	200, 190	Potential impact	Minor

Nat. Grid Ref	KTR Connection	Source or Property Name	Property	Source /Source Type	Type[1]	Nearby KTR Infrastructure	Distance from closest Infra-structure (m)	Flow Path Analysis Result[2]	Likely Effect
NX60409 78722	GT	Glenlee Source of 003		Spring	-	Access Track to tower 7, Tower 7	186	PWS not likely impacted	None
NX60810 78676	GT	Glenlee Sheep Dip	Property (for Livestock)	-	-	Access Track to tower 8, Tower 8	82	Potential impact	None
NX60800 78700	GT	Airie Cottage		Spring	B	Access Track to tower 8, Tower 8	86	Potential impact	None
NX61053 78546	GT	Airie Cottage	Property		B	Access Track to tower 9 Tower 9	265, 251	Potential impact	None
NX60800 77000	GT	Darsalloch		Surface Water-course	B	Access Track to GT connection	121	Potential impact	Minor
NX60788 77021	Gt	Darsalloch	Property		B	Access Track to GT connection	145	Likely impact on PWS	Minor
NX64682 68448	GT	Slogarie		Spring	A	Access Track, Tower 55	360	PWS not likely impacted	None
NX64700 68437	GT	Slogarie 2*		Spring	A	Access Track, Tower 55	360	PWS not likely impacted	None
Various (see Figure 9.2.11)	GT	8 Properties supplied by Slogarie	8 Properties		A	Access Track, Towers 55-57	Properties at least 600m away	PWS properties not likely impacted	None
NX65973 66773	GT	Nether Crae[3]		Spring	B	Existing Access Track to GT connection	14	PWS not likely impacted	None
NX66776 66142	GT	Summerhill[4]		Source location from DWQRS website (possibly inaccurate)	B	Existing Access Track to GT connection	25	Source not identified during site survey	None
NX67108 66107	GT	Summerhill		Well	B	Existing Access Track to GT connection	222	PWS not likely impacted	None
NX67063 66112	GT	Summerhill	Property		B	Existing Access Track to GT connection	185	Potential impact	None
NX64755 65073	GT	Ramerish Retreat	Property		A	Existing Access Track to GT connection	25	PWS not likely impacted	None
NX64803 65076	GT	Lochenbreck Cottage	Property		A	Existing Access Track to GT connection	80	PWS not likely impacted	None
NX64782 65024	GT	Lochenbreck Well[5]		Dry	-	Existing Access Track to GT connection	57	Source no longer in use	None
NX66431 64779	GT	Cullenoch 1		Surface Water-course	B	Access Track to GT connection	22	Potential impact	Minor
NX66569 65011	GT	Cullenoch 2*		Surface Water-course	B	Access Track to GT connection	118	Potential impact	Minor
NX66706 65014	GT	Cullenoch	Property		B	Access Track to GT connection	18	Potential impact	Minor
NX67800 64400	GT	Gatehouse Farm		Spring	B	Access Track to GT connection	40	PWS not likely impacted	None
NX67981 64354	GT	Gatehouse Farm	Property		B	Access Track to GT connection	9	PWS not likely impacted	None
NX66568 63332	GT	Cot Cottage		Spring	A	Access Track to GT connection	165	PWS not likely impacted	None
NX66571 63367	GT	Cot Cottage	Property		A	Access Track to GT connection	165	PWS not likely impacted	None
NX66703 63359	GT	Edgarton		Spring / Surface Water-course	B	Access Track to GT connection	280	PWS not likely impacted	None
NX68000 63300	GT	Bargatton		Spring	B	Access Track to tower 79, Tower 79	225, 180	Potential impact	Minor
NX68782 63270	GT	Bargatton Bungalow	Property		B	Access Track to Construction Compound 6	167	Potential impact	Minor
NX70161 56048	GT	Park of Tongland[6]		Source – no longer in use	B	Existing Access Track to GT connection	38	Source no longer in use	None
NX69800 55299	GT	Parklea		Spring	B	Access Track to tower 112, Tower 112	94, 158	Potential impact	None
NX70111 55322	GT	Parklea	Property		B	Access track to tower 112	215	Potential impact	None

[1]Type: Type A supplies are larger PWS, or those with a commercial activity, and are defined as Regulated supplies, which supply either a commercial activity or 50 or more people in domestic premises. These supplies are subject to regular testing by D&GC. Type B supplies are smaller supplies that serve only domestic properties (<50 persons).

[2]Flow Path Analysis Result: Likelihood of impact on PWS from infrastructure construction, based on flow paths.

* Several PWS have more than one more than one location of supply infrastructure close to their source (e.g. Carsfad 2, Dundeugh 2, Slogarie 2 and Cullenoch 2)

[3] The source location for the Nether Crae PWS shown on the DWQRS online map is thought to be incorrect, based on additional information provided by D&GC. However, given its suggested proximity to a proposed access track the actual location of the source will be confirmed prior to construction.

[4] The source of the Summerhill PWS will be confirmed prior to construction.

[5] The Lochenbreck Well is not in use and was dry and dirty. Clarification will be made prior to construction that the well will continue to be dry and in disuse during the extent of the KTR Project construction. This is not considered further.

[6] The Park of Tongland PWS is no longer used, as the properties are now on the Scottish Water system. This is not considered further.

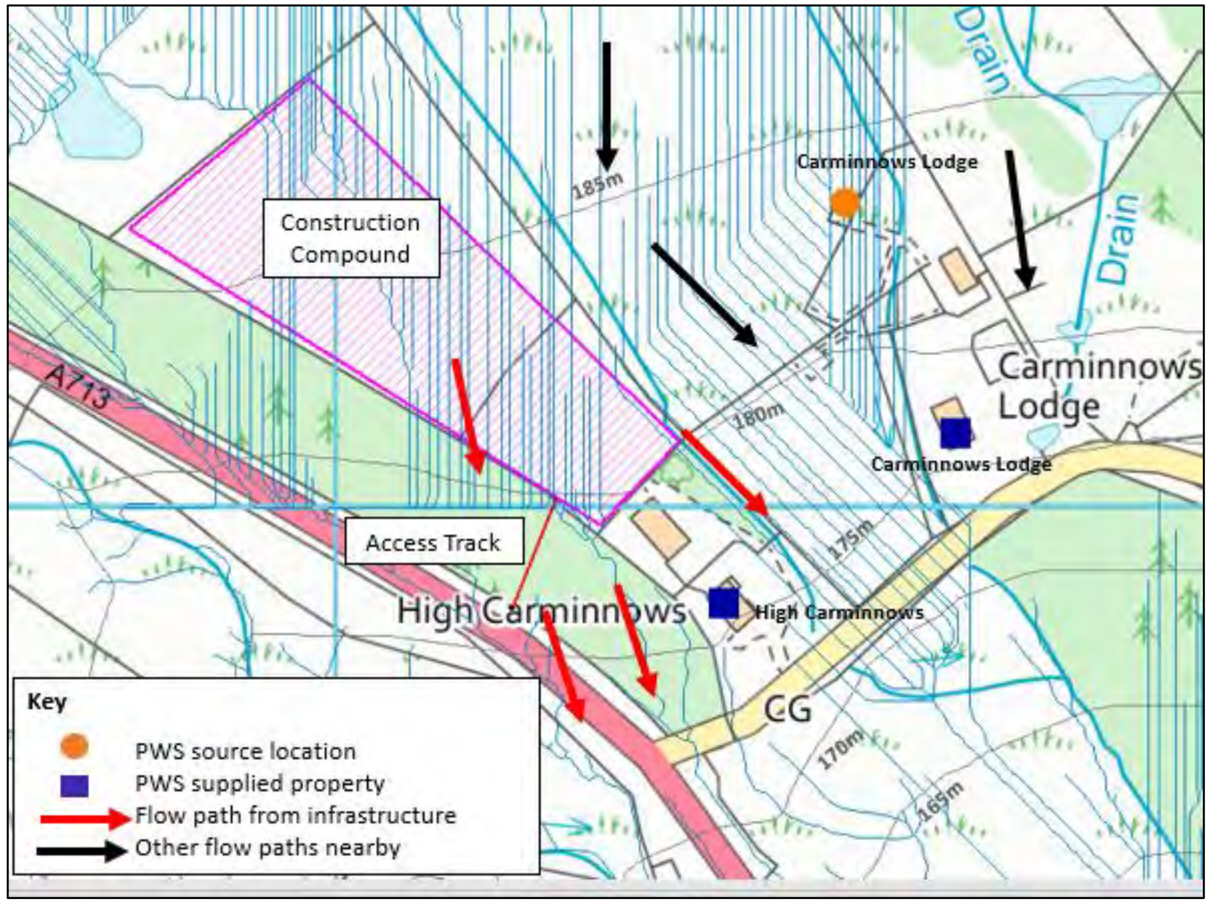
Carminnows Lodge (PG connection)

9.3.15 The source of the Carminnows Lodge PWS is a borehole. The source and property are located ~120m east of construction compound 1. Flow routing analysis (Figure 1) shows that surface flow paths are to the south in this area and no runoff created from the construction compound or access tracks would flow toward either the PWS source or the supplied property. The PWS source and property are upgradient of the construction compound and not considered to be hydrologically connected to the location of the KTR infrastructure. Thus, the magnitude of effect on the PWS is considered to be negligible resulting in an effect significance of none.

High Carminnows (PG connection)

9.3.16 The source of the High Carminnows PWS is a borehole; the exact location of the borehole is unknown at the time of writing but is assumed to be close to the property, shown in Figure 1. The property is located ~60m south east of construction compound 1. Watershed analysis (Figure 1) shows that surface runoff created from the compound and access track will be routed to the south of the property. However, there is still a risk of contaminated run-off or suspended sediment/dust from the construction compound entering the watercourse or shallow groundwater. Embedded mitigation measures during construction will minimise the risk, however given the uncertainty of the location of the borehole the magnitude of effect on the PWS is considered to be minor resulting in an effect of minor significance. Monitoring of the water quality of this PWS will be undertaken before and during construction.

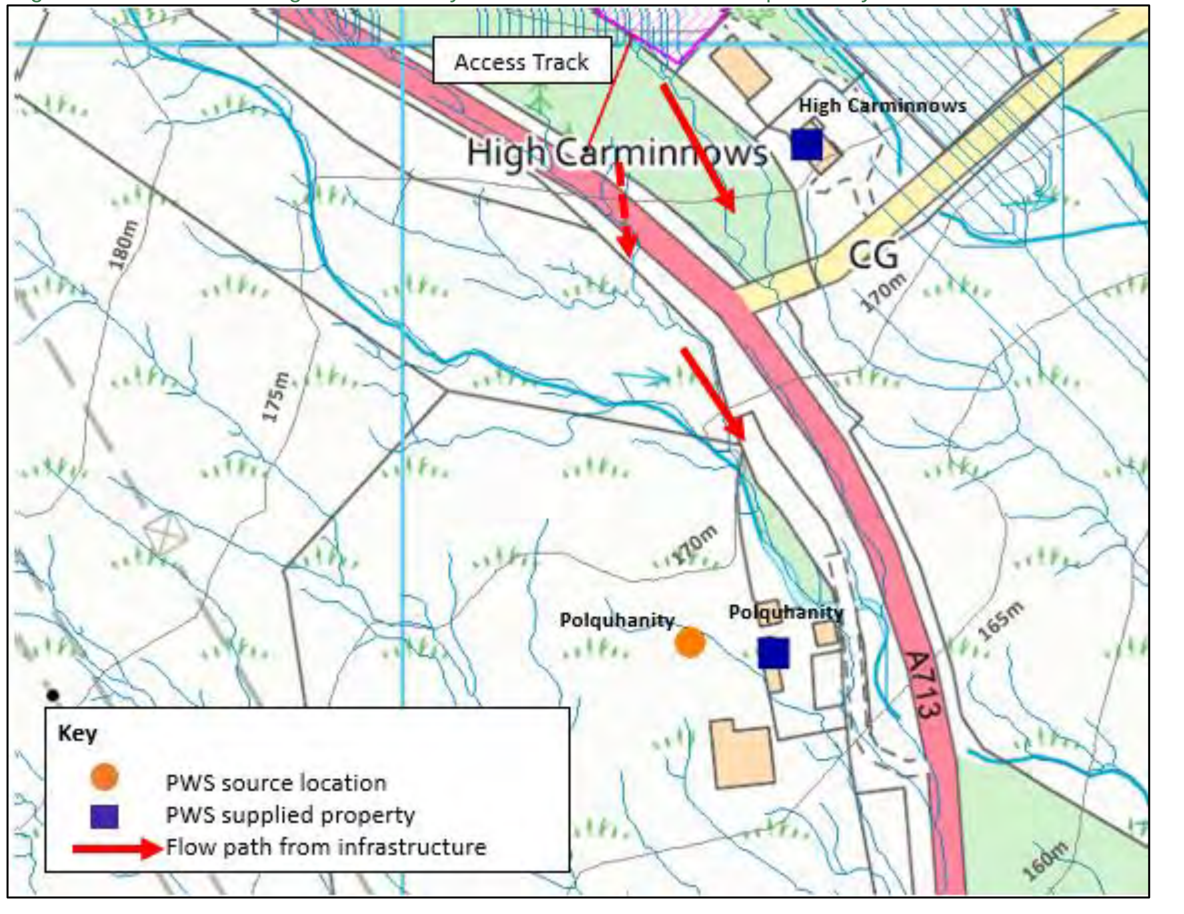
Figure 1: Flow routing and nearby infrastructure for Carminnows Lodge and High Carminnows



Polquhanity (PG connection)

9.3.17 The source of the Polquhanity PWS is a spring. The source and property are located ~187m and ~223m south of an access track to construction compound 1. Flow routing analysis (Figure 2) shows that surface water runoff from the access track north of the A713 could potentially flow into the Polquhanity Burn which flows to the east of the Polquhanity PWS source and property, however it is likely that surface runoff will be intercepted by drainage on the A713 road. There is also an existing access track crossing of this watercourse ~600m upstream of the PWS, which will be used during construction. Given the distance from the infrastructure and with embedded mitigation during construction, the magnitude of effect is considered to be negligible resulting in an effect significance of none.

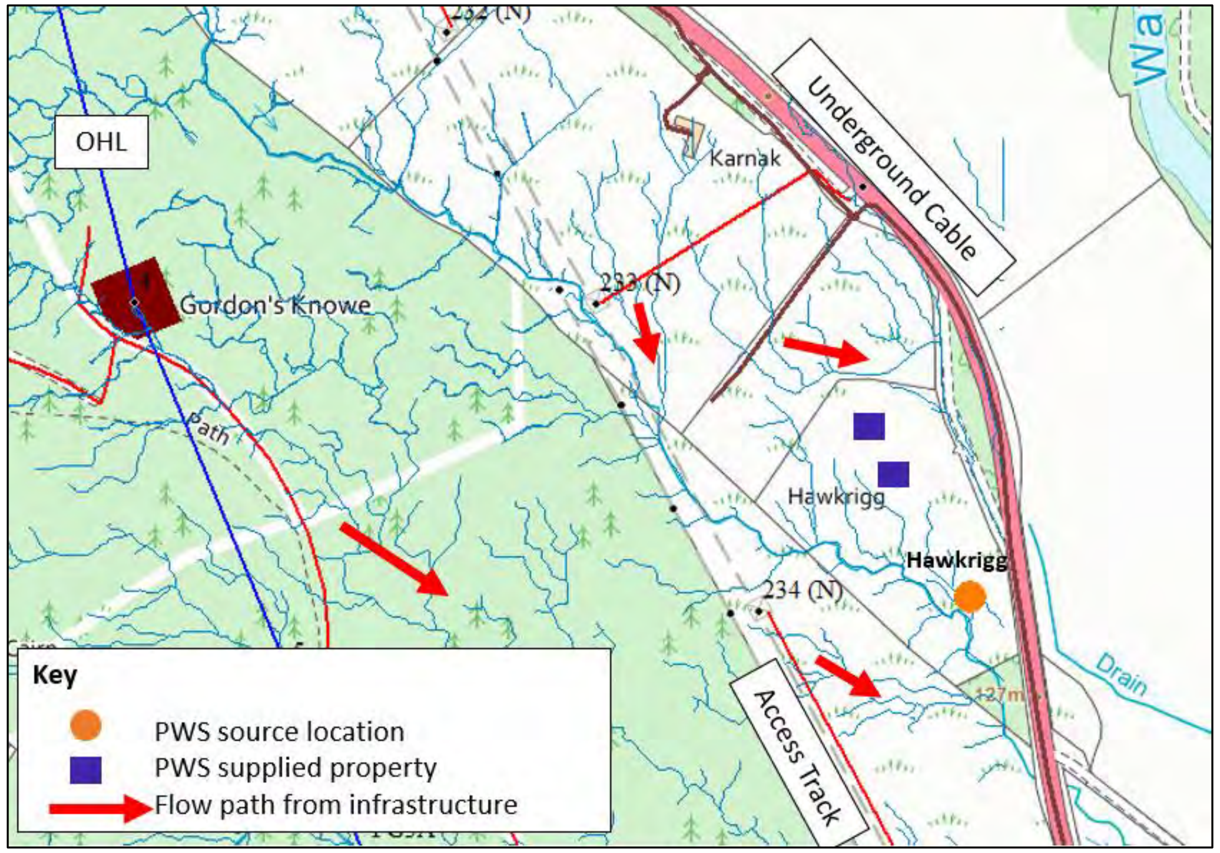
Figure 2: Flow routing and nearby infrastructure for Polquhanity PWS



Hawkrigg (PG connection)

9.3.18 The source of the Hawkrigg PWS is a borehole, which supplies two properties (a dwelling house and a toilet/shower block for a small caravan site). The borehole is located ~30m west and ~225m south of the UGC within the A713 road verge and within agricultural land, respectively. Tower N (for removal) is ~145m west. Flow routing analysis (Figure 3) shows that flow paths from the infrastructure do not flow towards the PWS source or supplied properties. The nearby underground cabling work is in within the public road and will not impact the PWS. Trenching for installation of the UGC though agricultural land ~225m to the north is on higher ground (~8m higher than the PWS source) and will not impact the source. The magnitude of effect is considered to be negligible resulting in an effect significance of none.

Figure 3: Flow routing and nearby infrastructure for Hawkrigg PWS



Dundeugh (PG connection and N route)

9.3.19 The source of the Dundeugh PWS is surface water from the Polmaddy Burn (this is labelled as Dundeugh 2 on Figure 4). The location was visited during the site survey and a concrete water supply structure was observed (Photo 1). Water is pumped from the Polmaddy Burn via a hut and up towards a second source structure to the south-east (labelled as Dundeugh on Figure 3). From there, the water flows via gravity to the nearby houses and supplies 16 domestic properties (see Figure 3 for locations). The PWS source is located ~54m north-west of the access track to tower 7, ~252m east of tower 7, ~260m downstream of the OHL crossing location of the Polmaddy Burn and ~130m upstream of the underground cable crossing of the burn. Flow routing analysis (Figure 3) shows that any surface runoff created during infrastructure construction will enter the watercourse upstream of where the PWS source draws water. With embedded good practice mitigation during construction, the magnitude of effect is considered to be negligible resulting in an effect significance of none. The cable will be installed under the bed of the burn using directional drilling techniques. The cable crossing is ~130m downstream of the PWS source and thus is not expected to have any effect on the PWS water supply. The supplied properties are within 100m of the access track to tower 236 on the existing OHL (N route), which will be removed. The PWS source is upgradient of the tower to be removed and will not be impacted during removal.

Figure 4: Flow routing and nearby infrastructure for Dundeugh PWS

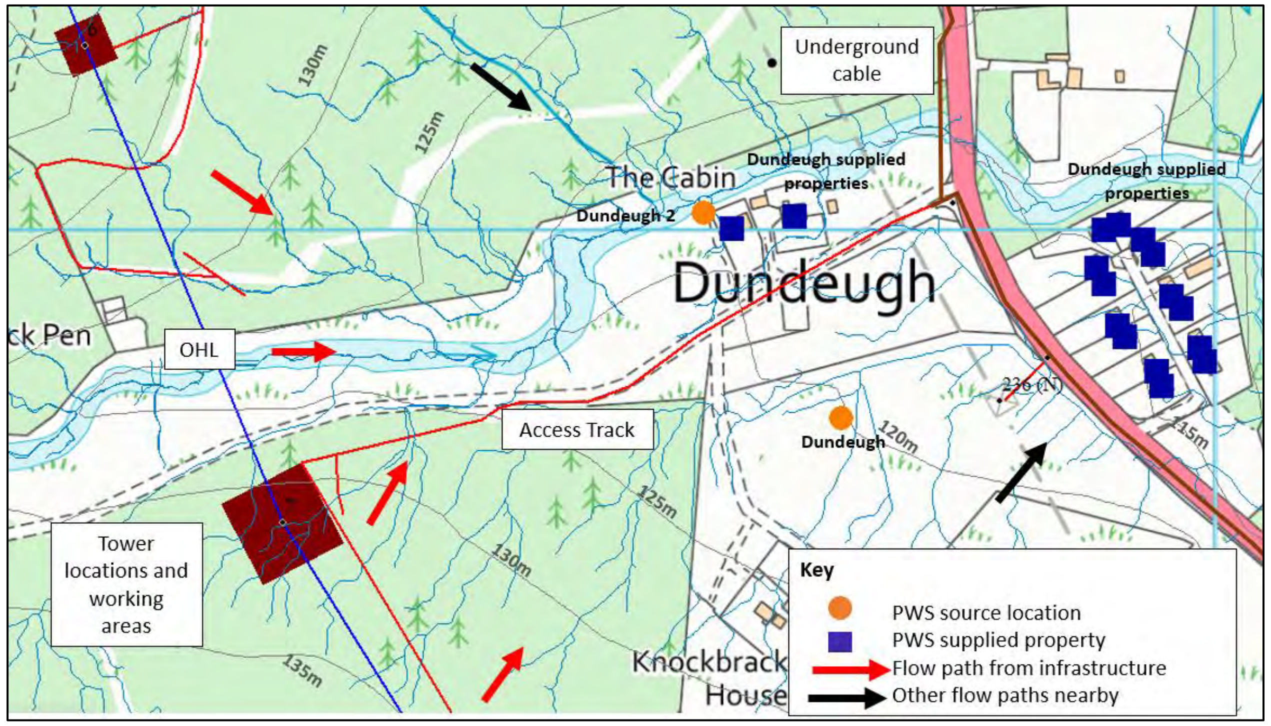


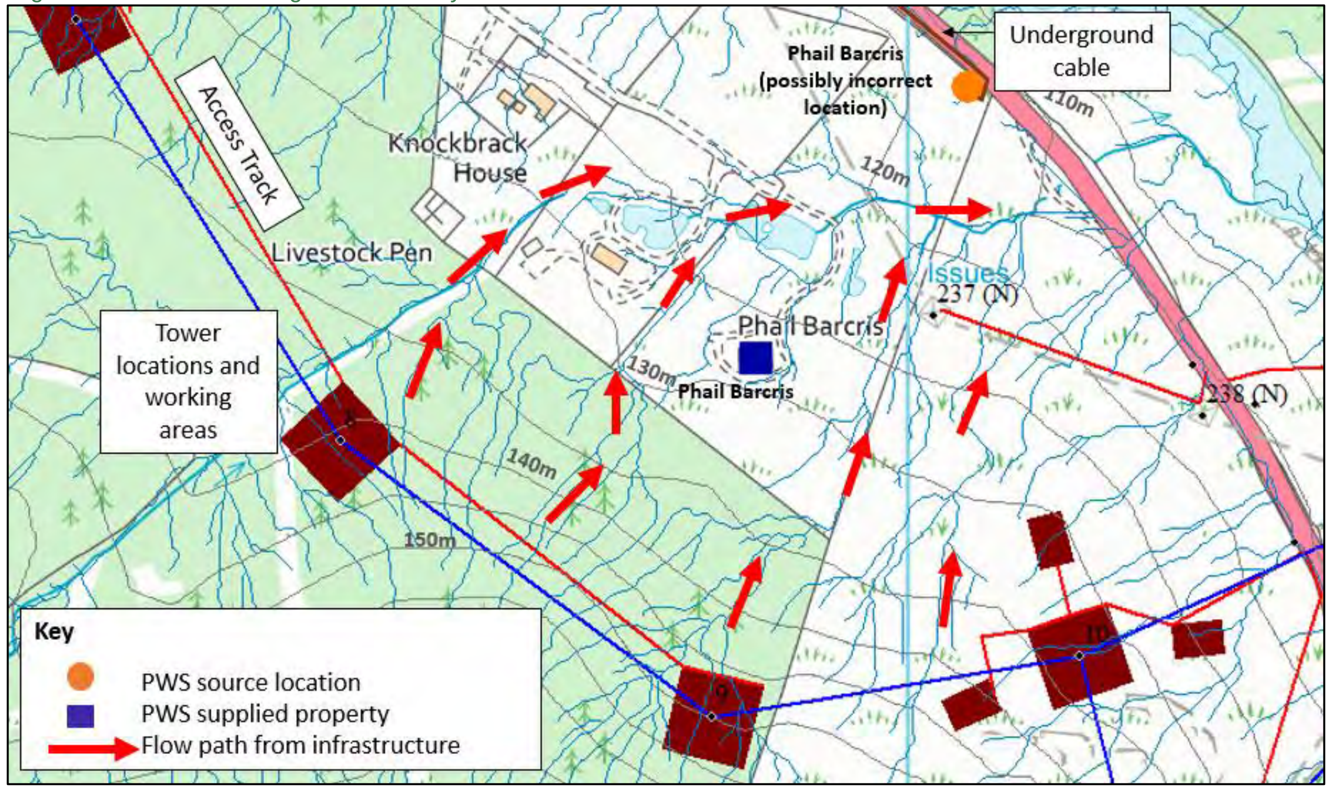
Photo 1: Concrete water supply structure on the Polmaddy Burn (Dundeugh PWS)

Phail Barcris (PG connection and N route)

9.3.20 The source of the Phail Barcris PWS is a borehole. The property is located ~170m north-east of an access track and ~180m north of tower 9. The source location provided by D&GC is close to the A713 road, however it is considered this is incorrect, as it would be expected that the PWS borehole source would be close to (and upgradient of) the supplied property. The underground cable will be installed in the road verge and terminates within ~3m of the 'possible' location of the PWS source (Figure 4). Despite the proximity, as the cable will be installed within the existing road verge it is considered that it will not affect the 'possible' PWS source.

9.3.21 Flow paths from the infrastructure are towards the property (Figure 5) and the PWS could be potentially affected by the infrastructure construction if the actual borehole source is close to the property. However, with the embedded mitigation measures, the magnitude of effect on the PWS is considered to be negligible resulting in an effect significance of none. The location of the borehole will be confirmed and avoided during construction. Monitoring of the water quality of this PWS will be undertaken before and during construction, if required. This will depend on the confirmed location of the borehole, which will be clarified at pre-construction stage. The existing OHL (N route) tower to be removed and its associated access is downgradient of the PWS property and tower removal will not impact the PWS.

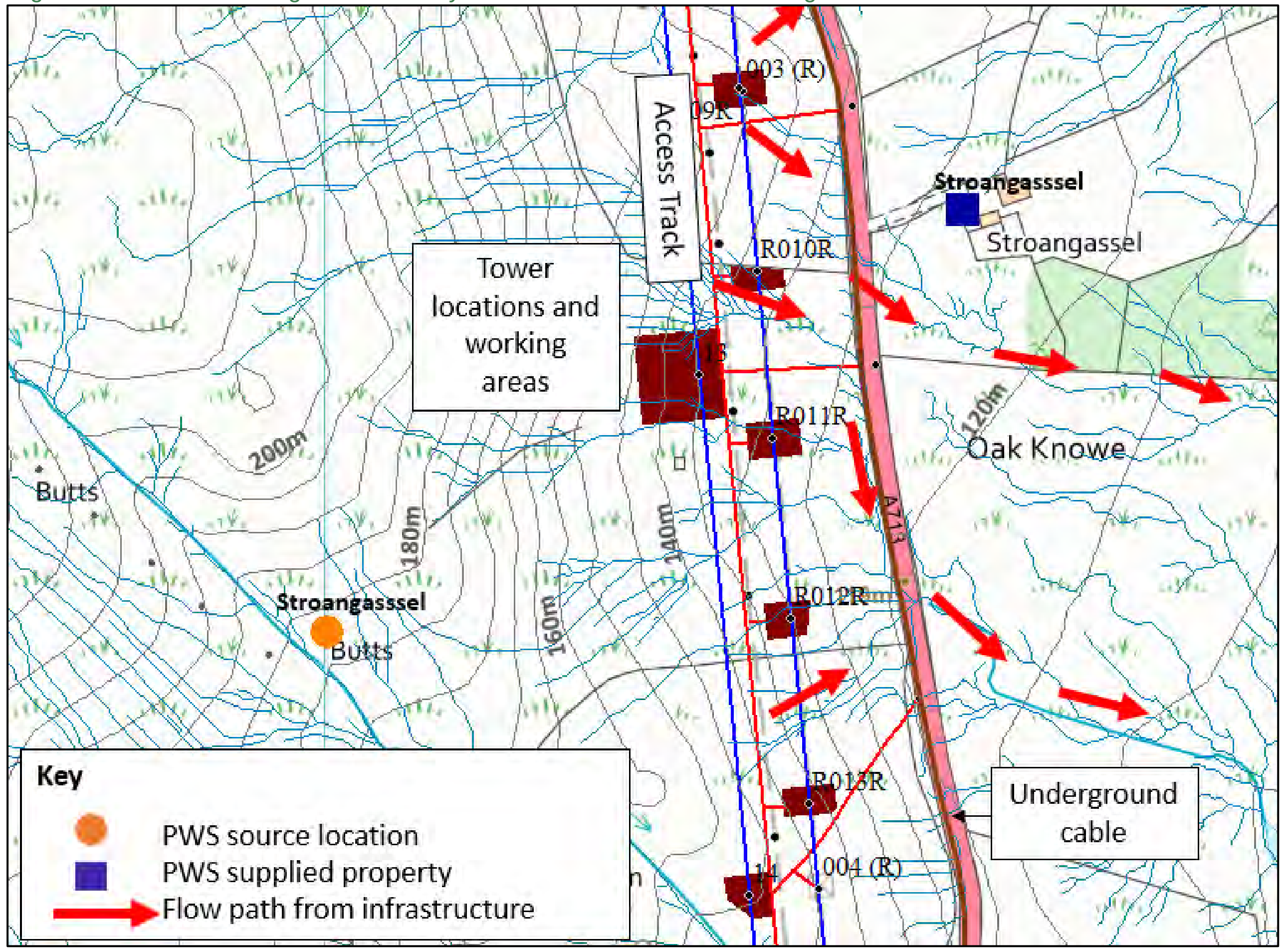
Figure 5: Flow routing and nearby infrastructure for Phail Barcris PWS



Stroangassel (PG and CK connections)

9.3.22 The source of the Stroangassel PWS is a spring. The source location was visited during the site survey and no water supply structure was observed. The PWS supplies Stroangassel Farm (located on the east side of the A713 road) and there will be pipework from the source to the property. The location of the pipework will be identified prior to construction. The PWS source is located upgradient of the infrastructure and is ~247m west of an access track and ~222m west of tower 13. The underground cable will be installed in the verge of the A713, ~70m west of the property. Flow routing analysis (Figure 6) shows that surface water flow paths from the infrastructure is to the east and will not impact the PWS source or the property. However, there is a risk that any PWS pipework connecting the source to Stroangassel property may be affected during construction and cable installation and locations of pipework will be identified and avoided during construction. With embedded mitigation measures in place during construction, the magnitude of effect on the PWS is considered to be negligible resulting in an effect significance of none.

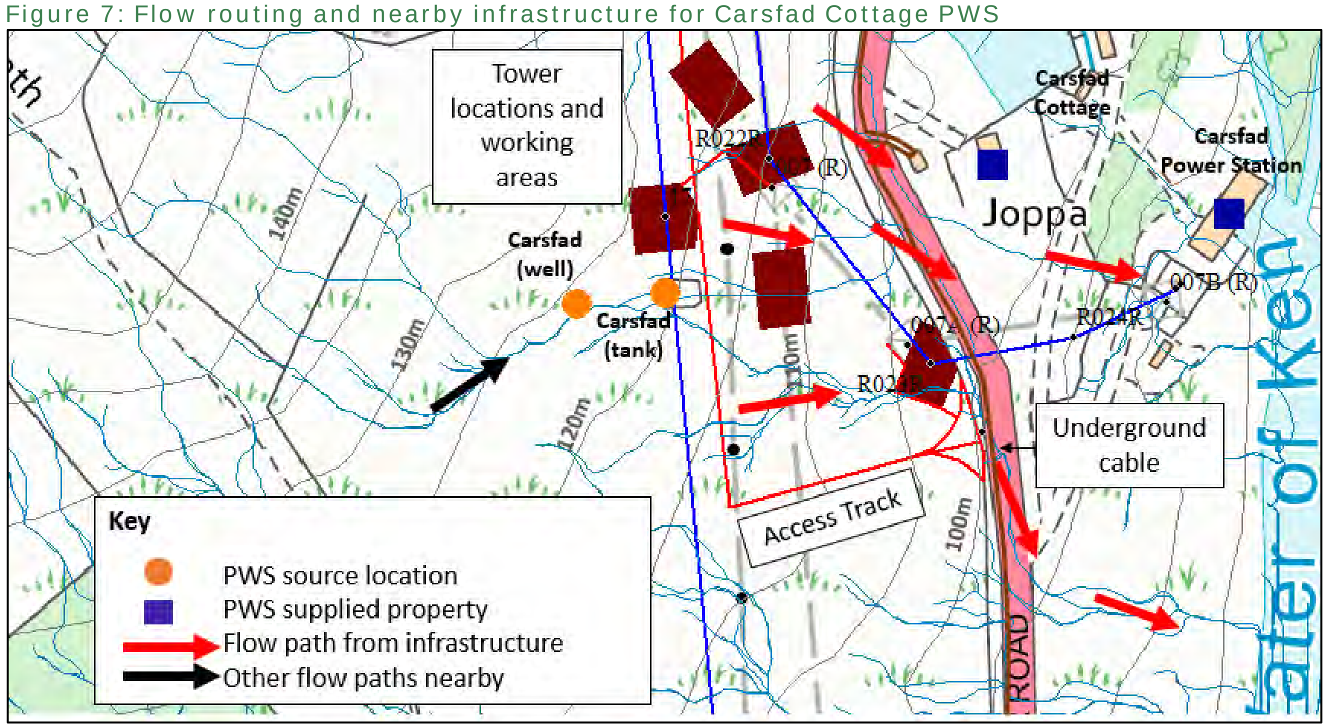
Figure 6: Flow routing and nearby infrastructure for Stroangassel PWS



Carsfad (PG and CK connections and R route)

9.3.23 The source of the Carsfad Cottage PWS is a groundwater spring located upgradient of the KTR infrastructure. Two structures were observed during the site survey as part of this PWS; a covered well and a covered tank located ~35m downgradient of the well. The location of this infrastructure was taken into account during design iterations of the KTR Project. However, the OHL line will be above the tank and there are construction working areas for the towers ~17m north and ~35m east of the PWS tank. The well and tank are ~52m and 16m upslope of the access track, respectively. The underground cable will be installed in the verge of the A713 road, ~22m west of Carsfad Cottage. Flow routing analysis (Figure 7) shows that any surface runoff created during infrastructure construction will flow to the east of the access track and OHL works and will not impact where the Carsfad Cottage PWS draws water. However, given the proximity to the source, care will need to be taken during construction to ensure the supply is not affected. The supplied properties (Carsfad Cottage and Carsfad Power Station) are on the other side of the A713 road from the infrastructure; the location of the pipework connecting the source to the properties is unknown and will be identified and avoided during construction. With embedded mitigation measures in place during construction, the magnitude of effect on the PWS is considered to be negligible resulting in an effect significance of none. However, given the proximity of the works to the source, monitoring of water quality of this PWS will be undertaken before and during construction.

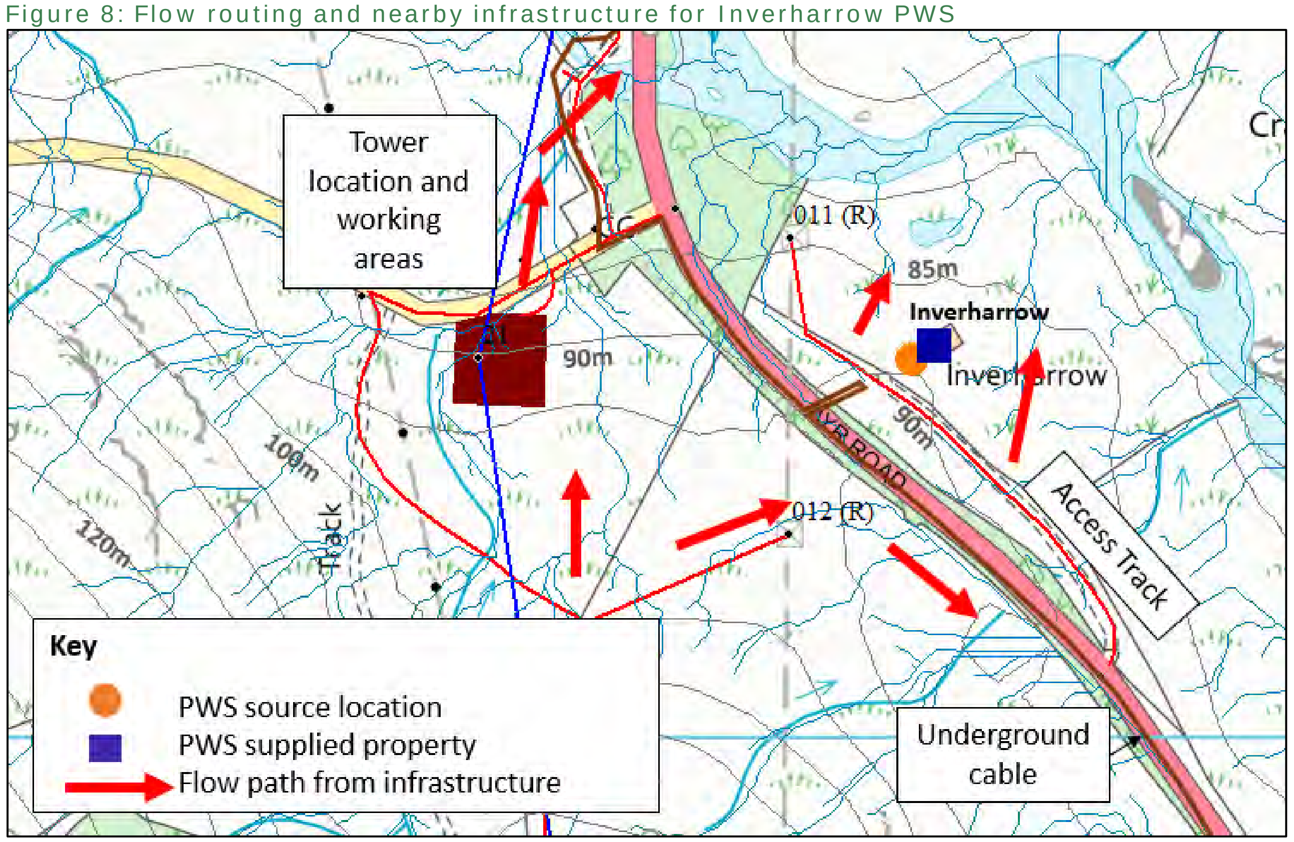
Figure 7: Flow routing and nearby infrastructure for Carsfad Cottage PWS



Inverharrow (PG connection and R route)

9.3.24 The source of the Inverharrow PWS is a borehole located adjacent to the supplied property. The PWS source is ~20m north-east of an access track that will be used for the removal of the existing OHL (R route) and ~196m east of a tower 21. The route of the underground cable is ~28m west of the PWS source as it supplies electricity to the property. Flow routing analysis (Figure 8) shows that most surface runoff created during infrastructure construction will flow north or north-east, entering the Polharrow Burn and Water of Ken upstream of the PWS and is unlikely to impact the PWS. The access route for removal of the R route drains towards the PWS but will only be used for a short period of time and is likely to be comprised of temporary matting, and no excavation works are anticipated. The UGC will be installed via an open cut trench to a depth of ~1m. Given the trench is 30m from the borehole source there may be an impact on the quantity and quality of water during the construction and installation of the trench. Installation of the UGC on this short section off the A713 road will take less than 1 week and any effect will be temporary. However, monitoring of water quality and quantity of this PWS will be undertaken during UGC installation. The magnitude of effect on the PWS is considered to be minor resulting in an effect of minor significance.

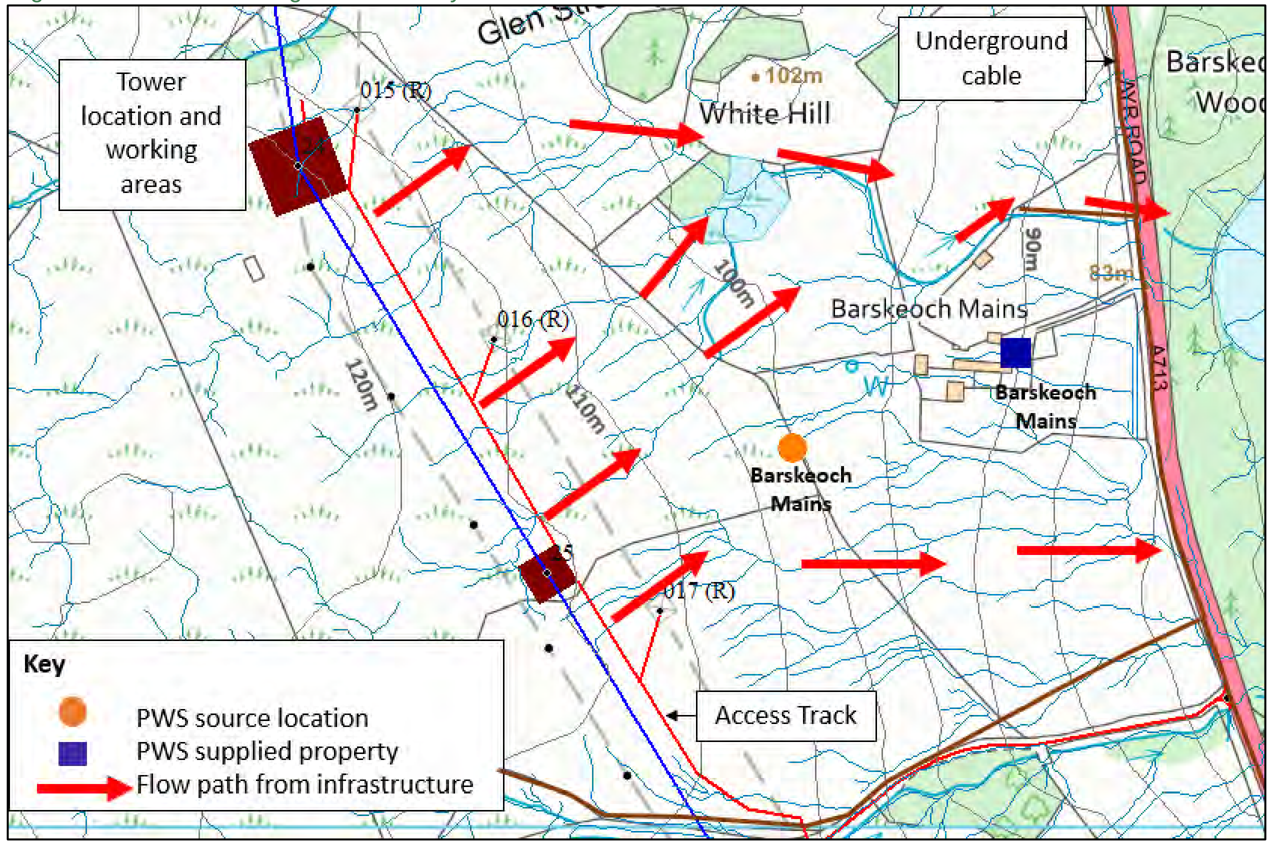
Figure 8: Flow routing and nearby infrastructure for Inverharrow PWS



Barskeoch Mains (PG connection and R route)

9.3.25 The source of the Barskeoch Mains PWS is a spring located to the west of the supplied property (Figure 9). No water supply structure was observed during the site walkover survey. The PWS source is located ~150m east of tower 25 and its access track and over 200m from the underground cable route. Flow routing analysis shows that any surface runoff created during infrastructure construction will flow east, entering the watercourse to the north of the PWS and the source spring is unlikely to be impacted The existing OHL Tower 17R to be removed and its access is ~125m upgradient of the PWS source. With embedded mitigation during construction and tower removal, the magnitude of effect on the PWS is considered to be negligible resulting in an effect significance of none.

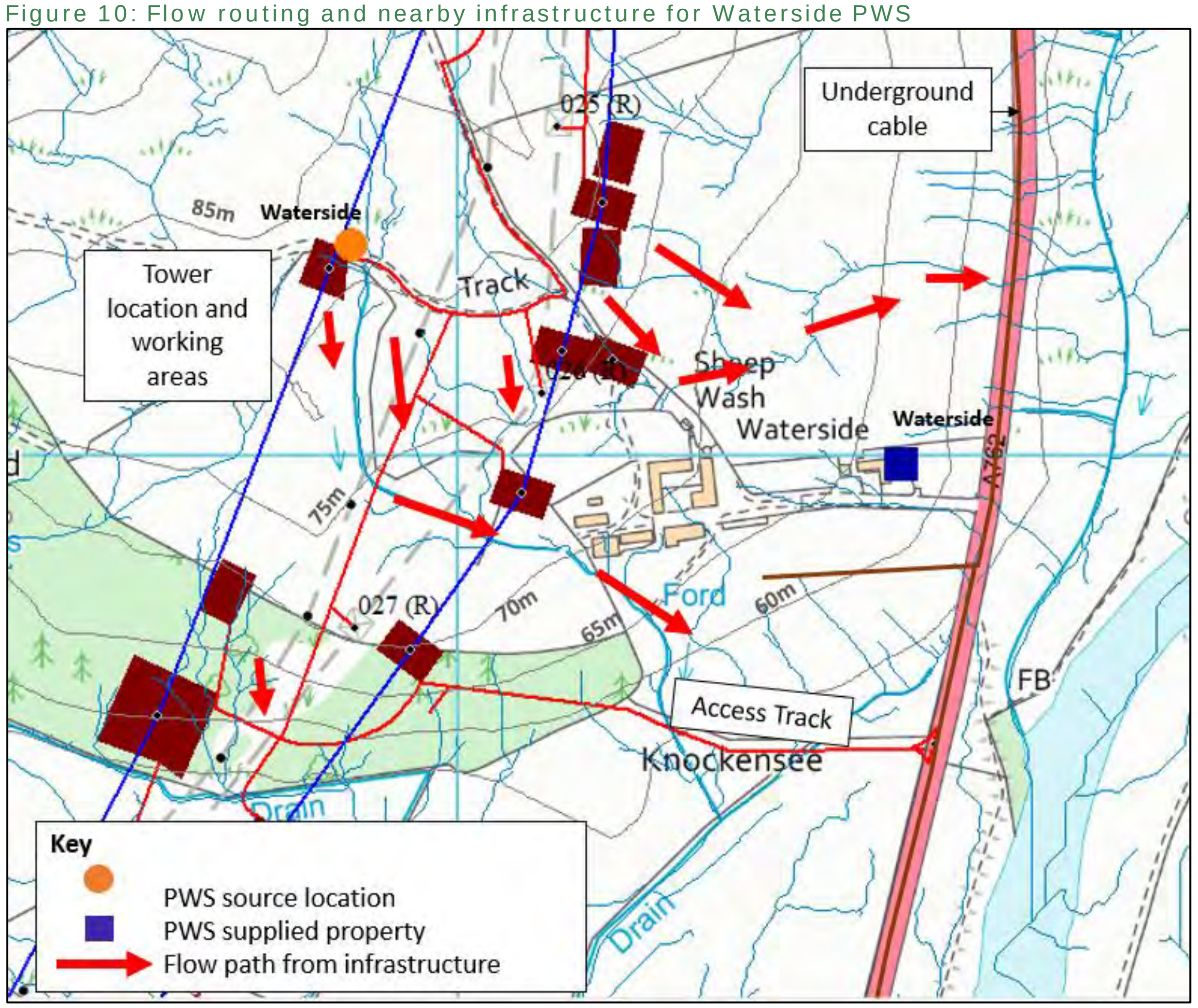
Figure 9: Flow routing and nearby infrastructure for Barskeoch Mains PWS



Waterside (PG and EG connections and R route)

9.3.26 The source supplying the Waterside PWS is surface water. During the site survey, only rubble was found at the source location, appearing to be an old outtake from a watercourse; no operational outtake was observed. This will be investigated further prior to construction in accordance with the CDEMP. The PWS source location is ~6m north of the access track to tower 33 and ~3m from its working area and the supplied property is located ~198m east of the access track and downslope of several working areas for EG wood poles and towers to be removed on the existing OHL (R route). The underground cable route is ~48m from the property and over ~280m from the source and will not impact the PWS. Flow routing analysis (Figure 10) shows that any surface flow paths from infrastructure will flow south and south-east, routed to the north and south of the Waterside property. However, due to the close proximity of the PWS source to both the access track and the proposed tower the magnitude of impact is considered to be of minor magnitude resulting in an effect of minor significance. Monitoring of water quality of this PWS will be undertaken before and during construction.

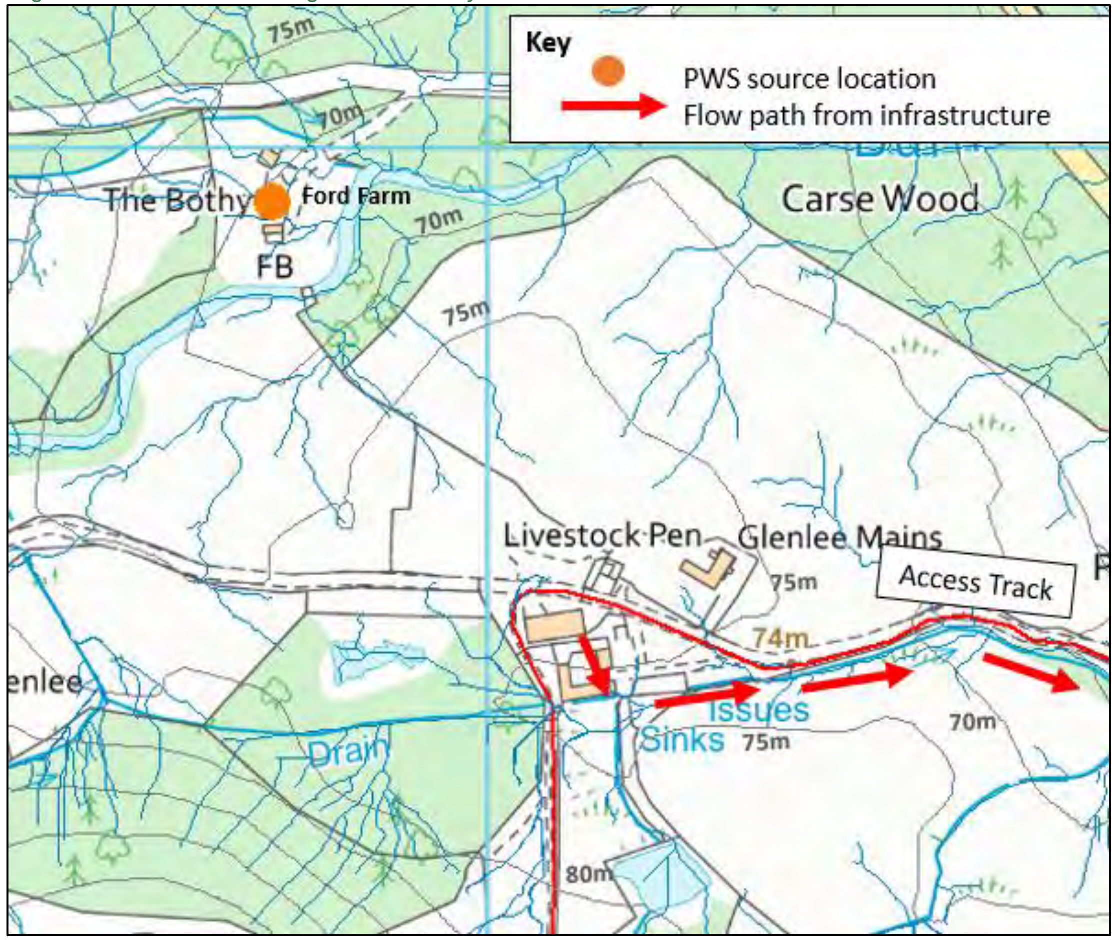
Figure 10: Flow routing and nearby infrastructure for Waterside PWS



Ford Farm (GT connection and BG deviation)

9.3.27 The source of the Ford Farm PWS is unknown. The PWS is located ~226m north-west of an existing access track that will used for construction access to BG deviation towers and several GT towers. There are no excavations within 250m of the PWS. The PWS is on the opposite side of the Glenlee Burn from the access track (Figure 11) and is not in the same catchment as the access track or any KTR infrastructure Flow routing analysis shows that flow paths from the access track will flow south and east of the access track and the PWS will not be impacted. Thus, the magnitude of effect on the PWS is negligible resulting in an effect significance of none.

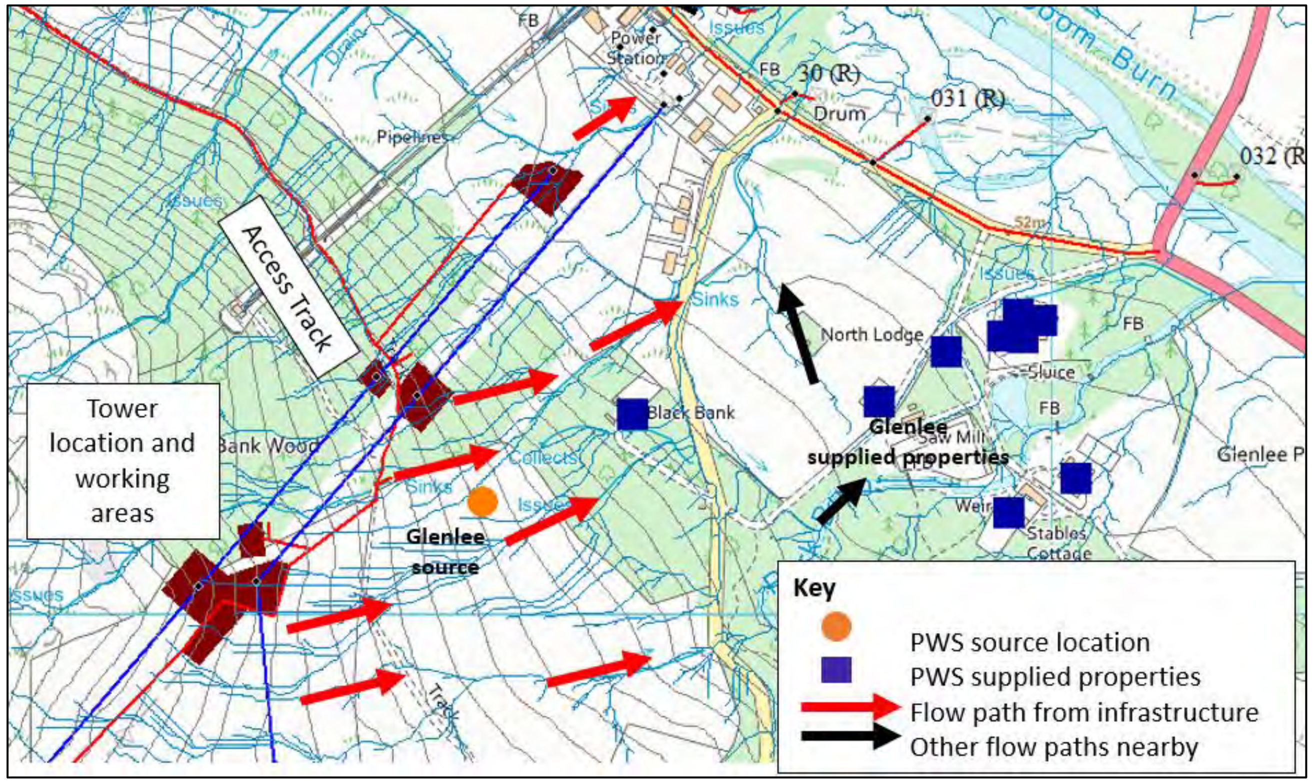
Figure 11: Flow routing and nearby infrastructure for Ford Farm PWS



Glenlee (GT connection and BG deviation)

9.3.28 The source supplying the Glenlee PWS is a groundwater spring. No access to the source location was available during the site survey. The Glenlee PWS source is located ~84m east of an access track between towers 2 and 3 and ~100m south-east of tower 2. Flow routing analysis (Figure 12) shows that surface water flow paths from the infrastructure are to the east, both directly north-east and south-east of the Glenlee PWS source. The source location is potentially hydrologically and hydrogeological connected to the proposed infrastructure location. Embedded mitigation (including SUDS and standard good practice) during construction will reduce the risk, and the magnitude of effect on the PWS is considered to be minor resulting in an effect of minor significance. The Glenlee PWS supplies ten domestic properties, the locations of which are also shown in Figure 12. With the exception of the Blackbank property as shown on Figure 12, all the supplied properties are greater than 250m from the infrastructure. Given the importance of this supply, monitoring of this PWS will be undertaken before, during and after construction (see Monitoring section below).

Figure 12: Flow routing and nearby infrastructure for Glenlee PWS



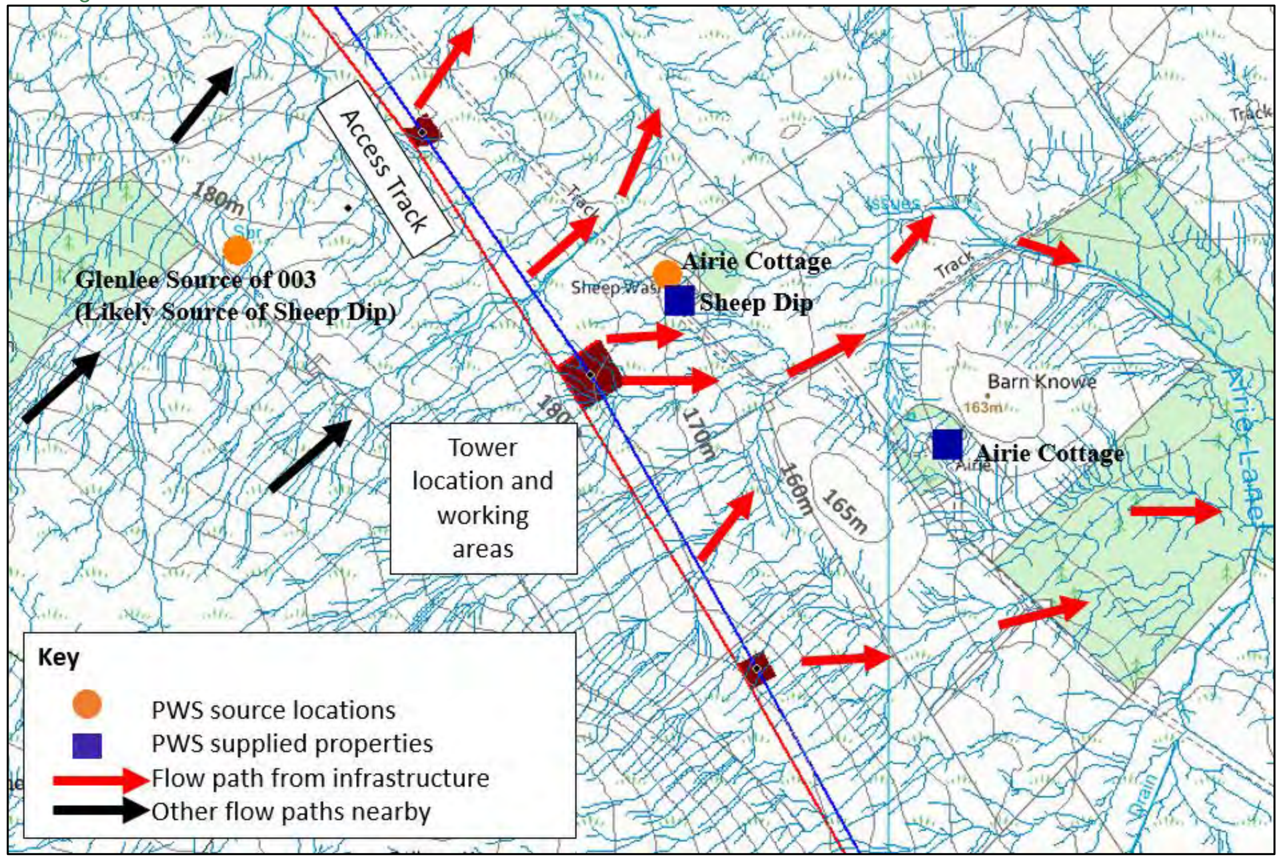
Glenlee Sheep Dip (GT connection)

9.3.29 The source supplying the Glenlee Sheep Dip is a spring, located at Glenlee Source of 003[4], although this was not confirmed during the site survey. The Glenlee Sheep Dip (for livestock) is located ~82m north-east of an access track to tower 8. Flow routing analysis (Figure 13) shows that any surface runoff created during infrastructure construction will flow east of the access track and will not impact the source location, which is ~186m west of the access track and upgradient of the infrastructure. However, surface runoff could flow towards the Glenlee Sheep Dip itself. Embedded mitigation measures during construction will reduce the risk and the magnitude of effect on the PWS is considered to be negligible resulting in an effect significance of none.

Airie Cottage (GT connection)

9.3.30 The source of the Airie Cottage PWS is a groundwater spring. It is understood this is from 30m deep groundwater from Gallows Knowe Hill to the west. This is a new well, as it is understood that the old well became dry[5]. The PWS source is located ~86m east of an access track and tower 8. However, flow routing analysis (Figure 13) shows that any surface runoff created during infrastructure construction will flow to the north and south of the PWS and will not impact the source or the property resulting in an effect significance of none. However, pipework between the source and the property will be identified prior to construction and will be avoided during the works. Given the proximity of the Airie Cottage PWS source and property, monitoring of this PWS will be carried out during construction.

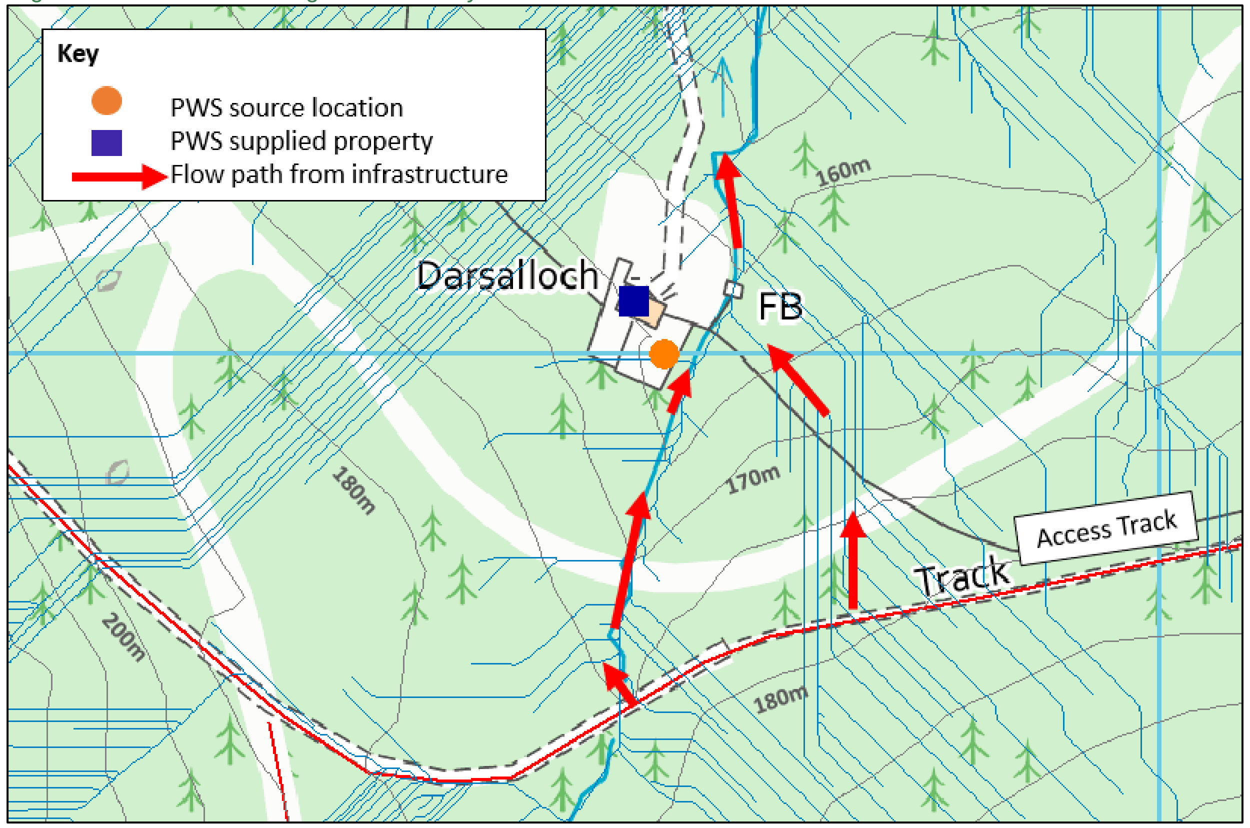
Figure 13: Flow routing and nearby infrastructure for Glenlee Sheep Dip PWS and Airie Cottage PWS



Darsalloch (GT connection)

9.3.31 The source of the Darsalloch PWS is surface water. The Darsalloch source and property are located ~121m and ~145m respectively north of an existing access track to be used during construction. There are no excavations within 250m of the PWS. Flow routing analysis (Figure 14) shows that any polluted surface runoff from the access track created during construction will flow north, entering the watercourse upstream of where the Darsalloch PWS draws water. Embedded mitigation, including SUDS on the access tracks, during construction will reduce the risk. The magnitude of effect on the PWS is considered to be minor resulting in an effect of minor significance. Monitoring of this PWS will be undertaken before, during and after construction.

Figure 14: Flow routing and nearby infrastructure for Darsalloch PWS

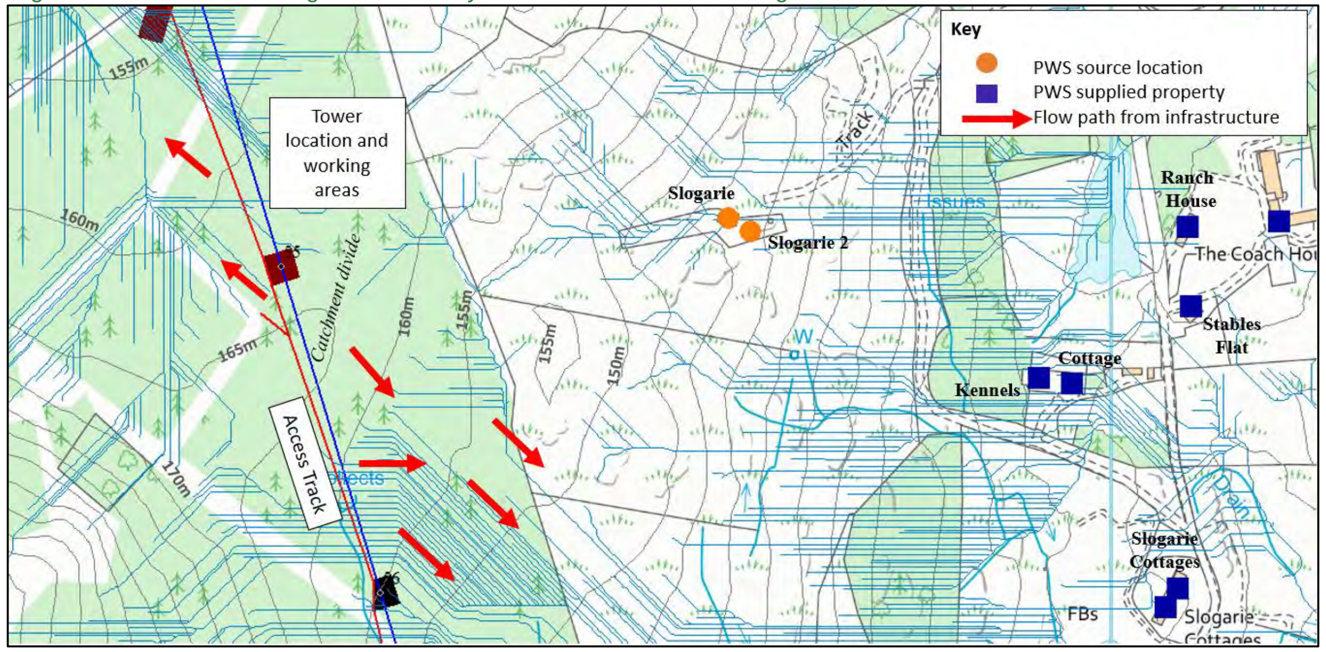


[4] Informed from discussions with the landowner.
[5] Informed from discussions with the landowner.

Slogarie (GT connection)

9.3.32 The source of the Slogarie PWS is a spring. During the site survey, two open reservoirs with sand filters were observed, with inflow entering from a piped spring. The location of the two reservoirs are labelled as Slogarie and Slogarie 2 (Figure 15). These reservoirs supply eight properties in Slogarie Estate. Although the PWS source reservoirs are located over ~360m east of the GT connection infrastructure, this PWS has been assessed in response to a consultation request from a member of the public. Flow routing analysis (Figure 15) shows that any surface runoff created during infrastructure construction will flow either north-west (down the north-western side of Bennan hill) or south-east (down the south-eastern side of the hill). As the access track is located on the western side of the hilltop, it is unlikely that surface runoff will flow down the north-eastern side of the hill towards the Slogarie PWS source and associated properties. Hence it will not be impacted by the project resulting in an effect significance of none.

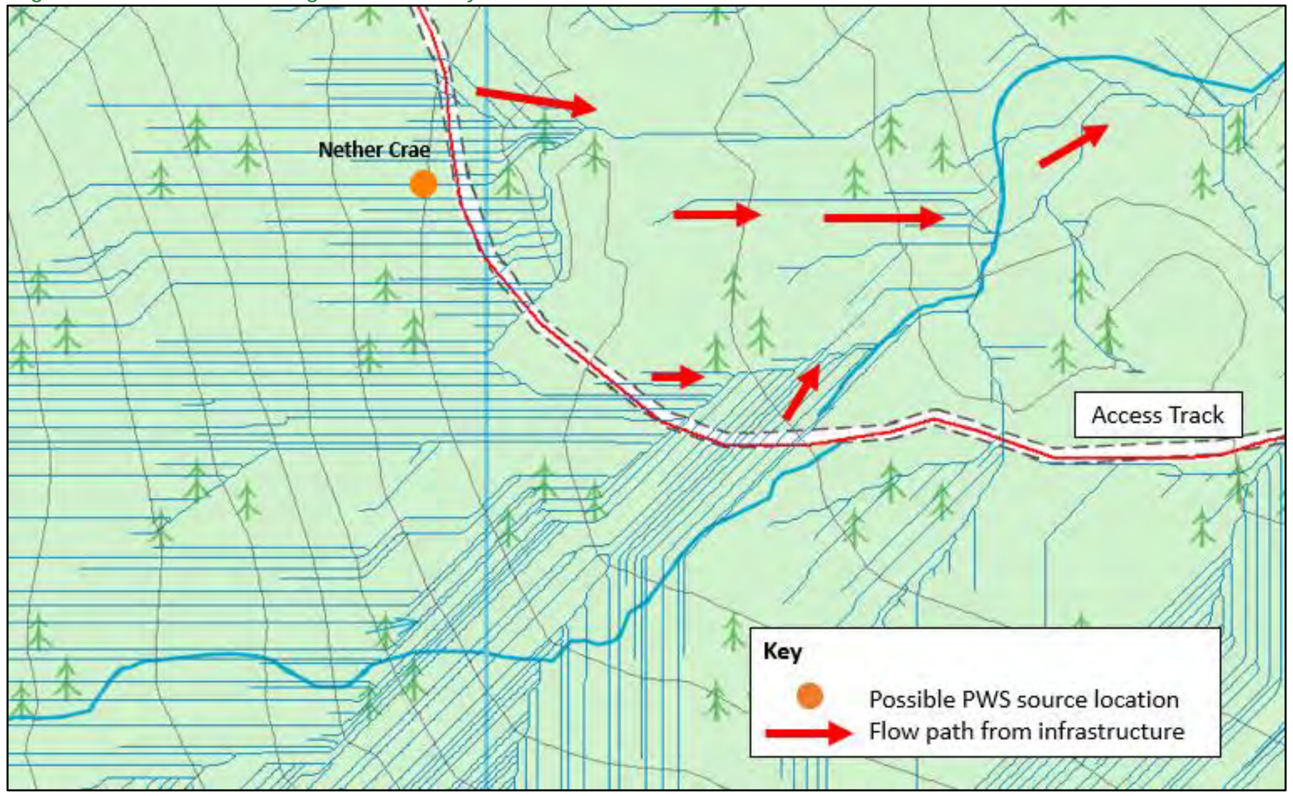
Figure 15: Flow routing and nearby infrastructure for Slogarie PWS



Nether Crae (GT connection)

9.3.33 Data from the DWQRS online map indicates that the source of the Nether Crae PWS is located ~14m west of an existing access track (Figure 16). However, additional information from D&GC indicates that the Nether Crae source is actually from a spring ~850m further north and closer to the Nether Crae property. This is outside of the 250m buffer and will not be impacted by the development (see Figure 9.2.12 in the EIA Report). It is likely that the PWS source from the online map is incorrect, given the distance between the source and the property; however, this will be confirmed prior to construction and it is assessed as a worst-case scenario, as per Figure 16. Flow routing analysis (Figure 16) shows that any surface runoff created during infrastructure construction will flow east of the access track and not impact the Nether Crae PWS source resulting in an effect significance of none. However, given the close proximity of the possible PWS source to the access track, care will be taken not to disrupt the supply, particularly given that the location of the source is unknown. The location will be confirmed prior to construction by a detailed survey and location specific mitigation measures provided as necessary.

Figure 16: Flow routing and nearby infrastructure for Nether Crae PWS

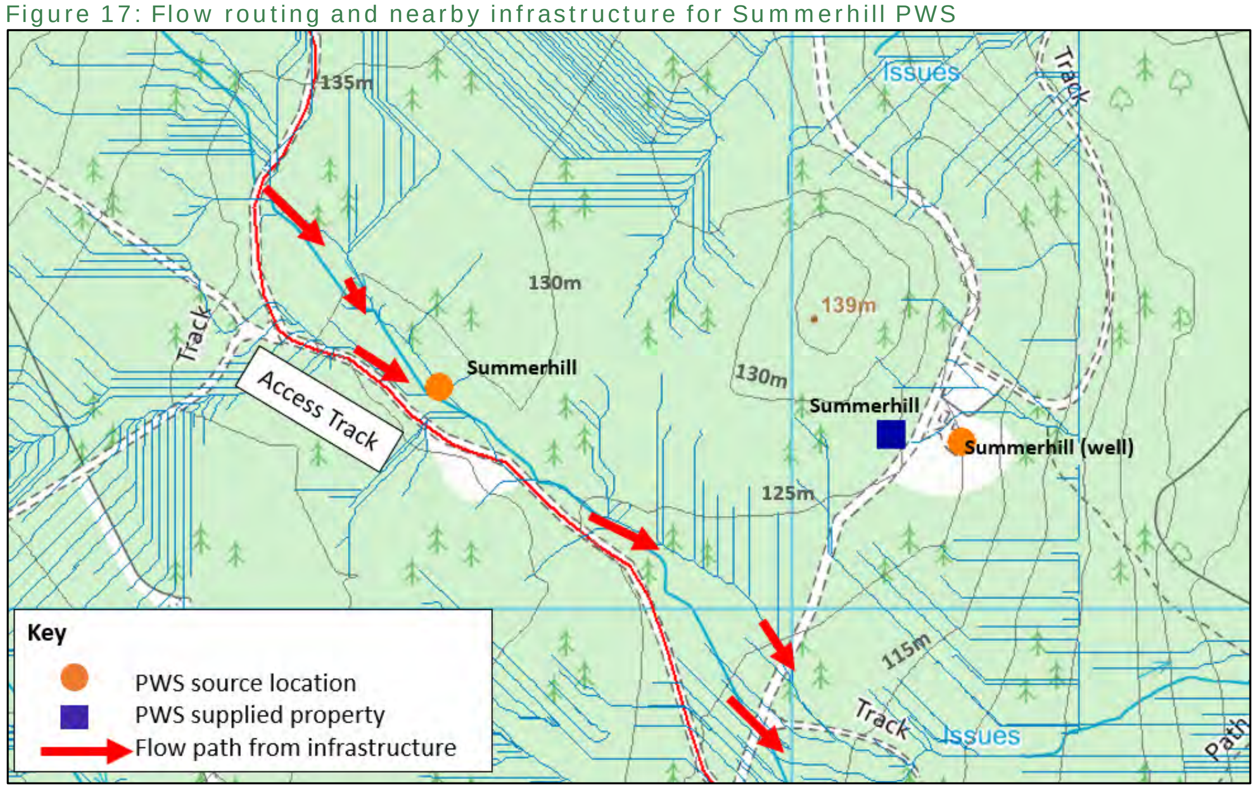


Summerhill (GT connection)

9.3.34 Two different supply locations for the source of the Summerhill PWS were provided; from the DWQRS online maps and D&GC data (Figure 17). Data from the online maps indicate the PWS source is from a burn up the hill to the west of the property, ~25m east of an existing access track. However, no offtake from the burn was observed at this location during the site survey and a PWS source here could not be located. It is possible that the PWS source data from the online maps is incorrect; this will be confirmed prior to construction. D&GC data indicate that the supply source is a well to the east of the property, which was identified during the site survey at this location (Photo 2). The well and the Summerhill property are located ~222m and ~185m respectively east of an existing access track that will be used during construction. Flow routing analysis shows that neither will be impacted by construction traffic on the access track, resulting in an effect significance of none.

Photo 2: Covered manhole at Summerhill PWS location; potential well

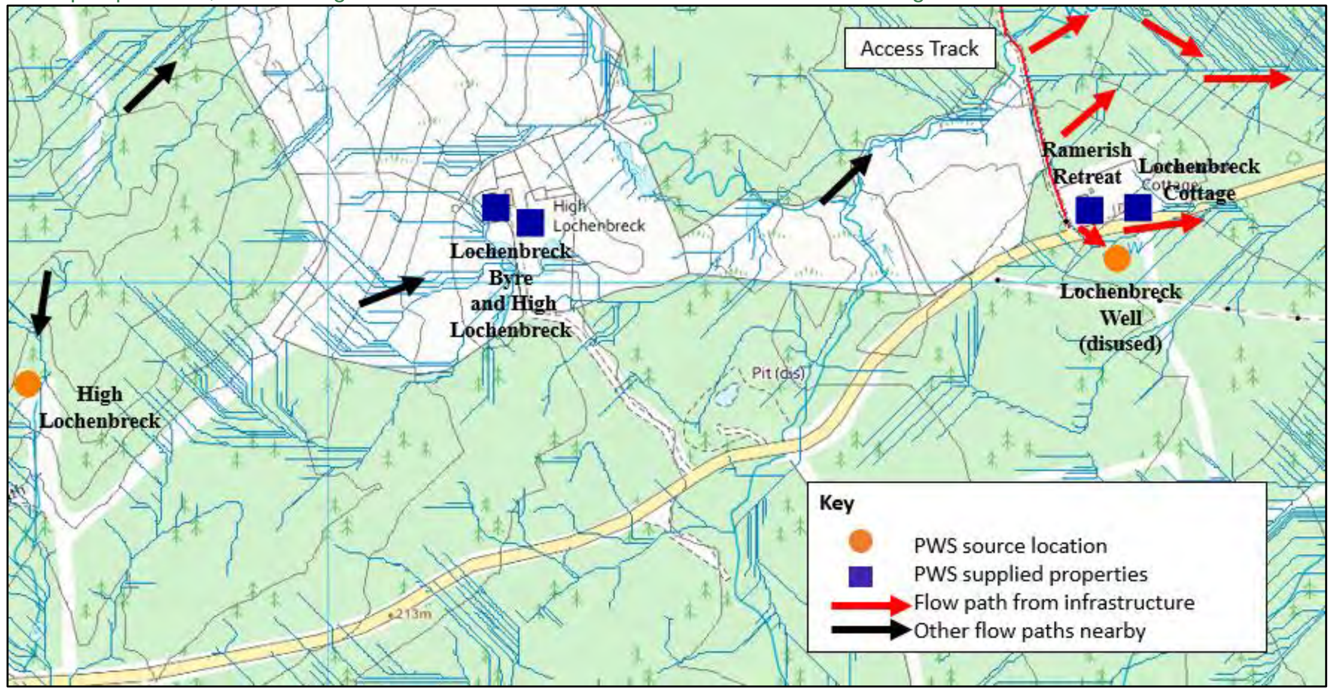
Figure 17: Flow routing and nearby infrastructure for Summerhill PWS



High Lochenbreck (GT connection)

9.3.35 The source of the High Lochenbreck PWS is a groundwater spring, which is located over 1km west of the GT infrastructure and associated access tracks and will not be impacted by the development (Figure 18). The High Lochenbreck PWS supplies four properties, two of which are close to an existing access track that will be used during construction. The source spring flows into a covered tank at the source location before flowing east and downhill towards High Lochenbreck House and Lochenbreck Byre, and finally continuing down to the two properties of Ramerish Retreat and Lochenbreck Cottage, which are located ~25m and ~80m respectively east of the access track. Flow routing analysis (Figure 18) shows that any contaminated surface runoff from the access track during construction will run to the north and directly south of the two properties and will not impact the properties resulting in an effect significance of none. However, care will be taken not to damage supply pipes running from the source in the west (High Lochenbreck) to the properties.

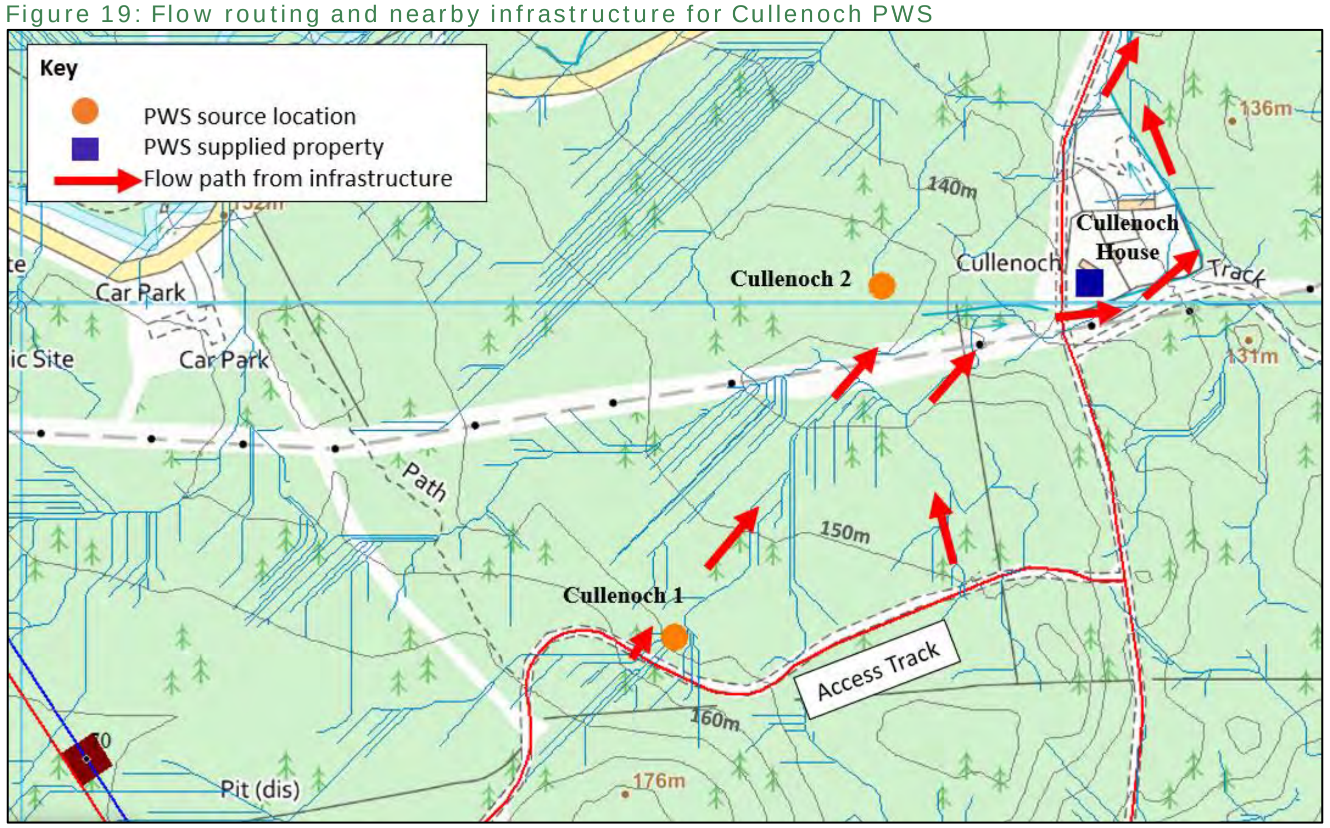
Figure 18: Flow routing and nearby infrastructure for High Lochenbreck PWS, which supplies four properties, including Ramerish Retreat and Lochenbreck Cottage



Cullenoch (GT connection)

9.3.36 The source of the Cullenoch PWS is surface water, which comes from a surface water catchment to the south west of the property (Figure 19). The surface water passes under the upper forestry track via two culverts (Cullenoch 1) and flows as open ditches down the hillside to a small holding pond (Cullenoch 2); from there it flows into a tank and is piped to the house, passing another forestry track. Both tracks will be used during construction of the GT connection. It is understood from discussions with the property owner that the pond has been previously polluted from forestry work and subsequent road runoff. The two Cullenoch source structures and the property are located ~22m north-east, ~118m west and ~18m east of an existing access track, respectively. Flow routing analysis shows that any surface runoff created during construction will flow north-east of the western access track, directly towards the Cullenoch 1 PWS source and open ditches and south of the holding pond (Cullenoch 2). Surface runoff created from the existing access track running north to south will flow around the Cullenoch property to the east. Embedded mitigation measures, including additional space for SUDS on the access tracks during construction will reduce the risk. The magnitude of effect on the PWS is considered to be minor resulting in an effect of minor significance. Given the proximity of the Cullenoch PWS infrastructure and property, monitoring of this PWS will be carried out during construction.

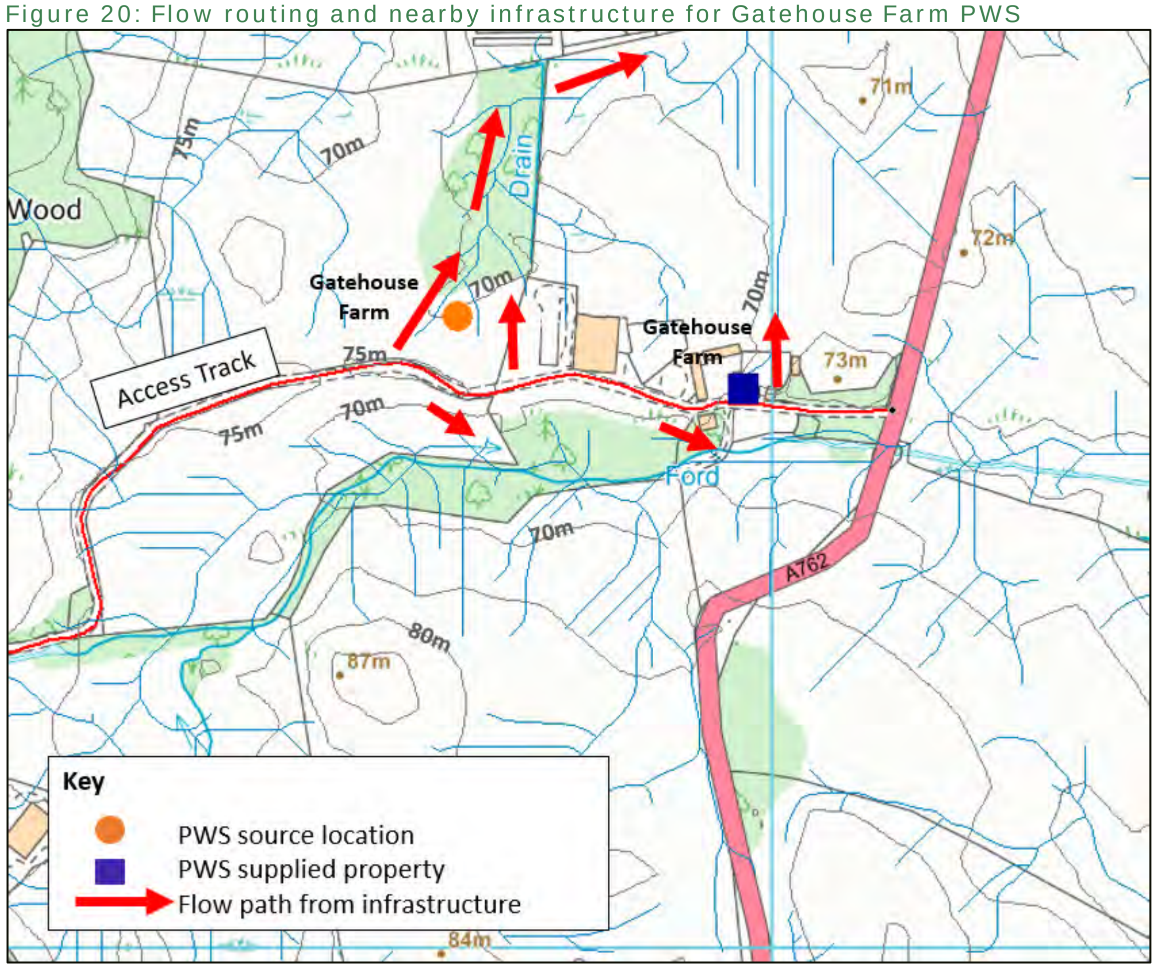
Figure 19: Flow routing and nearby infrastructure for Cullenoch PWS



Gatehouse Farm (GT connection)

9.3.37 The source of the Gatehouse Farm PWS is a spring. Discussions with the property owner indicate that the spring has been capped with a manhole cover and concrete surround, although visual confirmation could not be made during the site survey. The source and the property are ~40m and ~9m north of an existing access track. The access track sits at a higher elevation than ground levels to the north and south and flow routing analysis (Figure 20) shows that any surface runoff created during construction will flow both north and south from the access road, potentially affecting the Gatehouse PWS and property. However, given the source is capped and protected the magnitude of the effect is considered to be negligible resulting in an effect significance of none. However, pipework between the source and the property will be identified prior to construction and will be avoided during the works.

Figure 20: Flow routing and nearby infrastructure for Gatehouse Farm PWS



Cot Cottage (GT connection)

9.3.38 The source for the Cot Cottage PWS is a spring, which is capped with a manhole (Photo 3). The Cot Cottage PWS and property are located ~165m east of an existing access track. Flow routing analysis (Figure 21) shows that any surface runoff created during construction will flow to the north, avoiding the Cot Cottage PWS, which will thus not be impacted resulting in an effect significance of none.

Photo 3: Capped spring source for Cot Cottage PWS and property

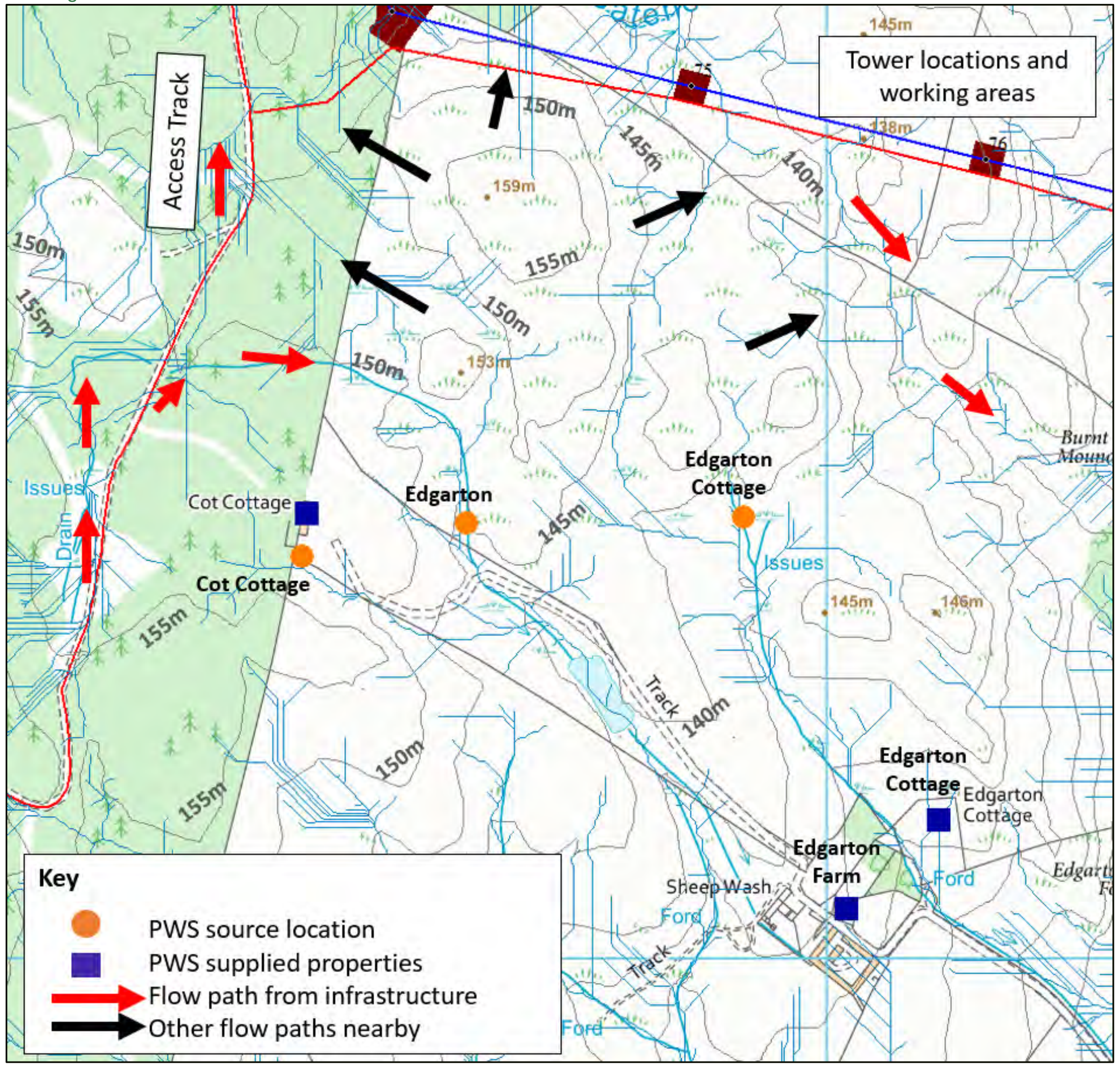
Edgarton (GT connection)

9.3.39 The source of the Edgarton PWS is a spring/surface watercourse which is located ~280m east of an existing access track and supplies Edgarton Farm. Although this is just outside the 250m buffer, flow routing analysis shows that an unnamed watercourse, which passes under the existing access track to be used during construction, flows directly towards the source location (Figure 21), which indicates the source could potentially be impacted. The source location was visited during the site survey and is uncapped (Photo 4) and was noted to be fed from surface water and groundwater from the forested area to the west of the source. With embedded mitigation measures, including SUDS, at the crossing location and given the distance of the source from the access track, the effect during construction on the source is considered to be negligible resulting in an effect significance of none.

9.3.40 The source for Edgarton Cottage is a spring located ~320m south of a new access track and ~350m south of a new tower. This is outside the 250m buffer and flow routing analysis (Figure 21) shows that flow paths are to the north, hence the PWS source and property is not considered to be hydrogeologically or hydrologically connected to the infrastructure and it is not considered in the assessment.

Photo 4: Source location for Edgarton PWS

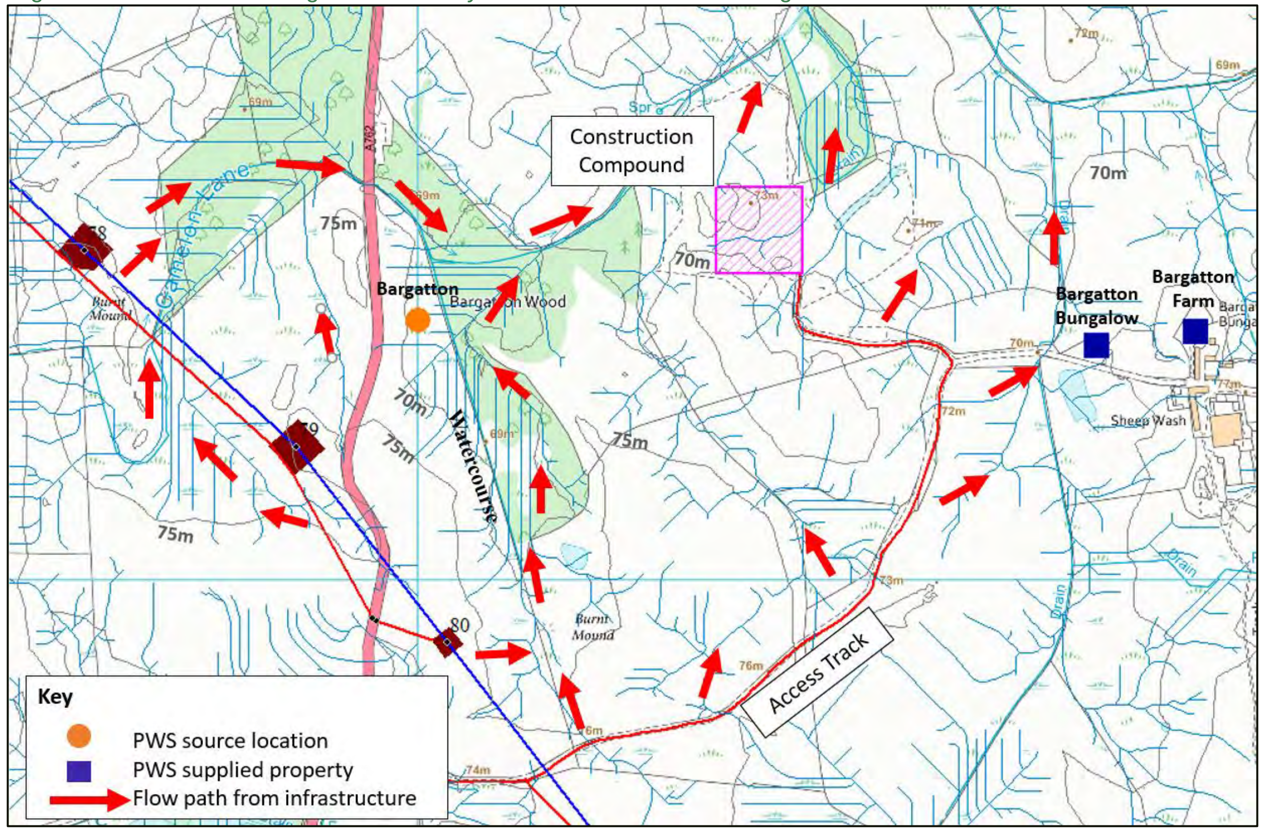
Figure 21: Flow routing and nearby infrastructure for Cot Cottage, Edgarton and Edgarton Cottage PWS



Bargatton (GT connection)

9.3.41 The source for the Bargatton PWS is a spring; a bog and a small watercourse were also identified close to the source location during the site survey. The Bargatton PWS source is located ~225m north-east of a new access track and ~180m north-east of proposed tower GT79. Ground levels at the source location are approximately 5m lower in elevation than levels at the tower location, and flow path analysis indicates it may be hydrogeologically connected, although separated by the main road. The two properties that are supplied (Bargatton Bungalow and Bargatton Farm) are located ~167m and ~285m east of an existing access track to construction compound 6, respectively (Figure 22). Flow routing analysis shows that any surface runoff created during infrastructure construction will flow both to the north-west and north-east of the western access track, close to the Bargatton source. The magnitude of effect on the PWS is considered to be minor resulting in an effect of minor significance. While flow routing shows that surface runoff flows to the west of the Bargatton property, pipework between the source and the property will be identified prior to construction and will be avoided. Given the proximity of the source to the access track and tower, monitoring will be undertaken.

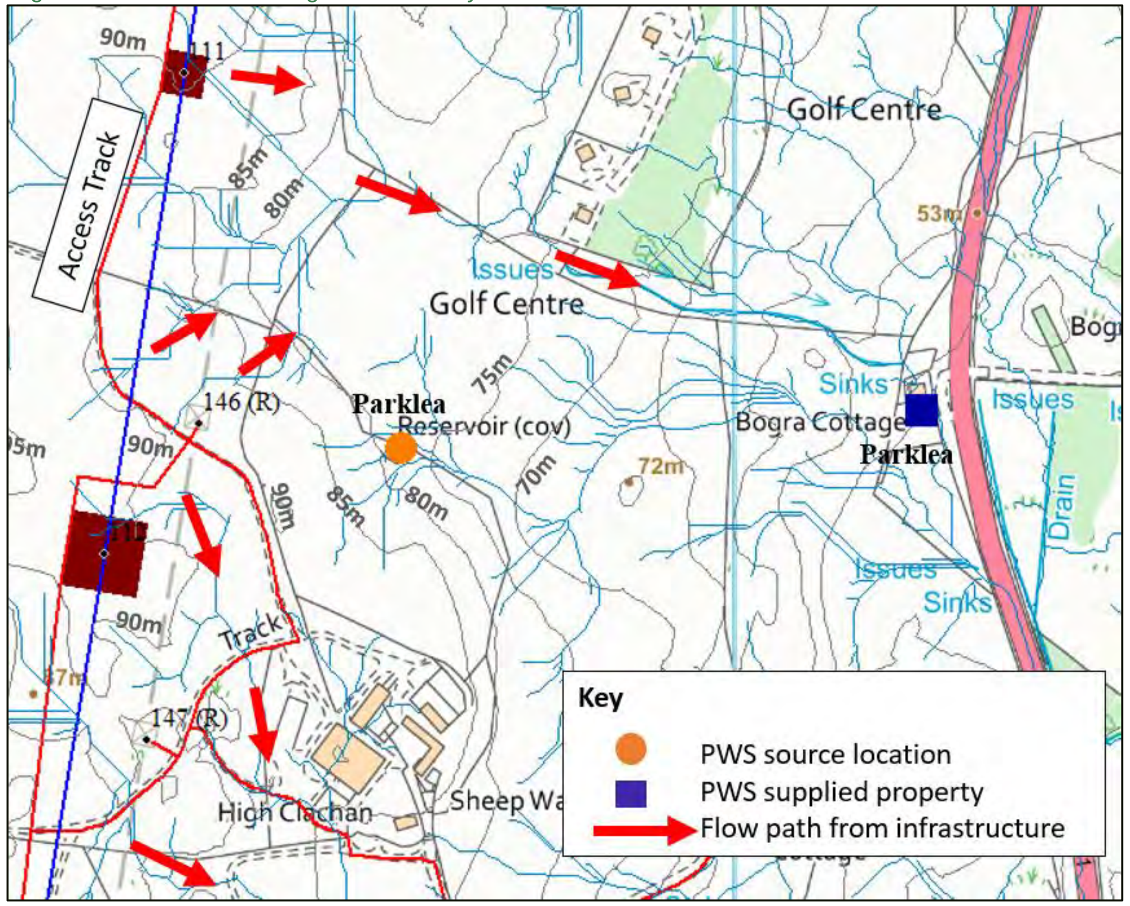
Figure 22: Flow routing and nearby infrastructure for Bargatton PWS



Parklea (GT connection and R route)

9.3.42 The source of the Parklea PWS is a spring. The site survey identified a covered tank with two manholes and the PWS feeds one domestic property downhill from the source site, close to the A711 (see Figure 23). The Parklea PWS source is located ~94m east of an access track to GT towers and ~158m north-east of tower 112. Flow routing analysis shows that any surface runoff created during infrastructure construction removal of existing towers on R route will flow west of the ridgetop located just west of the Parklea PWS (the access track is just downslope of the western side of the ridgetop). Surface runoff will also flow to the east both north and south of the PWS, indicating it is unlikely to be affected by the development resulting in an effect significance of none. However, given the proximity of the PWS source to the infrastructure, monitoring will be carried out during construction.

Figure 23: Flow routing and nearby infrastructure for Parklea PWS



PWS along Existing R Route (to be removed)

9.3.43 This section covers the R route where the existing OHL route deviates from the proposed KTR OHL route (i.e. on the eastern side of Loch Ken and north of tower GT94). Other PWS close to the existing OHL NR route are assessed in the section above due to their proximity to the KTR infrastructure.

9.3.44 There are 14 PWS sources identified within 500m of the existing R OHL route (Table 3). Access routes for removal will only be used for a short period of time and excavations for tower removal will not exceed a depth of 1m. On this basis, a 100m buffer zone from the R route was considered appropriate for detailed assessment as per SEPA guidance. Of the PWS identified, only three sources are within 100m of the removal towers and associated accesses (Table 4). All sources are for domestic use only. Additionally, there are 12 properties located within 100m of the OHL removal route and access tracks. The results of the flow path analysis is summarised below.

Table 3: Details of Private Water Supplies (PWS) sources within 500m of the existing R route

Nat. Grid Ref (source)	Source Name	Source Ref	Source Type	Type[1] (A or B)	No of Properties and Use[2]	Recent Sample /Result[3]
NX63381 80085	Grennan - Dalry	98000	Spring / Surface Watercourse	B	5	P: Sep 2011 (low pH)
NX64101 79197	Garplefoot	99395	Spring / Well	B	1	None
NX64473 77808	Cubbox	99296	Spring	B	3	None
NX65725 76386	Barnwalls	98947	Wells x 2	B	1	P: Mar 2018
NX64802 75907	Low Park	99706	Spring / Well	B	1	P: Feb 2018 (low pH)
NX65688 74302	Shirmers Farm	99928	Spring	B	1	None
NX65809 73716	Ringbane	99866	Spring	B	1	None
NX67647 72516	Auchrae Sauchs	-	Unknown	B	1	-
NX67744 72421	Little Drumrash	99670	Spring	B	2	P: Aug 2004
NX69793 71503	Fominoch	99354	Spring	B	1	None
NX70998 70605	Culdoach - Parton	99314	Spring	B	1	None
NX70911 69899	Parton Estate	98408	Surface Loch	B	6	P: Oct 2017 (high colour)
NX72100 69094	Barbershall	98930	Spring	B	1	None
NX72202 66299	Kenholm House	99550	Spring	B	1	None

[1]Type: Type A supplies are larger PWS, or those with a commercial activity, and are defined as Regulated supplies, which supply either a commercial activity or 50 or more people in domestic premises. These supplies are subject to regular testing by D&GC. Type B supplies are smaller supplies that serve only domestic properties (<50 persons).

[2]No of Properties and Use: D = domestic, C = commercial, L = livestock

[3]Sample Result: P = pass, F = fail

Table 4: Details of Private Water Supplies (PWS) sources and properties within 100m of the existing R route

Nat. Grid Ref	Source or Property Name	Property	Source /Source Type	Distance from Removal Route (m)	Flow Path Analysis Result	Likely Significant Effect
NX63381 80085	Grennan-Dalry		Spring	85	PWS not likely impacted	None
NX63718 79668	Curlew Cottage	Property		17	PWS not likely impacted	None
NX63727 79675	Plover Cottage	Property		17	PWS not likely impacted	None
NX63524 79884	Grennan Cottage	Property		15	PWS not likely impacted	None
NX63510 79847	Dairy Cottage	Property		40	PWS not likely impacted	None
NX63477 79866	Grennan Farm	Property		22	PWS not likely impacted	None
NX64321 77550	Cubbox Bungalow*	Property		22	PWS not likely impacted	None
NX64321 77602	Cubbox Farmhouse*	Property		51	PWS not likely impacted	None
NX64368 77606	Cubbox Farm Dairy*	Property		61	PWS not likely impacted	None
NX69445 71275	Fominoch Cottage*	Property		60	PWS not likely impacted	None
NX71445 70609	Culdoach*	Property		5	PWS not likely impacted	None
NX72100 69094	Barbershall		Spring	57	Potential impact on PWS	Minor
NX72160 69135	Barbershall	Property		14	Potential impact on PWS	Minor
NX72202 66299	Kenholm House		Spring	65	PWS not likely impacted	None
NX72179 66324	Kenholm House	Property		65	PWS not likely impacted	None

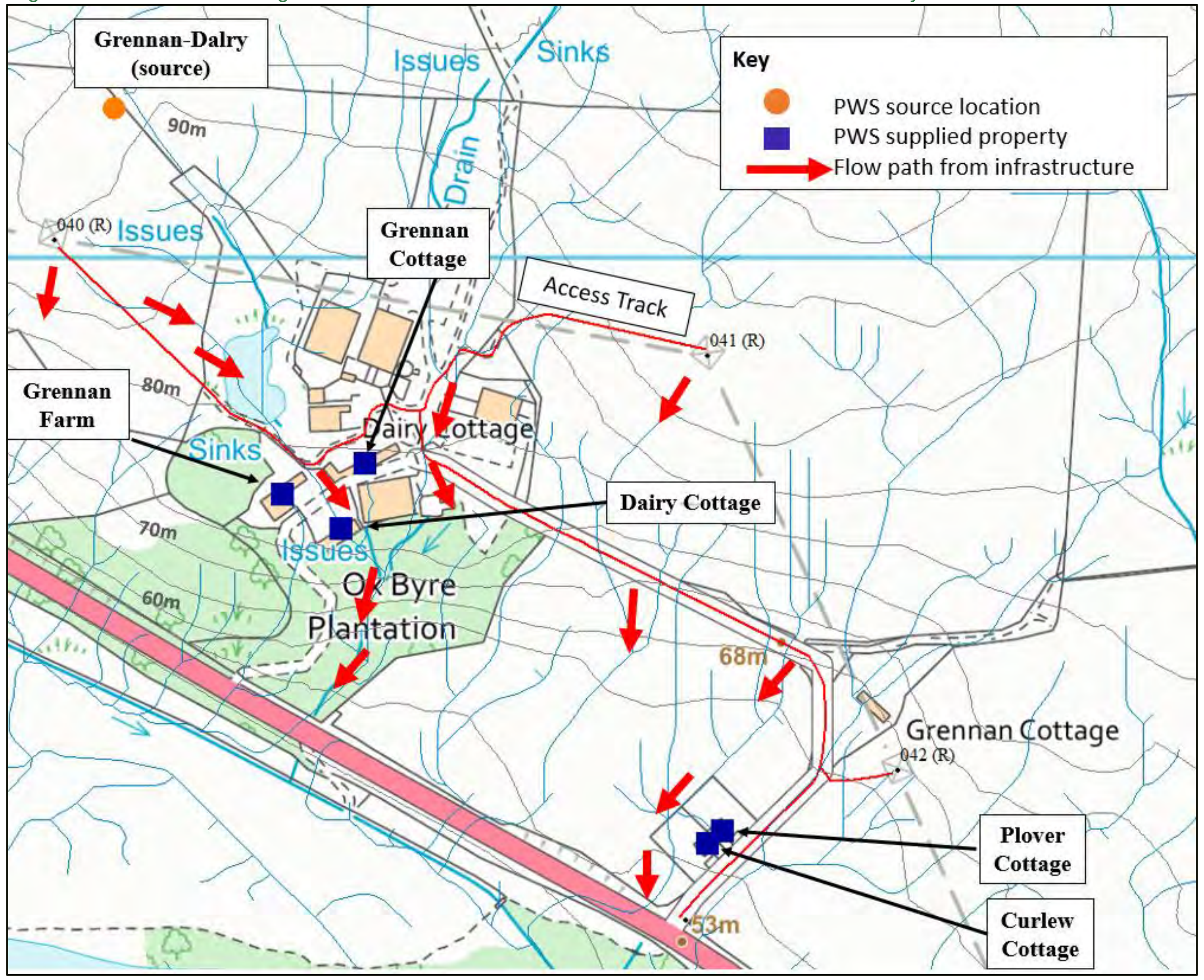
Flow Path Analysis Result: Likelihood of impact on PWS from OHL removal.

* The sources supplying the three Cubbox properties, Fominoch Cottage and Culdoach are outside the 100m buffer of the existing R route. Details of the sources of each are provided in Table 3 and described in the text and figures below.

Grennan-Dalry (R Route)

9.3.45 The source of the Grennan-Dalry PWS is a surface water spring. The Grennan-Dalry PWS source is located ~85m north and upgradient of existing tower 40R and the associated access track which will be used during removal. The PWS source supplies water to five properties: Curlew Cottage (~17m north-west of the access track), Plover Cottage (~17m north-west of the access track), Grennan Cottage (~15m south-east of the access track), Dairy Cottage (~40m south-east of the access track) and Grennan Farm (~22m south-west of the access track). Flow routing analysis (Figure 24) shows that flow-paths from the access routes and tower removal will flow south-east and will not impact the PWS source, resulting in effect significance of none. Pipework between the PWS source and the associated properties will be identified and marked prior to the removal works out to avoid damage.

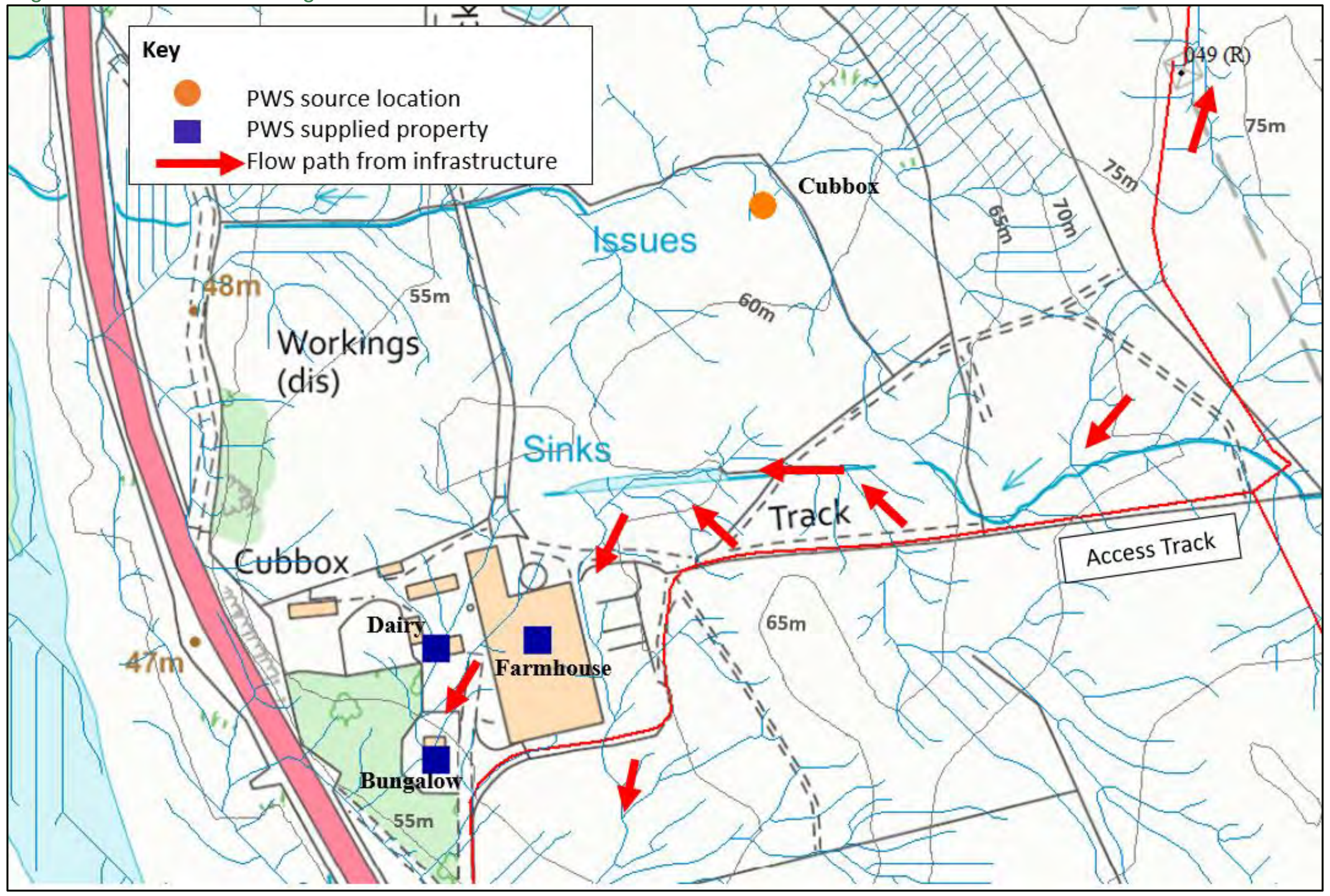
Figure 24: Flow routing and removal route access tracks for Grennan-Dalry PWS



Cubbox (R Route)

9.3.46 The source supplying the Cubbox PWS is a spring. While the Cubbox PWS source is located outwith the 100m infrastructure radius (~200m west of existing tower 49R), the three properties supplied by the Cubbox PWS source are located within the 100m buffer of the access track which will be used during removal: Cubbox Farm Dairy, Farmhouse and Bungalow are ~61m north-west, 51m north and 22m north-west of the access track, respectively. Flow routing analysis (Figure 25) shows that flow-paths from the access routes will flow south-west towards the three Cubbox properties but will not impact the source. Tower 49R is in a different catchment than the source and removal will not impact the source. The effect is considered to be of negligible magnitude resulting in effect significance of none. Pipework between the PWS and the three properties will be identified and marked prior to the removal works out to avoid damage.

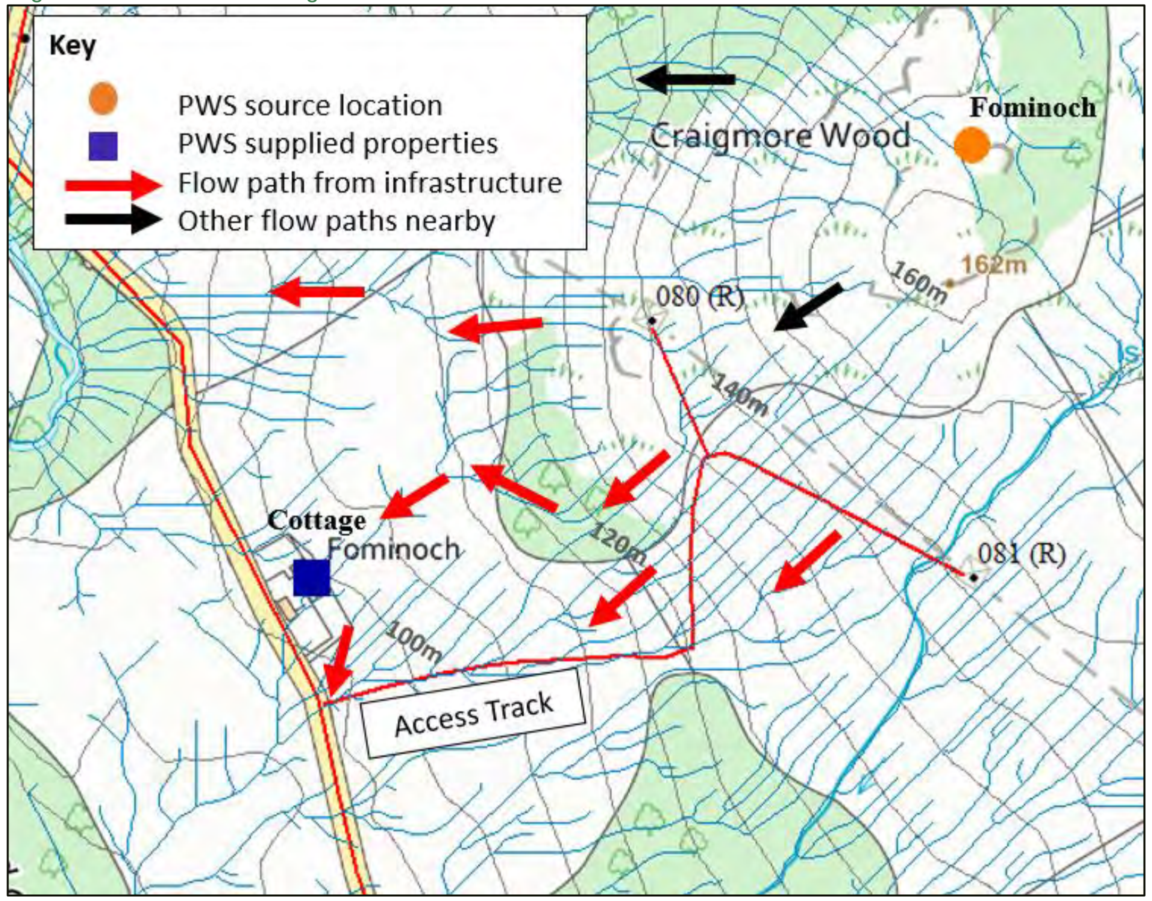
Figure 25: Flow routing and removal route access tracks for Cubbox PWS



Fominoch (R Route)

9.3.47 The source of the Fominoch PWS is a spring. While the Fominoch PWS source is located outwith the 100m infrastructure radius (~200m north-east of existing tower 80R and associated access track), the property supplied by the PWS is located ~60m north of the access route from the public road which will be used during tower removal. Flow routing analysis (Figure 26) shows that any surface runoff created during the removal works will flow south-west, with some runoff flowing towards the Fominoch Cottage property. The removal works will not impact the spring source, as it is located uphill of the towers 80R and 81R and access tracks. The effect on the PWS is considered to be none. Pipework between the PWS source and the property will be identified and marked prior to the removal works out to avoid damage.

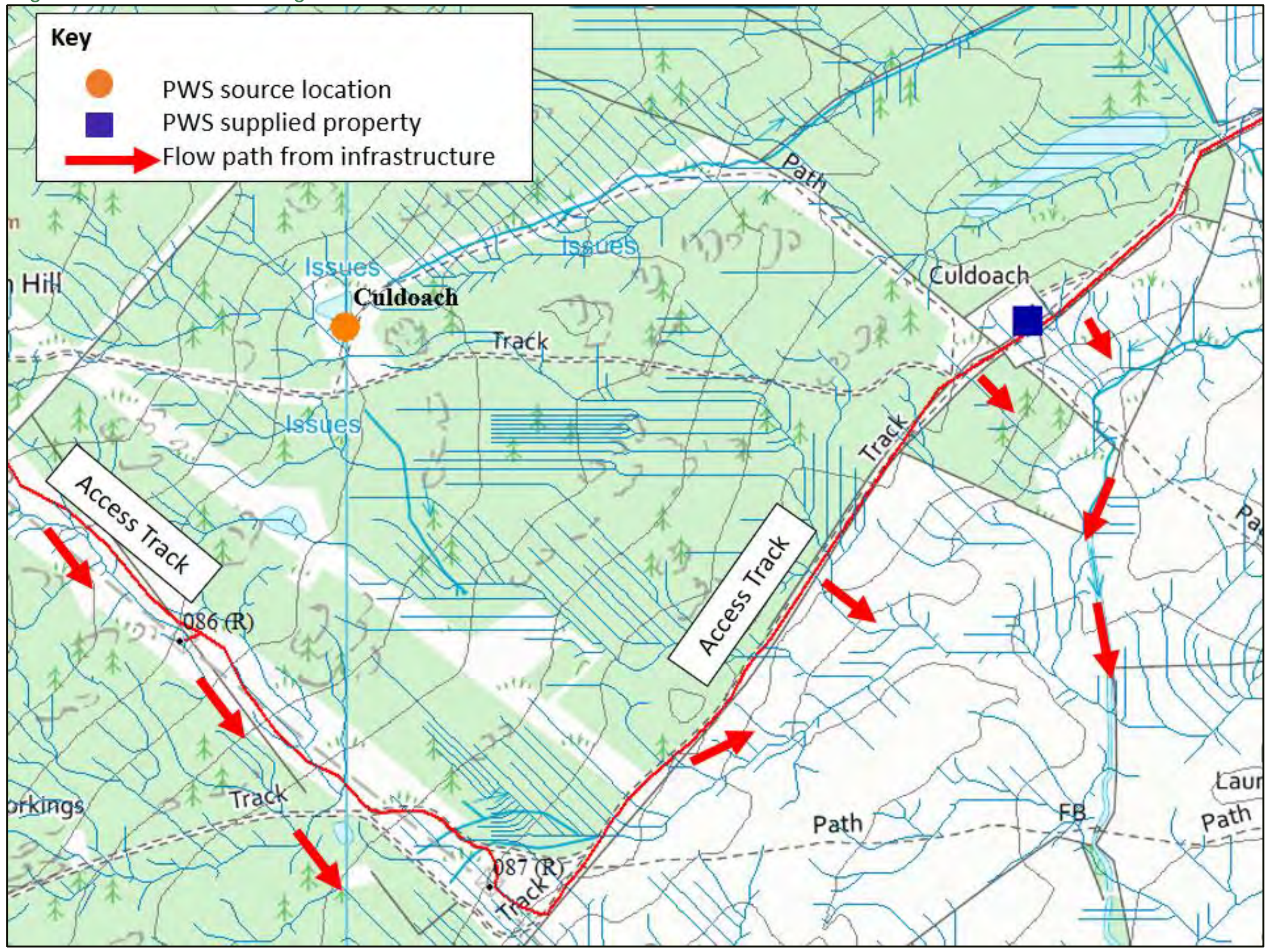
Figure 26: Flow routing and removal route access tracks for Fominoch PWS



Culdoach (R Route)

9.3.48 The source of the Culdoach PWS is a spring. While the Culdoach PWS source is located outwith the 100m infrastructure radius (~220m north-east of the existing R OHL and access tracks), the property supplied by the PWS is located ~5m north-west of an existing access track. However, as a track already exists here, no disruption to the property is expected. Flow routing analysis (Figure 27) shows that any surface runoff created during the removal works will flow south-east of the Culdoach PWS and property and not impact the PWS, hence the effect significance is none.

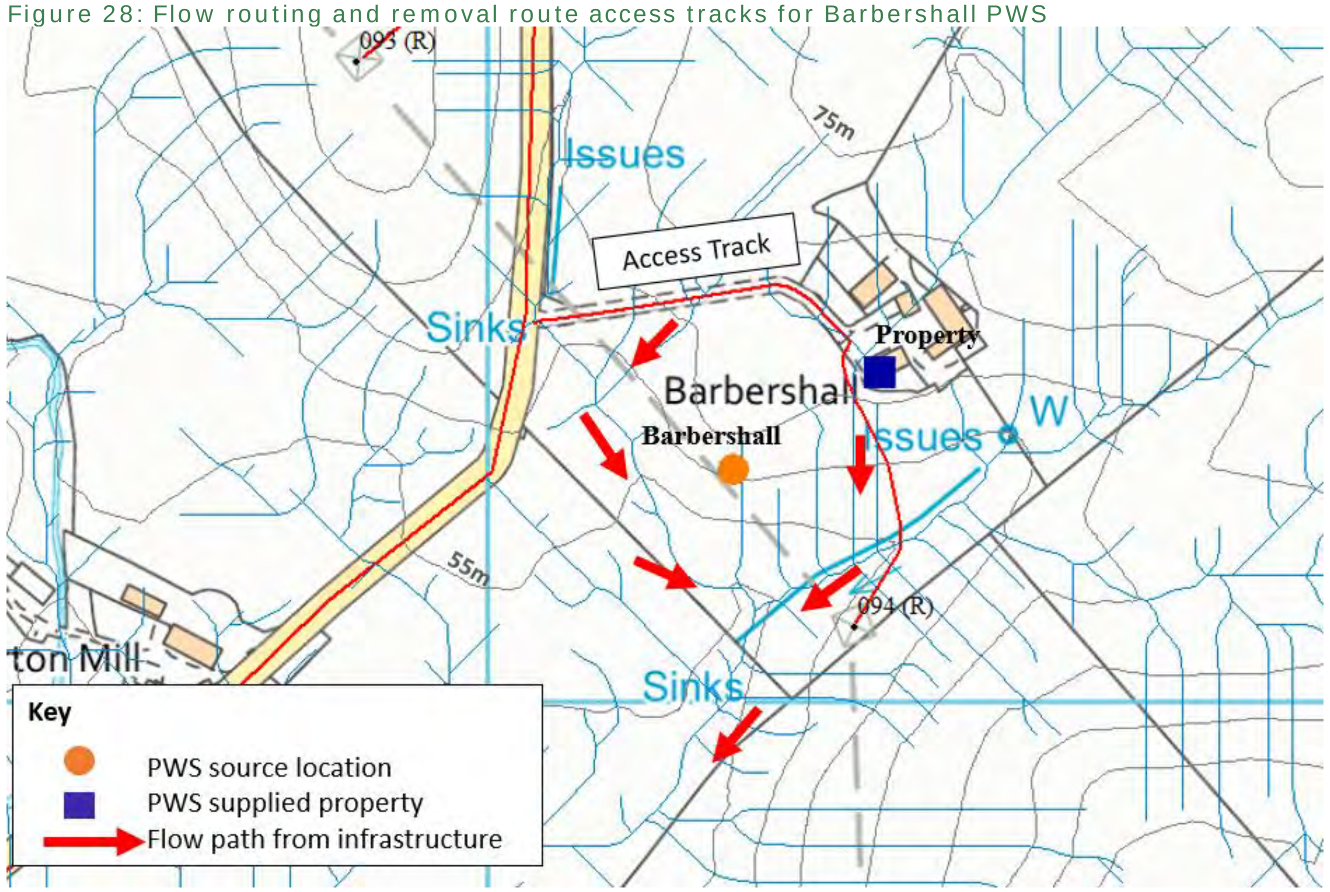
Figure 27: Flow routing and removal route access tracks for Culdoach PWS



Barbershall (R Route)

9.3.49 The source supplying the Barbershall PWS is a spring. The Barbershall PWS source and property are located ~57m south-west and ~14m east of the access track, respectively. The PWS source is understood to be located ~6m north-east of the existing OHL and ~55m north-west of tower 94R, but this has not been verified on site. Flow routing analysis (Figure 28) shows that any surface runoff created during the removal works will flow south from the access track, entering the watercourse. The exact location of the PWS source will be verified on site before the removal works commence and measures will be put in place to prevent the pollution of the PWS source and to prevent damage to any pipelines running between the PWS source and the property. The magnitude of effect on the PWS is considered to be minor, although very temporary resulting in an effect of minor significance. Monitoring of this PWS will be carried out during the removal works.

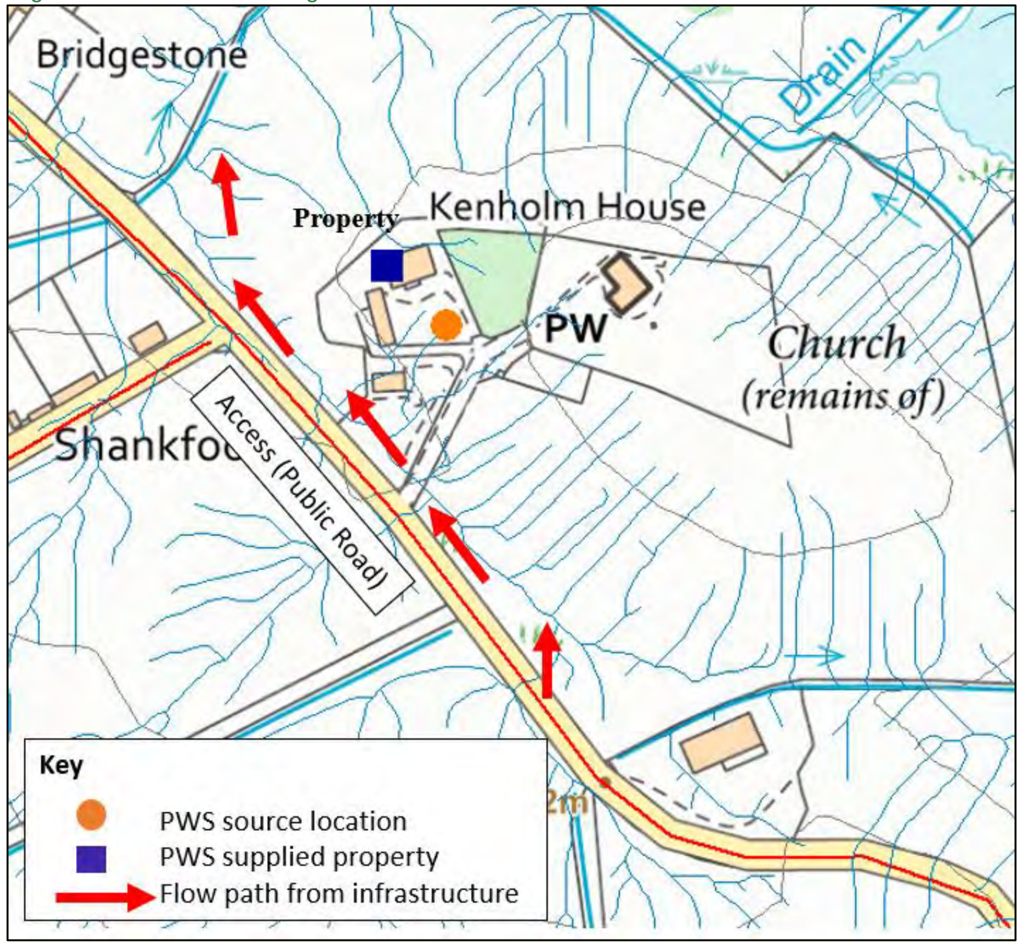
Figure 28: Flow routing and removal route access tracks for Barbershall PWS



Kenholm House (R Route)

9.3.50 The source supplying the Kenholm House PWS is a spring. The Kenholm House PWS source and property are located ~65m from a public road, which will be used for access during the removal works. Flow routing analysis (Figure 29) shows that any surface runoff created during accessing the removal works will flow north-west, just south of the Kenholm House PWS source and property and will not impact the PWS. In addition, as the access is an existing public road, it is likely to have its own surface water drainage system and surface waste runoff and pollution from the removal works will not impact the PWS, hence the effect significance is none.

Figure 29: Flow routing and removal route access tracks for Kenholm House PWS



Summary and Conclusions

9.3.51 An assessment was undertaken to identify which, if any, PWS sources and supplied properties, including groundwater abstractions, will be affected by the construction of the KTR Project (i.e. construction and use of access tracks, tower bases and cable installation) and the removal of the existing R route.

9.3.52 D&GC provided data on PWS and groundwater abstractions within 1km either side of the proposed KTR Project. The D&GC data is caveated as the provided information cannot be guaranteed to be 100% accurate, up-to-date or comprehensive. Data on PWS was also obtained from the Drinking Water Quality Regulator for Scotland (DWQRS) online map, which is limited to the name, location and type of PWS (A or B). Data on groundwater abstractions was also provided by SEPA. PWS close to the KTR infrastructure were visited where possible and additional information was collected either in person or via telephone or public meetings.

9.3.53 Buffer zones were used around infrastructure to identify PWS and groundwater abstractions potentially impacted by infrastructure construction. Based on SEPA Guidance for assessing impacts of development proposals on groundwater abstractions and PWS (SEPA 2017), a 250m buffer zone was used around all new powerline infrastructure and a 100m buffer zone was used along the existing OHL (N and R routes). Flow path analysis was performed for all sources and properties located within the buffer zones to assess potential hydrogeological and hydrological connectivity to the infrastructure.

9.3.54 Of the PWS sources identified within 1km either side of the proposed new connections forming part of the KTR Project, only 24 PWS are within 250m of the project infrastructure, which supply 50 properties (Table 2). Of those within the 250m buffer zone, an assessment of flow paths based on topography identified that 15 PWS will potentially be affected by the construction of the KTR Project. These PWS can be seen in Table 5, alongside those potentially affected along the R route.

9.3.55 Of the 14 PWS identified within 500m either side of the R route, only six PWS (or associated properties) are within 100m of the R route and its associated access tracks (Table 4). One PWS will potentially be affected by the OHL removal (Table 5).

9.3.56 The likely significant effect on each PWS was assessed based on the findings of the flow path analysis and the methodology set out in Chapter 9 of the EIA Report, and assumes that embedded mitigation measures (e.g. SUDS) are in place during felling operations and construction. With embedded mitigation there were no significant effects (i.e. moderate or major effects) predicted on any PWS, with all effects either of minor significance or none (Table 5).

Table 5: Details of Private Water Supplies (PWS) potentially impacted by the KTR Project and by the removal of the existing R OHL Route

Nat. Grid Ref	Source Name	Source Type	Flow Path Analysis Result	Likely Significant Effect	Monitoring During Construction[1]
PWS Along Proposed KTR Project Route					
NX59167 89959	High Carminnows	Borehole	Potential impact	Minor	Yes
NX59796 87894	Dundeugh	Surface Water	Potential impact	None	No
NX59908 87642	Phail Barcris	Borehole	Potential impact	None	Yes, if required. Will depend on the confirmed location of the borehole, which will be clarified at pre-construction stage
NX60374 86749	Stroangassel Farm	Spring	Potential impact	None	No
NX60300 85400	Carsfad Cottage	GW Spring	Potential impact	None	Yes
NX60491 84201	Inverharrow	Borehole	Potential impact	Minor	Yes
NX60680 83230	Barskeoch Mains	Spring	Potential impact	None	No
NX60942 81115	Waterside	Surface Water	Potential impact	Minor	Yes
NX60500 80099	Glenlee	GW Spring	Potential impact	Minor	Yes
NX60810 78676	Glenlee Sheep Dip	Spring	Potential impact	None	No
NX60800 78700	Airie Cottage	Spring	Potential impact	None	Yes
NX60800 77000	Darsalloch	Surface Water-course	Potential impact	Minor	Yes
NX66431 64779	Cullenoch	Surface Water-course	Potential impact	Minor	Yes
NX68000 63300	Bargatton	Spring	Potential impact	Minor	Yes
NX69800 55299	Parklea	Spring	Potential impact	None	Yes
PWS Along NR Removal Route					
NX72100 69094	Barbershall	Spring	Potential impact	Minor	Yes

[1] The results of surface water flow path analysis was undertaken to establish potential hydrological connectivity between PWS and KTR Project infrastructure. For PWS that are sourced from groundwater and/or groundwater springs, this assumes that groundwater flows paths are similar to surface water flows paths (a reasonable assumption in the absence of groundwater levels and flow data). The results of the flow path analysis were used to determine which PWS which may be impacted and which PWS require water quality monitoring during construction to ensure no contamination of supply during the work. However, given the above assumption, PWS which are close to excavations for tower bases, even if they are not within a direct surface water flow path, are also recommended to be monitored during construction, as groundwater flow paths may be slightly different. The reasons for monitoring or not monitoring a PWS are described in report text for each individual PWS.

9.3.57 Additional mitigation measures required for specific PWS have been described for each PWS, if required. This includes monitoring of the water quality of the PWS before and during construction, confirmation of location of PWS pipework and avoidance and provision of alternative water supply, if required.

9.3.58 Monitoring of water quality of the following PWS will be undertaken before, during and after construction to ensure no contamination of the supply. Monitoring will be undertaken by an Ecological Clerk of Works (or equivalent) and monitoring locations will be confirmed and identified in the CDEMP:

- High Carminnows PWS;
- Phail Barcris PWS (if required - will depend on the confirmed location of the borehole, which will be clarified at pre-construction stage);
- Carsfad Cottage PWS;
- Inverharrow PWS (during underground cable installation);
- Waterside PWS;
- Glenlee PWS;
- Airie Cottage PWS;
- Darsalloch PWS;
- Cullenoch PWS;
- Bargatton PWS;
- Parklea PWS; and
- Babershall PWS (R route).

9.3.59 If the water quality deteriorates during construction (e.g. discoloured, high sediment content, hydrocarbons) an alternative water supply will be installed at the PWS property, such as portable bowsers, to ensure minimal disruption of supply. The contractors will have a supply of bowsers ready to deploy to affected PWS, if required.

9.3.60 An Ecological Clerk of Works (ECoW) will be on site throughout construction to monitor and ensure the effectiveness of the embedded and additional mitigation measures.

Appendix 9.4: Peat Survey Report

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Appendices

Appendix 9.4: Peat Survey Report

Introduction

1.1 Fluid Environmental Consulting Ltd (Fluid) was commissioned by LUC to complete depth of penetration probing and coring along the route of the Kendoon to Tongland 132 kilovolt (kV) Reinforcement Project ('the KTR Project').

1.2 The KTR Project includes the following new connections as well as the decommissioning of the N and R routes.:

- A new 132kV double circuit steel tower overhead line, of approximately 10.1km in length between Polquhanity (approximately 3km north of the existing Kendoon substation) and Glenlee substation, via the existing Kendoon substation (P-G via K). Ancillary to the P-G via K route is approximately 13km of 11kV underground cabling to replace the 12km of OHL being removed
- A new 132kV single circuit wood pole overhead line, of approximately 2.6km in length, between Carsfad and Kendoon (C-K).
- A new 132kV single circuit wood pole overhead line, of approximately 1.6km in length, between Earlstoun and Glenlee (E-G) (and including a short underground cable section).
- A new 132kV double circuit steel tower overhead line deviation of the existing BG route, at Glenlee substation approximately 1.2km in length (BG Deviation).
- A new 132kV double circuit steel tower overhead line, of approximately 32.3km in length, between Glenlee and Tongland (G-T).

1.3 In addition, the KTR Project also comprises new temporary access tracks, widening of existing access tracks, working areas, construction compounds, and quarries. Peat depth surveys were undertaken for all areas of infrastructure where peat was considered likely to be present based on the criteria discussed further below.

Strategy for Peat Probing

1.4 Depth of penetration surveys (i.e. peat depth surveys) were undertaken between 2017 and 2019. During this time new guidance was published which was factored in to the probing strategy[1].

1.5 Probing locations were determined through review of a number of maps that indicate the likely presence of peat. These include:

- Scottish Soil Map, 1:250,000 Soil Survey of Scotland;
- Carbon Rich Soils, deep peat and priority peatland Map 2016 SNH; and
- Superficial Deposits. British Geological Survey.

1.6 Due to the change in guidance[2] that was issued in the period when the peat surveys took place and the changes to the design of the KTR Project that took place as the EIA progressed, the field survey therefore gave consideration to two methodologies which evolved over the duration of the project:

- Initially probing was conducted in the section of the KTR Project between Kendoon and Glenlee where the available mapping suggested peat may be present. Probing was undertaken at 40m intervals along the centre line of the proposed route with offsets at 10m and 20m when peat was located.
- Subsequently. once infrastructure locations were finalised, depth of penetration probing was completed at infrastructure locations where nearby previous probing indicated that peat was likely to be present or the mapping indicated a likelihood of peat. Probing frequency was at 50m along the track with 10m offsets and on a 10m grid at all infrastructure locations. The exception was the potential quarries where a 50m probing grid was used unless peat was located and then probing continued on a 10m grid to define the extent of the peat present.
- Subsequent iterations and adjustments of the infrastructure layout were probed in accordance with this second methodology.
- In addition, coring was completed at various locations to verify that the depth of penetration probing was representative of the actual peat depth (this is described further below).

Methodology

Layout Evolution

1.7 The field surveys were undertaken using the available data and route information as the design of the KTR Project was refined.

Field Activities

1.8 Peat probing, coring and sampling was undertaken as described above and in compliance with applicable guidelines. An extendable, narrow diameter, fibre glass peat probe of up to 6.7m length was used to obtain the peat depth data. Each probe is pushed into the ground until there is sufficient resistance to prevent further penetration and the depth recorded as the depth of penetration. A description of the resistant substrate below is made based on the feel of the resistance (grit, bedrock, clay, sand, rock or resistance where unable to differentiate). These probes do not allow a sample to be obtained.

1.9 The probes provide the depth of penetration in soft formations and, if peat is present, is often representative of the actual peat depth when the formation underlying the peat is sands and gravels or bedrock. However, the depth of penetration can be an overestimate of the depth of peat where the substrate below is soft and penetrable, such as soft clay or silt. In some cases, peat may not be present and the whole of the probe penetrates through silt or clay sediments. Coring is therefore necessary to verify some of the probe results by extracting a core of the deposits for examination.

1.10 A series of cores was therefore obtained using a gouge auger to verify peat depth and to allow the characteristics of the peat to be determined using recognised criteria (Von Post assessment). Observations on underlying geology and the presence of acrotelm, catotelm and amorphous layers (if present) within the peat were also identified within the peat where possible. Example photographs of typical ground conditions are shown in **Appendix I**.

1.11 Probe and core locations were located and recorded using a handheld global position system (GPS) device, with Birdseye aerial imagery, to a six figure grid reference (to 1m) and georeferenced photographic records were obtained for all cores.

1.12 The surveys included completion of the following:

- Record of the depth of penetration at each probe location along with an estimate of the geology at the limit of penetration.
- Collection of data from cores on total peat depth, Von Post measurements every metre, the thickness of the acrotelm, catotelm and amorphous peat (if present), the underlying geology and comments on water table if possible.
- Collection of a photographic record of all cores.

1.13 The above information was then used to complete this report, including the following:

- Record of data in tables with appropriate labelling of locations according to the specification document.
- A peat depth contour plan across the area of probing and coring.

1.14 The data obtained from the numerous site investigations between 2017 and 2019 was verified with the coring data and is presented in **Figures 1.1** to **1.31**. The depths were then contoured within ArcGIS to produce a contour plot of probe penetration (**Figures 2.1** to **2.31**).

[1] Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey, Guidance on Developments on Peatland

[2] Scottish Government, Scottish Natural Heritage, SEPA and The James Hutton Institute (2010) Developments on Peatland: Site Surveys

1.15 A shaded contour interval of 0-0.5m, >0.5m-1m, >1m – 1.5m, >1.5m – 2m, >2m+ – 3m, >3m – 4m, >4m – 5m, >5m – 6m, >6m+ has been used on the figures.

1.16 The data obtained is presented within this report on peat occurrence and properties across the survey area along with the contour plot. The results of the probing and coring have been tabulated in **Appendices II** to **IV** along with photographs and a table of peat conditions.

Limitations

1.17 It should be noted that the peat depth probes were undertaken only in areas where peat was considered likely based on the available mapping and subsequently at locations close to probes that had identified peat with a higher intensity of probing around proposed infrastructure. In the areas away from the more detailed probing there may be more localised peat depth variations. There were also 21 locations where access was not possible due to fallen trees and a further 327 locations were not accessible due to landowner restrictions (**Figures 1.1** to **1.31**)[3].

1.18 Despite these limitations, it is considered that the data obtained is sufficient to inform a robust assessment of potential effects on peat as presented in the EIA Report in **Chapter 9: Geology, Hydrology, Hydrogeology, Water Resources and Peat**, **Appendix 9.5: Outline Peat Management Plan**, and **Appendix 9.6: Peat Landslide Hazard Risk Assessment**.

Results

Depth of Penetration Probing

1.19 A total of 6,651 probes were undertaken by Fluid along the proposed KTR routes between 2017 and 2019. The data collected are presented in **Appendix II** including the depth of penetration, the potential substrate at the limit of penetration, definition of vegetation, ground firmness and any further comments on the location. In addition, a total of 426 probes were undertaken by Energyline along the route of the KTR Project in 2017 at the anticipated tower locations at the time of survey. A total of 7,077 were therefore completed (**Figures 1.1** to **1.31**).

1.20 Of the 7,077 locations probed, a total of 5,911 probes (83.5%) recorded depths of 0.5m or less, 618 probes (8.7%) recorded depths of penetration between >0.5m and 1.0m, and 548 probes (7.7%) recorded depths of penetration >1.0m (**Table 1**).

Table 1: Depth of Penetration Distribution

Depth Range (m)	Number of Probes	Percentage of Probes
0 to 0.5 (no peat)	5,911	83.5
>0. 5 – 1.0	618	7.7
>1.0 – 1.5	208	2.9
>1.5 – 2.0	118	1.7
>2.0 – 3.0	115	1.6
>3.0 – 4.0	46	0.65
>4.0 – 5.0	34	0.48
>5.0 – 6.0	15	0.21
>6.0+	12	0.17
Total	7,077	100%

1.21 The depth of penetration at each probe location is presented on **Figures 1.1** to **1.31**.

Coring

1.22 A total of 122 locations were cored during the peat surveys (**Figures 1.1** to **1.31**). The data collected at each of the 122 cores including Von Post test results, acrotelm and catotelm thickness, observations on the peat structure. and any observations on water features nearby. The findings are presented in **Appendix III**. Comparison of the probe depth of penetration and the peat depth verified from the core is also presented in **Appendix III** and full logs of each core including photographic record are presented in **Appendix IV**.

1.23 Of the 122 locations cored, a total of 75 identified peat greater than 0.5m depth.

1.24 Comparison of the coring to the depth of penetration probes demonstrated the following:

- Coring was spread across a variety of depths – 78 at 0m – 0.5m, 20 at >0.5m – 1.0m, 13 at >1.0m – 1.5m, 9 at >1.5m – 2.0m, 2 at >2.0m – 3.0m, 2 at >3.0m to 4.0m.
- The depth of penetration of the probe at 114 (93%) of the 122 locations was the same (within 0.1m) as the core verified depth of peat. The other 8 probes presented an over estimate of the peat depth up to a maximum of 0.55m.
- Six of the eight probes that were greater than 0.1m different than the core recorded peat depth were in locations where no peat was actually recorded and the probed depth was less than 0.5m, therefore also indicating no peat. The other two locations were a single location resulted in a probe depth of 0.55m but the core log indicated silt soil with traces of peat and a single location that resulted in a probe depth of 0.75m but the core log indicated that at 0.30m the peat changed to peat soil mixed with gritty silt.

1.25 These data generally validate the peat probing results with probe and coring depths of peat >0.5m generally within 0.1m difference.

1.26 Sections of the route of the KTR Project were observed to have distinctive acrotelm layer in peat deposits extracted in cores. Within the 74 core locations where peat was identified the thickness ranged from 0.00m and 0.25m with an average depth of 0.09m.

1.27 Based on the data collected an interpreted peat depth map (**Figures 2.1** to **2.31**) was produced to demonstrate the variation in peat across the route of the KTR Project and at the various infrastructure locations.

Summary

1.28 The following summarises the results of the peat survey and subsequent peat depth contouring:

- Acrotelm thickness across the cored locations has an average depth of 9cm.
- No amorphous peat was identified.
- The coring results verified the depth of penetration probing as generally representative of peat depth with some minor areas of over estimation of peat.
- The peat surveys have provided a wide coverage of peat occurrence and depth across the proposed KTR Project with higher frequency probing undertaken in the areas of proposed infrastructure.
- Peat has been determined to be present in excess of 6.7m at 12 of the 7,077depth of penetration probes.
- The data collected has been used to produce an interpreted maximum depth of peat contour map using ArcGIS.
- The mapping indicates that most of the areas surveyed have no peat (0.0 - 0.5m depth) with numerous isolated pockets of peat and deep peat present as shown on **Figures 2.1** to **2.31.**These include some minor areas north and south of Barlae Hill Quarry (Q1), north of Glenlee, more extensive areas to the north and south of Hind Craig Quarry (Q4), various pockets to the south, north and north west of Stroan Loch, areas within and to the north and north east of Craigelwhan Quarry (Q6), more frequent and deeper areas to the west, north west and south of Bargatton Loch, along with some isolated areas along a number of the access tracks.
- The peat contour map shows that the infrastructure has generally avoided peat and deep peat where possible.

[3] This includes restrictions which were in place due to the presence of Annex 1 bird species nests located within close proximity to some areas along the proposed wayleave. Annex 1 bird species, their nests eggs and habitats are protected under Schedule 1 of the Wildlife and Countryside Act 1981 and RSPB advice was sought.

Appendix 9.5: Outline Peat Management Plan

Contents

Appendix 9.5: Outline Peat Management Plan

Introduction

9.5.1 Fluid Environmental Consulting Ltd (Fluid) was commissioned by SP Energy Networks (SPEN) to prepare an Outline Peat Management Plan (OPMP) for the Kendoon to Tongland 132 kilovolt (kV) Reinforcement Project ('the KTR Project'). The KTR Project includes the following new connections as well as the decommissioning of the existing N and R routes:

- A new 132kV double circuit steel tower overhead line, of approximately 10.1km in length between Polquhanity (approximately 3km north of the existing Kendoon substation) and Glenlee substation, via the existing Kendoon substation (P-G via K). Ancillary to the P-G via K route is approximately 13km of 11kV underground cabling to replace the 12km of OHL being removed.
- A new 132kV single circuit wood pole overhead line, of approximately 2.6km in length, between Carsfad and Kendoon (C-K).
- A new 132kV single circuit wood pole overhead line, of approximately 1.6km in length, between Earlstoun and Glenlee (E-G) (and including a short underground cable section).
- A new 132kV double circuit steel tower overhead line deviation of the existing BG route, at Glenlee substation approximately 1.2km in length (BG Deviation).
- A new 132kV double circuit steel tower overhead line, of approximately 32.3km in length, between Glenlee and Tongland (G-T).

9.5.2 The results of the peat probing are set out by connection, and, in line with the approach to assessment in the Environmental Impact Assessment (EIA) Report, the implications for the KTR project as a whole on peat have also been considered.

9.5.3 The removal of the existing N and R routes has not been considered within this assessment as no peat depth surveys were undertaken along these sections, on the basis that it is proposed that all tracks required for the removal of N and R will be temporary (steel matting or undertaken by low pressure vehicles) and therefore no significant earthworks will be required for the removal of the existing towers.

9.5.4 No peat penetration surveying was undertaken in the BG Deviation as review of the Scottish Soils, the SNH Peatlands and Carbon Plan 2016 and British Geological Survey Superficial Geology Mapping indicated there is no peat present. This is further supported by the ecological survey presented in Chapter 10: Ecology.

9.5.5 The total new infrastructure of the KTR Project comprises:

- Approximately 11.4km of existing tracks that will be upgraded and temporarily widened by 1m either side;
- Approximately 48km of new temporary excavated tracks;
- 200 OHL Towers and temporary working areas;
- six construction compounds;
- 0.25km underground cable;
- 13km of 11kV underground cabling with three switch stations; and,
- seven quarries.

9.5.6 The total area of the new footprint of the KTR Project is 1,587,262 [1].

9.5.7 The design of the KTR Project has been undertaken as an iterative process and, where possible (taking other environmental characteristics into consideration), areas of deep peat (>1m deep) have been avoided to limit peat excavation and the potential for peat slide risk. The findings of the Peat Slide Risk Assessment are presented in Appendix 9.5 of the EIA Report and are summarised in Chapter 9: Geology, Hydrology, Hydrogeology, Water Resources and Peat. Details of the iterative design process are presented in Chapter 2: The Routeing Process and Design Strategy.

9.5.8 The OPMP will be further developed and in the event that the individual connections comprising the KTR Project receive consent from Scottish Ministers, the Peat Management Plan as approved (PMP) will be implemented. Further details and location specific plans will be determined during the detailed design process and once further site investigations have been undertaken. These details will then be included in a detailed PMP as a part of the required Contractor's detailed Construction and Decommissioning Environmental Management Plan (CDEMP). The responsibility for the implementation of the PMP will be with the Principal Contractor (PC).

9.5.9 The OPMP has been prepared further to identification of the presence of peat and peatland habitats (including blanket bog, dry and wet heath) potentially affected by the KTR Project based on the review of Scottish Soils, Scottish Natural Heritage (SNH) Peatland and Carbon Plan 2016 and Geological Mapping, and relevant field survey and assessments prepared for the EIA Report (including Chapter 9, Chapter 10, and Appendix 9.4 Peat Survey Report).

9.5.10 The potential volumes of peat excavated and re-used have been calculated based on the infrastructure footprint using a modelled peat contour plan developed on a high-density probing grid where peat was identified and excavations may be undertaken. This has allowed high levels of confidence in the estimation of the volumes of peat that will be excavated and that will require appropriate re-use.

9.5.11 The OPMP addresses the management of peat during the construction period and immediate restoration once construction has been completed. In accordance with SEPA's Regulatory Position Statement (2010) Developments on Peat, the objective is to for as much peat as possible to be reused on site.

9.5.12 This report should be read in conjunction with Chapter 4: Development Description and Chapter 5: Felling, Construction, Operational Maintenance and Decommissioning, and associated figures and appendices.

Objectives

9.5.13 The OPMP has been developed to demonstrate that peat has been afforded appropriate consideration during the design and construction phases of the KTR Project should the consents be granted. The OPMP:

- outlines the overall approach to minimise disruption to peatland that has been taken to date;
- proposes measures that will further minimise any effects on peat;
- proposes long-term peatland restoration and management plans for key areas where peat has been identified;
- demonstrates a commitment that all further opportunities to minimise peat disturbance and extraction will be taken; and
- seeks to demonstrate that appropriate proposals to re-use the surplus peat can be accommodated within the design of the KTR Project, without significant environmental or health and safety implications, to minimise risk in terms of carbon release and human health.

[1] It should be noted that the peat calculations have been undertaken for each connection comprising the KTR Project as though they were being constructed separately and includes the associated infrastructure required for construction. However, in reality, many accesses etc. will be shared between connections, albeit that the amount of peat in these areas is minimal. With the exception of the 0.25km of underground cable and the 13km of 11KV underground cabling the cable is above ground and therefore the cable itself does not involve direct land take or have a footprint associated with it for the purposes of this assessment. The land take for the 11kV underground cabling is not counted where it coincides with an existing or the proposed access track to avoid double counting the actual footprint area of the development. The footprints are associated with the supporting tower and pole foundations, working areas, construction compounds, quarries, access tracks, underground cabling and switch stations where not coinciding with each other.

Legislation, Policy and Guidance for Peat Management

Legislation, Policy and Guidance

9.5.14 When considered as part of a carbon landscape, peat has the capacity to act as a carbon sink. The management of peat therefore has implications for carbon emissions and climate change. There is a substantial body of relevant legislation and guidance regarding climate change and carbon which is relevant to the management of peat including:

- Scotland's National Peatland Plan Working for our future. SNH 2015.
- Scottish Government, SNH, Scottish Environment Protection Agency (SEPA) and The James Hutton Institute (2010) Developments on Peatland: Site Surveys.
- Scottish Government, SNH, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland.
- Scottish Planning Policy, Scottish Government July 2014.
- SEPA Regulatory Position Statement – Developments on Peat. February 2010.
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste Scottish Renewables, 17 January 2012.
- Forestry Civil Engineering and SNH (2010). Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads in Peat with particular reference to Wind Farm Developments in Scotland.
- Towards an assessment of the state of UK Peatlands, JNCC 2010.

Role of the Outline Peat Management Plan

9.5.15 The OPMP is intended to be a working document to be used throughout the key stages of the design, construction, operation, decommissioning (of N and R routes), and re-instatement phases of the KTR Project, as part of the overall CDEMP. The key stages of the KTR Project and links with the OPMP are set out below.

Stage 1: Environmental Impact Assessment

9.5.16 It is necessary to show how, through site investigation and iterative design, the KTR Project has been designed to minimise, so far as reasonably practicable, the quantity of peat which will be excavated, that volumes of peat anticipated to be excavated by the KTR Project have been considered, and how excavated peat will be managed. The overall aim is to minimise the impacts associated with excavation of peat by using the following hierarchy of design principles:

- prevent excavation;
- reduce volumes of peat excavated; and,
- reuse excavated peat in a manner to which it is suited.

9.5.17 This hierarchical approach comprises the following key steps:

- calculation of estimated volumes of excavated peat and potential reuse volume requirements based upon the design of the KTR Project;
- determine the overall peat balance, and identify whether the generation of excess material can be avoided, and, if not, where reductions in the volumes of excavated materials may be achieved;
- refine layout to avoid areas of deeper peat and therefore reduce carbon impacts associated with construction activities and identify how overarching principles of peat avoidance have been taken into account in the design;
- ensure the assessment is consistent with and feeds into the Peat Slide Risk Assessment (PSRA); and,
- to identify limitations and make recommendations for further site investigation (post-consent) to inform detailed design and micro-siting within the 50m infrastructure location allowance (ILA) around all infrastructure, such that opportunities for further reductions in excavated peat volumes can be implemented where possible[2].

Stage 2: Post Consent / Pre-Construction

9.5.18 The peat balance calculations may be further developed and refined post consent, and prior to the relevant works commencing, as a consequence of any further or more detailed ground investigation or survey works required to inform detailed design, or that may be required as part of the consent.

Stage 3: Construction

9.5.19 Actual peat volumes excavated during construction will be recorded against predicted volumes provided in Tables 13 to 17 of this OPMP. Within the 50m ILA, the alignment and design of tracks, working area orientation and construction methods will be reviewed to avoid/minimise peat disturbance as much as possible in light of the more detailed information available once construction commences. A regular review and update of the peat balance table will be undertaken by the appointed Principal Contractor and monitored by the Environmental Clerk of Works (ECoW) on site and made available to regulators as required.

Stage 4: Monitoring

9.5.20 Monitoring of restored areas will take place once construction is complete. A site visit would take place annually by an ecologist over a five year period.

Peat Conditions

Definitions of Peat

9.5.21 Peat is classified as organic material over 0.5m in depth. Organic material less than 0.5m depth is not defined as peat. This reflects the following guidance:

- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey Guidance on Developments on Peatland states that *"Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness"*;
- The James Hutton Institute defines shallow peat as having *"a prescribed depth of organic matter of 50 – 100 cm"*[3]; and
- The Forestry Commission uses 45 cm as the critical depth for peat to occur (Understanding the GHG implications of forestry on peat soils in Scotland, 2010).

9.5.22 Peat can be separated into three main layers: acrotelmic (the upper living layer), catotelmic (the middle to lower layer) and occasionally amorphous (lower layer) peat:

- Acrotelmic peat is the living layer of the peat including the peat turf being a thin, floating vegetation mat layer. The acrotelm is generally found within the top layer of peat (often less than 0.5m) depending on the degree of decomposition and fibrous nature of the peat (approximately H1 to H6 on the von post classification scale). The acrotelm is generally of high permeability, decreasing with depth. The water table fluctuates in this layer and conditions vary from aerobic to anaerobic. Material may be fibrous or pseudofibrous (plant remains recognisable), spongy, and when excavated strength is lost but retains integral structure and can stand unsupported when stockpiled >1m.
- Catotelmic peat is the dead layer of peat found deeper than acrotelmic peat which has some remnant plant structures. Material has high water content and is permanently below the water table (saturated) therefore organic matter decomposes anaerobically. Some plant structures may be

[2] The peat survey did not include the ILA which was undertaken in several stages, and was based on a targeted survey approach based on infrastructure locations where existing mapping showed there to be a potential of peat. Surveying for tracks, construction compounds and quarries were undertaken in the last stage of surveying based on the final layout of the KTR Project which his assessed in the EIA.

[3] https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils

recognisable but are highly humified losing most of their characteristics (approximately H6 to H9 on the von post classification scale) and strength. Water flow through the catotelm is slow unless peat structures such as sink holes or peat pipes are present. Material should not be stockpiled greater than 1m in height as it can lead to slippage.

- Amorphous peat is highly decomposed organic material where all recognisable plant remains are absent (approximately H9 to H10 in the von post classification scale). These deposits are dark brown to black in colour, plastic, are low tensile strength and are unable to stand unsupported >1m when stockpiled.

Peat Survey Methodology

Desk Based Review

9.5.23 Depth of penetration surveys, considered to be equivalent to peat depth, were completed between 2017 and 2019. The initial surveys in 2017 were undertaken in accordance with Scottish Government, Scottish Natural Heritage, SEPA and The James Hutton Institute (2010) Guidance Developments on Peatland: Site Surveys. Subsequently the probing strategy was undertaken in accordance with the new guidance Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey, Guidance on Developments on Peatland[4].

9.5.24 Probing locations were determined through review of a number of maps that indicate the likely presence of peat. These include:

- Scottish Soil Map. 1:250,000 Soil Survey of Scotland;
- Carbon Rich Soils, deep peat and priority peatland Map 2016, SNH;
- Superficial Deposits. British Geological Survey; and,
- Phase I habitat survey undertaken by LUC for the KTR Project as it became available.

Peat Surveys

9.5.25 The peat probing surveys were undertaken as follows:

- Initially peat probing was conducted in 2017 in the area of the KTR Project between Kendoon and Glenlee (comprising the P-G via K, E-G and C-K connections) where the available mapping suggested peat may be present. Probing was undertaken at 40m intervals along the centre line of the proposed route with offsets at 10m and 20m when peat was located.
- Subsequently, post 2017, once infrastructure locations were finalised, depth of penetration probing was completed at infrastructure locations where nearby previous probing indicated that peat was likely to be present and/or the mapping indicated a likelihood of peat. Probing frequency was at 50m along the track with 10m offsets and on a 10m grid at all infrastructure locations. The exception was the potential quarries where a 50m probing grid was used unless peat was located and then probing continued on a 10m grid to define the extent of the peat present.
- Subsequent iterations and adjustments of the infrastructure layout were probed in accordance with this second methodology.
- In addition, coring was completed at a number of locations to verify that the depth of penetration probing was representative of the actual peat depth (this is described further in Appendix 9.4: Peat Survey Report of the EIA Report).

Limitations

9.5.26 It should be noted that the peat depth probes were undertaken only in areas where peat was considered likely based on the available mapping and subsequently at locations close to probes that had identified peat with a higher intensity of probing around proposed infrastructure. In the areas away from the more detailed probing there may be more localised peat depth variations. There were also 21 proposed probe locations were access was not possible due to fallen trees and a further 327 proposed probe locations were not accessible due to landowner restrictions. Despite these limitations, it is considered that the data obtained is sufficient to inform a robust assessment of potential effects on peat as presented in the EIA Report in Chapter 9, Appendix 9.6.

Peat Survey Results

9.5.27 This section discusses the Peat Survey Results for each connection comprising the KTR Project and for the KTR Project as a whole:

Polquhanity to Glenlee (via Kendoon)

Depth of Penetration Probing

9.5.28 A total of 671 probes were undertaken within the footprint and a 50m buffer of the P-G via K connection between 2017 and 2019. This data was used to develop the peat contour plan present in Figure 2.1 to 2.31 of Appendix 9.4. Of these 671 probes a total of 472 were within the P-G via K footprint (the remainder being within the 50m ILA or earlier design option areas).

9.5.29 The data collected is presented in Appendix II of the Appendix 9.4.

9.5.30 Based on the data collected an interpreted peat depth map (Figure 9.1.1 to 9.2.31 of Chapter 9 of the EIA Report) was produced to demonstrate the variation in peat across the site and at the infrastructure locations. A comparison of the peat depth with the site infrastructure footprint is presented in Table 1.

Table 1: Peat Depth Distribution across New Infrastructure Footprint – P-G Via K

Depth Range (m)	Area of New infrastructure footprint (m^2)	Area of New infrastructure footprint (%)
0 to 0.5 (no peat)	229,781.2	97.22
>0. 5 – 1.0	3,887.7	1.64
>1.0 – 1.5	1,366.9	0.58
>1.5 – 2.0	948.5	0.40
>2.0 – 2.5	333.5	0.14
>2.5 – 3.0	40.8	0.02
>3.0+	0	0.00
Total Area of New Infrastructure Footprint	236,358.6	100

Note: The area of infrastructure footprint does not include existing track or compound CC2 as no potential extraction of soil or peat are required in these locations. Nor does it include the 11kV underground cabling route that coincides with the proposed new access tracking to avoid double counting of areas. Areas that were not probed have been assumed to have no peat.

9.5.31 These data indicate that peat (>1.0m depth) is present across 1.14% of the infrastructure footprint of the P-G via K connection and there is no peat (0 – 0.5m depth) present across 97.22% of the infrastructure footprint of the P-G via K connection. Should the footprint location change as part of the ILA, further assessment would be undertaken as part of a Detailed Peat Management Plan post consent.

Carsfad to Kendoon

Depth of Penetration Probing

9.5.32 A total of 46 probes were undertaken within the footprint and a 50m buffer of the C-K connection between 2017 and 2019. This data was used to develop the peat contour plan present in Figure 2.1 to 2.31 of Appendix 9.4. Of these 46 probes, a total of 21 were within the C-K footprint (the remainder being within the 50m ILA or earlier design option areas).

[4] The key differences between the 2010 and 2017 peat survey guidance documents is that the 2010 guidance requires peat depth to be recorded only where peat (probe depths >0.5m) is encountered. The 2017 guidance states "a peat depth survey should assess the presence of any peat layer even when it is less than 50cm in thickness". In addition, the 2017 second edition Peat Slide Risk Assessment guidance states "Section 37 applications should also be assessed for peat landslide risk where infrastructure is proposed in peatland areas".

9.5.33 The data collected is presented in Appendix II of the Appendix 9.4.

9.5.34 Based on the data collected an interpreted peat depth map (Figure 9.1.1 to 9.2.31 of Chapter 9 of the EIA Report) was produced to demonstrate the variation in peat across the site and at the infrastructure locations. A comparison of the peat depth with the site infrastructure footprint is presented in Table 2.

Table 2: Peat Depth Distribution across New Infrastructure Footprint – C-K

Depth Range (m)	Area of New infrastructure footprint (m^2)	Area of New infrastructure footprint (%)
0 to 0.5 (no peat)	17,051.3	97.26
>0. 5 – 1.0	357.9	2.04
>1.0 – 1.5	122.0	0.70
>1.5+	0.0	0.00
Total Area of New Infrastructure Footprint	17,531.2	100

Note: The area of infrastructure footprint does not include existing tracks as no potential extraction of soil or peat are required in these locations. Areas that were not probed have been assumed to have no peat. Areas that were not probed have been assumed to have no peat.

9.5.35 These data indicate that peat (>1.0m depth) is present across 0.7% of the infrastructure footprint and there is no peat (0 – 0.5m depth) present across 97.3% of the infrastructure footprint of the C-K connection. Should the footprint location change as part of the ILA, further assessment would be undertaken as part of a Detailed Peat Management Plan post consent.

Earlstoun to Glenlee

Depth of Penetration Probing

9.5.36 A total of 10 probes were undertaken within the footprint and a 50m buffer of the E to G connection between 2017 and 2019. This data was used to develop the peat contour plan present in Figure 2.1 to 2.31 of Appendix 9.4. Of these 10 probes a total of 9 were within the E to G footprint (the remainder being within the 50m ILA or earlier design options).

9.5.37 The data collected is presented in Appendix II of the Appendix 9.4.

9.5.38 Based on the data collected an interpreted peat depth map (Figure 9.1.1 to 9.2.31 of Chapter 9, of the EIA Report) was produced to demonstrate the variation in peat across the site and at the various infrastructure locations. A comparison of the peat depth with the site infrastructure footprint is presented in Table 3.

Table 3: Peat Depth Distribution across New Infrastructure Footprint – E to G

Depth Range (m)	Area of New infrastructure footprint (m^2)	Area of New infrastructure footprint (%)
0 to 0.5 (no peat)	15,654.3	89.42
>0. 5 – 1.0	9.3	0.05
>1.0 – 1.5	87.3	0.50
>1.5 – 2.0	891.8	5.09
>2.0 – 2.5	0.0	0.00
>2.5 – 3.0	864.4	4.94
>3.0+	0.0	0.00
Total Area of New Infrastructure Footprint	17,507	100

Note: The area of infrastructure footprint does not include existing track as no potential extraction of soil or peat are required in these locations. Areas that were not probed have been assumed to have no peat.

9.5.39 These data indicate that peat (>1.0m depth) is present across 10.5% of the infrastructure footprint and there is no peat (0 – 0.5m depth) present across 89.4% of the infrastructure footprint. Should the footprint location change as part of the ILA, further assessment would be undertaken as part of a Detailed Peat Management Plan post consent.

Glenlee to Tongland

Depth of Penetration Probing

9.5.40 A total of 6,350 probes were undertaken within the footprint and a 50m buffer of the G-T connection between 2017 and 2019. This data was used to develop the peat contour plan present in Figure 2.1 to 2.31 of Appendix 9.4. Of these 6,350 probes a total of 2,486 probes were within the G-T footprint (the remainder being within the ILA or earlier design options).

9.5.41 The data collected is presented in Appendix II of the Appendix 9.4.

9.5.42 Based on the data collected an interpreted peat depth map (Figure 9.1.1 to 9.2.31 of Chapter 9, of the EIA Report) was produced to demonstrate the variation in peat across the site and at the various infrastructure locations. A comparison of the peat depth with the site infrastructure footprint is presented in Table 4.

Table 4: Peat Depth Distribution across New Infrastructure Footprint – G-T

Depth Range (m)	Area of New infrastructure footprint (m^2)	Area of New infrastructure footprint (%)
0 to 0.5 (no peat)	1,095,801.1	93.82
>0. 5 – 1.0	41,112.9	3.52
>1.0 – 1.5	13,466.7	1.15
>1.5 – 2.0	4,324.8	0.37
>2.0 – 2.5	3,987.9	0.34
>2.5 – 3.0	3,140.0	0.27
>3.0 – 3.5	1,714.0	0.15
>3.5 – 4.0	1,520.1	0.13
>4.0 – 4.5	856.8	0.07
>4.5 – 5.0	956.1	0.08
>5.0 – 5.5	496.2	0.04
>5.5 – 6.0	341.2	0.03
>6.0+	320	0.03
Total Area of New Infrastructure Footprint	1,168,037.80	100

Note: The area of infrastructure footprint does not include existing track or the existing quarry 2 as no potential extraction of soil or peat are required in these locations. Areas that were not probed have been assumed to have no peat.

9.5.43 These data indicate that peat (>1.0m depth) is present across 2.66% of the infrastructure footprint and there is no peat (0 – 0.5m depth) present across 93.82% of the infrastructure footprint. Should the footprint location change as part of the ILA, further assessment would be undertaken as part of a Detailed Peat Management Plan post consent.

KTR Project as a Whole

Depth of Penetration Probing

9.5.44 A total of 6,651 probes were undertaken by Fluid along the entire proposed new components of the KTR Project between 2017 and 2019. This data is presented in Appendix 9.4 , along with an additional 426 probes undertaken by Energyline in 2017 to inform the design at an early stage, focussed on an area where peat was known to be present. This provided a total of 7,077 peat depth locations that were used to estimate peat depths for the footprint of the KTR Project.

9.5.45 Of the 7,077 locations probed a total of 5,911 probes (83.5%) recorded depths of 0.5m or less, 618 probes (8.7%) recorded depths of penetration between >0.5m and 1.0m and 548 probes (7.7%) recorded depths of penetration >1.0m (Table 5).

Table 5: Depth of Penetration Distribution across the KTR Project as a Whole

Depth Range (m)	Number of Probes	Percentage of Probes
0 to 0.5 (no peat)	5,911	83.52
>0. 5 – 1.0	618	8.73
>1.0 – 1.5	208	2.94
>1.5 – 2.0	118	1.67
>2.0 – 3.0	115	1.62
>3.0 – 4.0	46	0.65
>4.0 – 5.0	34	0.48
>5.0 – 6.0	15	0.21
>6.0+	12	0.17
Total	7,077	100%

9.5.46 The depth of penetration at each probe location is presented on Figures 1.1 to 1.31 of Appendix 9.4.

Coring

9.5.47 A total of 122 locations were cored during the peat surveys. The data collected at each of the 122 cores included Von Post test results, acrotelm and catotelm thickness, observations on the peat structure and any observations on water features nearby. The data are presented in Appendix III, and full logs presented in Appendix IV of Appendix 9.4.

9.5.48 Of the 122 locations cored, a total of 74 identified a distinctive actotelm layer with a thickness ranging from 0.03m and 0.25m with an average depth of 0.09m.

9.5.49 Based on the data collected an interpreted peat depth map (Figure 9.1.1 to 9.2.31 of Chapter 9) was produced to demonstrate the variation in peat across the site and at the infrastructure locations. A comparison of the peat depth with the site infrastructure footprint is presented in Table 6.

Table 6: Peat Depth Distribution across KTR Project as a Whole

Depth Range (m)	Area of New infrastructure footprint (m^2)	Area of New infrastructure footprint (%)
0 to 0.5 (no peat)	1,369,600.8	94.41
>0. 5 – 1.0	45367.7	3.13
>1.0 – 1.5	15042.9	1.04
>1.5 – 2.0	6165.1	0.42
>2.0 – 2.5	4321.3	0.30
>2.5 – 3.0	4045.2	0.28
>3.0 – 3.5	1714.0	0.12
>3.5 – 4.0	1520.1	0.10
>4.0 – 4.5	856.8	0.06
>4.5 – 5.0	956.1	0.07
>5.0 – 5.5	496.2	0.03
>5.5 – 6.0	341.2	0.02
>6.0+	320.0	0.02
Total Area of New Infrastructure Footprint	1,450,747.4	100.00

Note: The area of infrastructure footprint does not include existing track or compound CC2 as no potential extraction of soil or peat are required in these locations. Nor does it include the 11kV underground cabling route that coincides with the proposed new access tracking to avoid double counting of areas. Areas that were not probed have been assumed to have no peat.

9.5.50 These data indicate that peat (>1.0m depth) is present across 2.48% of the infrastructure footprint and there is no peat (0 – 0.5m depth) present across 94.37% of the infrastructure footprint. Should the footprint location change as part of the ILA, further assessment would be undertaken as part of a Detailed Peat Management Plan post consent.

Summary

9.5.51 The following summarises the results of the peat surveys and subsequent peat depth contouring:

- Acrotelm thickness across the cored locations has an average depth of 9cm.
- No amorphous peat was identified.
- The coring results verified the depth of penetration probing as generally representative of peat depth with some minor areas of over estimation of peat.
- The peat surveys have provided a wide coverage of peat occurrence and depth across the proposed KTR Project with higher frequency probing undertaken in the areas of proposed infrastructure.
- Peat has been determined to be present in excess of 6.0m at 12 of the 7,077 depth of penetration probes.
- The data collected has been used to produce an interpreted maximum depth of peat contour map using ArcGIS as presented in Figures 2.1 to 2.31 of Appendix 9.4.
- The mapping indicates that most of the areas surveyed have no peat (0 - 0.5m depth) with numerous isolated pockets of peat and deep peat present as shown on Figures 2.1 to 2.31 of Appendix 9.4. These include some minor areas north and south of Barlae Hill Quarry, north of Glenlee, more extensive areas to the north and south of Hind Craig Quarry, various pockets to the south, north and north west of Stroan Loch, areas within and to the north and north east of Craigelwhan Quarry, more frequent and deeper areas to the west, north west and south of Bargatton Loch, along with some isolated areas along a number of the access tracks.
- The peat contour map shows that the infrastructure has generally avoided peat and deep peat (peat > 1.0m in depth) where possible.

Avoidance and Minimisation of Peat Disturbance

Avoidance

9.5.52 The infrastructure layout has been designed to avoid or minimise impact on peat and related sensitive ecological habitats. In practice, this has been undertaken where possible by avoiding the deepest peat (>1m deep), SNH carbon and peatland Plan 2016 category 1 and 2 areas, and where Annex I habitats such as blanket bog, raised bog, dry and wet heathland were recorded by the ecological surveys. In addition, where possible, areas where peat slide risk is moderate have also been avoided[5], with the exception of one moderate peat slide risk area where further mitigation will be required as described in Appendix 9.6.

Further Minimisation

9.5.53 Disturbance of peat from construction of the tracks, construction compounds, steel towers, wood poles, working areas, and other infrastructure (i.e. quarries), will be minimised as far as practicably possible, taking into account the other known environmental and technical constraints, to minimize any peat waste and minimise potential carbon losses from the peat excavation process.

9.5.54 Throughout the construction process, the appointed Principal Contractor (and / or Designer) will aim to minimise the volumes of excavated peat. As far as possible, appropriate handling and storage of excavated materials will be undertaken in accordance to the principles set out in Appendix 9.6 and

[5] There are no areas with 'High' or 'Very High' likelihoods of peat slide risk.

the CDEMP (an example of which is provided as Appendix 5.4) such that their integrity and subsequent reuse is not jeopardised.

9.5.55 Although every effort has been made to map and assess sensitive habitats, adjustment within the ILA is likely to allow further improvements to avoid particularly sensitive pockets of habitat, such as active peatland or base rich flushes. Therefore, the ECoW will work with the site engineers before construction commences to identify areas of sensitive habitat where impact can be reduced by movement of infrastructure within the ILA. These areas will be clearly marked with posts and tape. The ECoW will also ensure that any micrositing within the ILA does not lead to movements into more sensitive habitats.

9.5.56 Further measures to minimise peat disturbance will be incorporated, where possible, including adhering to the following principles:

- avoid and/or minimise production of excavated peat;
- reuse, where possible, excavated peat in restoration of temporary works, in landscaping and re-profiling works, to minimise visual impacts and facilitate habitat, ecological and hydrogeological restoration, improvement and enhancement; and
- avoid waste peat being sent for disposal, recovery and/or reuse off site.

9.5.57 All contractors will be made aware of the sensitivity of peat and wetland habitats and the ECoW will clearly mark sensitive habitats near to construction areas. Contractors will be required to work within the narrowest practical construction corridor when working in or near areas of peat.

9.5.58 All plans and method statements will be accompanied by justification of the final design and/or construction methods identified by the Principal Contractor, including reasons for discounting alternative methods. This is required to demonstrate that all avenues for avoiding hydrological disruption and reducing the disturbance and excavation of peat have been considered.

Excavation and Reuse Volume Estimates

Peat Excavation Assumptions

9.5.59 The infrastructure areas and excavation calculations are based on the final design of the KTR Project as presented in Chapters 4 and 5 of the EIA Report and assessed in the EIA with the following assumptions:

Existing Tracks and Widening

- Existing access tracks are assumed to be an average width of 3m and will remain in situ as permanent.
- Existing tracks will be temporarily widened by 1m on either side to bring the average width of these sections of access track to 5m width to facilitate construction.
- The widened sections will be temporary and soils and peat extracted from these areas will be reinstated and restored following completion of construction.

Temporary Tracks

- The spur access routes to individual towers/poles are temporary.
- The type of temporary track required will depend on a variety of factors including the sensitivity of the location, the type of land use and the ground conditions, with the latter confirmed through pre-construction ground investigations.
- New temporary access routes for the construction of the KTR Project will have a 5m width and, where possible, comprise:
  - low pressure vehicle use (no track required) - In areas of very dry pasture and level moorland, use will be made of low ground pressure vehicles which do not require a track. It is important to note however, that the movement of these vehicles will still be restricted to the access routes identified. Exceptions to this will arise where the indicated access is to an angle tower/pole position, where a defined track will be required. This track will be formed using imported stone, or, where practicable, temporary matting;
  - floating tracks - Floating tracks will be constructed in areas of peat of a depth greater than 1.0m. Geotextiles and geogrid will be placed on the existing surface then stone placed and compacted as required. Minor cut and fill might be required, especially when crossing slopes which require a drainage ditch on the upslope side with regular cross drains to the downslope side.
- wood/steel matting - In areas with any particular identified sensitivity (such as a high likelihood of undisturbed archaeological interest), temporary matting would be used for access, provided that the ground is relatively level and dry. A stone track would however be required where the ground is undulating and/or wet.For the purposes of this OPMP the worse-case scenario for peat excavation has been assumed whereby all temporary access tracks will be excavated tracks for construction with the exception of the Earlston to Glenlee and Carsfad to Kendoon temporary access tracks to wooden poles which will be matted and will not require any excavation.
- Turning bays will avoid being located on deep peat, will be temporary and reinstated. Turning bays will be further considered as part of the detail peat management plan post consent;
- Materials excavated for the temporary access tracks will be reinstated and restored as soon as possible and sequentially as each tower is completed.

9.5.60 For further information on the construction of access tracks see Chapter 5 of the EIA Report.

Working Areas/Pulling Areas

- Working areas for each individual tower/pole construction are temporary.
- Temporary working areas around towers / poles will be prepared prior to tower foundation excavation, with average dimensions of typical working areas for steel towers of 25m x 25m for standard towers, 50m x 50m for angle towers, and 30m x 15m for wood poles.
- For the purposes of this OPMP the worse-case scenario for peat excavation has been assumed whereby all working areas will be excavated.
- Materials excavated for the working areas will be reinstated and restored as soon as possible and sequentially as each tower/pole is completed.

Steel Lattice Tower Foundations

- Each steel lattice tower will have four legs requiring foundations.
- Excavations will be undertaken for each leg of the tower. The dimensions of the excavation will vary depending on the tower type to be constructed. A typical L4 leg excavation will be $14m^2$ by 3.5m deep for the line towers, increasing up to approximately 20m2 by 4.55m deep for angle towers. For an L7 tower a typical leg excavation will be 16m2 by 4m for the line towers, increasing to $25m^2$ by 5m deep for angle towers.
- The foundation type and design for each tower will be confirmed following detailed ground investigations at each tower location.

Wooden Pole Foundations

- The erection of the wood poles will require an excavation to allow the pole brace block and /or steel foundation braces to be positioned in place. A typical pole excavation will be $3m^2$ by 2m deep.
- The excavated material will be sorted in appropriate layers and the majority of it used for backfilling purposes.

Construction Compounds

- There will be six construction compounds (CC1: 1.71ha; CC2: 0.54ha; CC3: 2.25ha; CC4: 1.98ha; CC5: 2.90ha; and CC6: 1.0ha). With the exception of CC2, CC5 and CC6 which already exists as quarries, these areas will be excavated to remove peat and soils and covered with stone for the duration of the works. Subsequent to completion of the works, the stone will be removed and the peat and soils reinstated.

Quarries

- There will be a total of seven quarries that will be used to provide stone for tracks, construction compounds and other infrastructure (Q1 Barlae Hill Quarry: 8.09ha; Q2 Gallows Knowe Quarry: 4.50ha; Q3 Wills Hill Quarry: 27.48ha; Q4 Hind Craig Quarry: 12.39ha Q5 Lochenbreck Quarry: 6.44ha; Q6 Craigelwhan Quarry: 4.96ha; and Q7 Craigelwhan West Quarry: 10.63ha). A number of the proposed quarries are either in use or have been worked previously (Q3, Q4, Q5 and Q6) and these will be excavated following current excavation practices at each site. The sizes of the quarries presented above include the working area around the actual stone abstraction area and therefore represent the 'maximum case' scenario for temporary land take.

Underground Cable

- Open cut trenching is proposed for the 0.25km of underground cable for the E to G connection, from the terminal pole into the Glenlee substation and for the 11kV OHL to be removed and replaced by 13km of underground cabling. Works commonly consist of the construction of a haul road, the excavation of the cable trench by mechanical excavators, cable laying, the backfilling of the trench with sand and native material and surface reinstatement. A typical cable installation rate is up to 160m per week, depending on the terrain. Any peat extracted for the cable trenching will be immediately reinstated in the same location following cable laying. Therefore, the volumes of peat extracted and reinstated will be a net balance with the exception of the foundations required for the three switch stations (2.6m x 3.1m each).

9.5.61 The infrastructure and dimensions used in the peat balance calculations are summarised in Tables 7 to 12 below.

Table 7: New OHL Infrastructure Dimensions – P-G via K

Infrastructure	Dimensions	Area (Ha)
2 x Construction Compounds	Construction compound 1 and 2	2.25
Existing Access	Approx. 3.6km length, 3m wide	1.08
Existing Access - Widening	Approx. 3.6km length, 1 meter each side	0.70
New access	Approx. 11.2km length, 5m wide	5.51
Barlae Hill Quarry (Q1)	Irregular	8.09
37 x Steel Tower Bases and Work Areas/Pulling Areas	Approx. 25m^2 to 50m^2 each	6.03
11Kv underground cable and 3 x switch stations	Approx 13km length, 3m width working area and 0.45m wide excavations (temporary). 0.2km of this is within the proposed access track footprint 25m^2 areas (temporary) for switch stations with a 2.6m x3.1m (permanent) concrete plinth	3.91
Total		27.57

Table 8: New OHL Infrastructure Dimensions – C-K

Infrastructure	Dimensions	Area (Ha)
New access	Approx. 3.23km length, 5m wide	1.63
24 x Trident wood Poles and Work Areas/Pulling Areas	Approx. 30m x 15m each	1.49
Total		3.12

Table 9: New OHL Infrastructure Dimensions – E-G

Infrastructure	Dimensions	Area (Ha)
Existing Access	Approx. 0.14km length, 3m wide	0.04
Existing Access - Widening	Approx. 0.14km length, 1 meter each side	0.03
New Access	Approx. 2.6km length, 5m wide	1.28
Underground Cable	Approx. 0.25km length	0.04
15 x Trident Wood Poles and Work Areas/Pulling Areas	Approx. 30m x 15m each	1.26
Total		2.65

Table 11: New OHL Infrastructure Dimensions – G-T

Infrastructure	Dimensions	Area (Ha)
4 x Construction Compounds	construction compound 3 to 6	8.13
Existing Access	Approx. 7.8km length, 3m wide	13.44
Existing Access - Widening	Approx. 7.8km length, 1 meter each side	8.95
New Access	Approx. 35.2km length, 5m wide	16.50
Craigelwhan Quarry (Q6), Craigelwhan West Quarry (Q7), Lochenbreck Quarry (Q5), Gallows Knowe Quarry (Q2), Hind Craig Quarry (Q4), Wills Hill Quarry (Q3)	Irregular	66.41
119 x Steel Lattice Tower Bases and Work Areas/Pulling Areas	Approx. 50m^2 each	16.87
Total		130.3

Table 12: New OHL Infrastructure Dimensions – KTR OHL as a Whole

Infrastructure	Dimensions	Area (Ha)
6 x Construction Compounds	Construction compound 1 to 6	10.38
Existing Access	Approx. 11.44km length, 3m wide	14.56
Existing Access - Widening	Approx. 11.44km length, 1 metre each side	9.95
New access	Approx. 46.36km length, 5m wide	22.55
7 Quarries: Craigelwhan Quarry (Q6), Craigelwhan West Quarry (Q7), Lochenbreck Quarry (Q5), Gallows Knowe Quarry (Q2), Hind Craig Quarry (Q4), Wills Hill Quarry (Q3); Barlae Hill Quarry (Q1)	Irregular	75.22
200 x towers and working areas including: 156 Steel lattice Tower Bases and Work Areas/Pulling Areas, 39 x Trident Wood Poles and Work Areas/Pulling Areas and 3 moved wood poles and associated working areas.	Approx. 4 x 6m^2 = 24m^2 to 2 x 25m^2 = 100m^2 each for steel lattice towers Approx. 30m x 15m each for trident wood poles Approx. 3m^2 each for wooden tower	27.55
Underground Cable	Approx. 0.25km length	0.04
11Kv underground cable and 3 x switch stations	Approx 13km length, 3m width working area and 0.45m wide excavations (temporary). 0.2km of this is within the proposed access track footprint 25m^2 areas (temporary) for switch stations with a 2.6m x3.1m (permanent) concrete plinth	3.80
Total		164.06

Excavated Volumes

9.5.62 Peat excavation volumes associated with the KTR Project have been calculated using ArcGIS software to calculate assumed peat depth based on interpolation of values from probing undertaken across the survey area (contour map shown in Figure 2.1 to 2.31 of Appendix 9.4), the proposed areas for excavation, and infrastructure dimensions data in Tables 7 to 12. The following further assumptions have also been made:

- Based on the peat core data the depth of acrotelm is assumed to be 0.09m across the infrastructure area where peat (>0.5m organic soil) is present.
- Based on the peat core data the thickness of catotelm is assumed to be the average depth of the peat minus the acrotelm (0.09m) across the infrastructure area where peat is present.
- It is assumed that the probe depth is representative of the actual depth of the peat (validated by the spatial coverage of 122 cores).
- It is assumed that any peat excavated for the cable trenches is stored adjacent to the trench while the cable is laid and then replaced, therefore this volume is not applicable to the excavated volume. 2km of 13km 11kV underground cable is located within the footprint of the proposed access track and 9.92km is located within or adjacent to existing roads considered to be disturbed ground areas where there is no peat.

9.5.63 The interpreted peat depth contour map (Figure 2.1 to 2.31 of Appendix 9.4) was used along with the infrastructure dimensions (ArcGIS shapefiles) and associated excavation areas to determine the volumes of peat that would be excavated during construction. These calculations produced the following volume estimates detailed in Table 13 to Table 17[6].

Table 13: Excavated Volumes Based on Infrastructure on Peat – P-G via K

Infrastructure on peat	Infrastructure area on peat (m^2)	Average peat depth over infrastructure area (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Existing Access - Widening	588	1.04	605.88	52.90	552.98
New access	3,031	1.25	3,782.92	272.77	3,510.15
Barlae Hill Quarry (Q1)	114	0.68	76.48	10.27	66.21
Construction compound 1	407	0.56	225.81	36.61	189.20
Tower 4 and working area	668	1.02	682	60.11	621.93
Tower 5 and working area	394	1.34	526	35.46	490.86
Tower 15 and working area	437	0.85	372	39.35	332.45
Tower 22 and working area	287	0.78	223	25.79	197.02
Tower 36 and working area	883	0.73	610	74.98	534.92
Total	6,835	-	7,104	608	6,496

Table 14: Excavated Volumes Based on Infrastructure on Peat – C-K

Infrastructure on peat	Infrastructure area on peat (m^2)	Average peat depth over infrastructure area (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
New access	271.94	0.93	253.84	24.47	229.36
Wood Pole R016R and working area	137.0	0.52	71.6	12.33	59.24
Wood Pole R017R and working area	88.87	0.77	68.0	8.00	59.99
Total	503	-	393	45	349

Table 15: Excavated Volumes Based on Infrastructure on Peat – E-G

Infrastructure on peat	Infrastructure area on peat (m^2)	Average peat depth over infrastructure area (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
New access	678.39	2.24	1,517.61	61.05	1,456.55
Wood Pole EG002 and working area	574.75	3.00	1,723.74	51.73	1,672.01
Wood Pole EG003 and working area	599.63	2.00	1,196.85	53.97	1,142.89
Total	1,853	-	4,438	167	4,271

Table 16: Excavated Volumes Based on Infrastructure on Peat – G-T

Infrastructure on peat	Infrastructure area on peat (m^2)	Average peat depth over infrastructure area (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Existing Access - Widening	5,418.60	1.04	5,632.69	487.67	5,145.01
New access	21,280.40	1.32	28,090.13	1,915.24	26,174.89
Craigelwhan West Quarry (Q6)	13,676.14	1.07	14,685.43	1,230.85	13,454.57
Hind Craig Quarry (Q4)	4,244.29	0.80	3,393.51	381.99	3,011.52
Construction Compound 3	12,398.23	0.87	10,752.42	1,115.84	9,636.58
Construction Compound 4	1,259.91	0.73	925.38	113.39	811.99
Tower 7 and working area	2.7	0.84	2.25	0.24	2.01
Tower 12 and working area	15.72	0.54	8.51	1.41	7.10
Tower 14 and working area	50.00	0.69	34.52	4.50	30.02
Tower 17 and working area	1391.1	1.47	2050.88	125.20	1,925.68
Tower 18 and working area	325.0	0.66	215.74	29.25	186.50
Tower 20 and working area	341.3	0.71	242.23	30.72	211.51

[6] It should be noted that there is no total for the 'Average peat depth over infrastructure area (m)' within Table 13 to Table 17 because this relates to areas that are specifically on peat. Most of the sections of connections of the KTR Project are not on peat therefore an average has not been calculated as it would have little meaning across the entirety of the Project.

Infrastructure on peat	Infrastructure area on peat (m^2)	Average peat depth over infrastructure area (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Tower 22 and working area	386.3	0.93	357.50	34.77	322.73
Tower 23 and working area	2014.6	2.53	5088.68	181.31	4,907.36
Tower 24 and working area	605.0	1.18	711.52	54.45	657.07
Tower 25 and working area	50.0	0.57	28.62	4.50	24.12
Tower 28 and working area	13.4	0.76	10.16	1.20	8.96
Tower 29 and working area	12.2	0.59	7.27	1.10	6.17
Tower 30 and working area	226.3	0.71	161.26	20.36	140.90
Tower 31 and working area	75.0	0.58	43.42	6.75	36.67
Tower 33 and working area	335.6	0.71	238.27	30.21	208.06
Tower 34 and working area	191.4	0.64	122.05	17.23	104.83
Tower 36 and working area	276.0	0.87	241.46	24.84	216.62
Tower 38 and working area	7.5	0.75	5.59	0.68	4.92
Tower 41A and working area	138.2	1.07	147.87	12.43	135.44
Tower 41 and working area	209.7	0.56	118.17	18.87	99.30
Tower 42 and working area	671.8	0.78	523.92	60.46	463.46
Tower 46 and working area	252.8	0.66	166.54	22.75	143.79
Tower 48 and working area	414.0	2.09	865.90	37.26	828.64
Tower 49 and working area	50.0	0.65	32.38	4.50	27.88
Tower 50 and working area	1520.7	2.01	3055.96	136.87	2,919.09
Tower 51 and working area	579.7	2.17	1257.19	52.18	1,205.01
Tower 54 and working area	335.3	0.72	241.85	30.17	211.68
Tower 59 and working area	222.8	0.60	133.18	20.05	113.13
Tower 63 and working area	50.0	0.64	31.77	4.50	27.27
Tower 69 and working area	273.3	0.54	147.47	24.60	122.87
Tower 70 and working area	321.2	0.65	208.13	28.91	179.22
Tower 72 and working area	782.5	0.90	707.06	70.42	636.64
Tower 74 and working area	233.1	0.76	176.28	20.98	155.30
Tower 85 and working area	529.8	3.04	1609.37	47.68	1,561.69
Tower 86 and working area	3866.6	4.23	16366.43	347.99	16,018.44
Tower 88 and working area	70.7	0.56	39.85	6.36	33.49
Tower 89 and working area	2019.3	1.38	2782.65	181.73	2,600.92
Tower 90 and working area	33.2	0.62	20.48	2.99	17.49
Tower 94 and working area	471.0	0.71	336.42	42.39	294.03
Tower 98 and working area	9.0	0.55	4.95	0.81	4.14
Total	77,651.4	-	102,023.65	6988.65	95,035.01

Table 17: Excavated Volumes Based on Infrastructure on Peat – KTR as a whole

Infrastructure on peat	Infrastructure area on peat (m^2)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
P to G (via K)	6,835	7,104	608	6,496
C to K	503	393	45	349
E to G	1,853	4,438	167	4,271
BG Deviation	-	-	-	-
G to T	77,651	102,024	6,989	95,035
Total	86,842	113,960	7,809	106,151

9.5.64 The total peat volume that is predicted to be excavated for the KTR Project as a whole is therefore:

- total volume of peat: 113,960m^3;
- total volume of acrotelm: 7,809m^3; and
- total volume of catotelm: 106,151m^3.

9.5.65 Further probing and/ or other ground investigation techniques will be employed as necessary prior to and during the works to inform micro-siting requirements within the ILA, and to further update the peat management plan.

Peat Reuse Volumes

9.5.66 Peat will be reused in accordance with the assumptions in the section on 'Peat Excavation Assumptions' above which states that peat reinstatement will occur as follows:

- Peat will be replaced on all temporary infrastructure areas. This includes all new access tracks and construction compounds.
- Peat will be replaced in the working areas/pulling areas area (except for each of the individual tower leg or pole foundations).
- In the quarries, in any areas where peat has been extracted it will be replaced in depths similar to those currently existing, and over a wider area where feasible, allowing areas to be reinstated but also forming a more continuous peatland habitat/connect to adjacent peat areas outside of the quarry where relevant.

- Where considered appropriate, peat will be used to block any drains/ditches currently located in peatland along the route of the OHL. The suitability and requirement for this will be assessed during the pre-construction works and has therefore not been assumed for the purposes of the calculations presented in this report. Any peat used in drain/ditch blocking would reduce the volume re-used in the quarries.

Peat Reuse and Balance P-G via K

9.5.67 The excavated peat volumes for the P-G via K connection are presented in Table 13 and the volumes of peat that can be re-used are in Table 18. These indicate that the excavated peat can all be reused within the connection including some additional peat restoration in the Barlae Hill Quarry (Q1). The quarry has a depth of peat of 0.68m over an area of 114m^2 in the northern entrance and linked to peat habitat outside of the quarry to the north. The excavated peat would be replaced in the same thickness (0.68m) and the peat area would be extended by 286m^2 to a total of 400m^2 to reinstate and improve the peat habitat connection in this area. Table 19 demonstrates that the excavated peat volumes can be balanced by appropriate re-use. The negative balance value indicates more peat can be re-used on site than the volume of peat is excavated.

Table 18: Peat Reuse Volumes – P-G via K

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
Existing Access – Widened area to be completely reinstated	588	1.04	605.88	52.90	552.98
New access – to be completely reinstated	3031	1.25	3,782.92	272.77	3,510.15
Barlae Hill Quarry (Q1) – peat reinstated in specific area slightly larger than the extracted area to link with adjacent peat.	400	0.68	272	36	236
Construction compound 1 – to be completely reinstated	407	0.56	225.81	36.61	189.20
Working area of Tower 4 to be reinstated around a 64m2 tower foundation	668 −64 = 604	1.02	616.08	54.36	561.72
Working area of Tower 5 to be reinstated around a 41m2 tower foundation	394 – 41 = 353	1.34	473.02	31.77	441.25
Working area of Tower 15 to be reinstated around a 51m2 tower foundation	437 – 51 = 386	0.85	328.1	34.74	293.36
Working area of Tower 22 to be reinstated around a 32m2 tower foundation	287 – 32 = 255	0.78	198.90	22.95	175.95
Working area of Tower 36 to be reinstated around a 47m2 tower foundation	883 – 47 = 836	0.73	610.28	75.24	535.04
Total	6,860		7,113	617	6,496

Table 19: Net Peat Balance – P-G via K

	Acrotelm volume (m^3)	Catotelm volume (m^3)	Total Volume (m^3)
Excavated Peat	608	6,496	7,104
Potential Peat Reuse	617	6,496	7,113
Total Balance	-9	0	-9

Peat Reuse and Balance C-K

9.5.68 The excavated peat volumes for the C-K connection are presented in Table 14 and the volumes of peat that can be re-used are in Table 20. These indicate that a very minor quantity of peat (approx. 5m3) only equivalent to the foundation area of the two wooden poles may need to be reinstated either in ditches or as dressing on other infrastructure.

Table 20: Peat Reuse Volumes – C-K

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
New access – to be completely reinstated	271.94	0.93	253.84	24.47	229.36
Tower R016R and working area to be reinstated around a 3m2 wood pole foundation	137.0 – 3 = 134	0.52	70.00	12.06	57.94
Tower R017R and working area to be reinstated around a 3m2 wood pole foundation	88.87 – 3 = 85.87	0.77	65.70	7.73	57.97
Total	492		390	44	345

Table 21: Net Peat Balance – C-K

	Acrotelm volume (m^3)	Catotelm volume (m^3)	Total Volume (m^3)
Excavated Peat	45	349	394
Potential Peat Reuse	44	345	389
Total Balance	1	4	5

Peat Reuse and Balance E-G

9.5.69 The excavated peat volumes for the E-G connection are presented in Table 15 and the volumes of peat that can be re-used are in Table 22. These indicate that a minor quantity of peat only equivalent to the foundation area of the two wooden poles may need to be reinstated either in ditches or as dressing on other infrastructure. Table 23 demonstrates that the excavated peat volumes can be balanced by appropriate re-use.

Table 22: Peat Reuse Volumes – E-G

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
New access – to be completely reinstated	678.39	2.24	1,51	61.05	1,456.55
Tower EG002 working area to be reinstated around a 3m2 tower foundation	574.75 – 3 = 571.75	3.00	1714.74	51.46	1663.29
Tower EG003 working area to be reinstated around a 3m^2 tower foundation	599.63 – 3 596.63	2.00	1190.87	53.70	1137.17
Total	1847		4,423	166	4,257

Table 23: Net Peat Balance – E-G

	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Excavated Peat	167	4,271	4,438
Potential Peat Reuse	166	4,257	4,409
Total Balance	1	14	15

Peat Reuse and Balance G-T

9.5.70 The excavated peat volumes for the G-T connection are presented in Table 16 and the volumes of peat that can be re-used are in Table 24. These indicate that by reinstating peat in the Craigelwhan West Quarry (Q6) over a slightly larger area but equivalent depth to the current peat in that area a peat balance can be achieved. These indicate that the excavated peat can all be reused within the connection, including some additional peat restoration in the Craigelwhan West Quarry (Q6). The quarry has a depth of peat of 1.07m over an area of 13,676m^2 in two main areas within the quarry. The area in the east is linked to peat habitat outside of the quarry. The excavated peat would be replaced in the same thickness (1.07m) and the area would be extended by 744m^2 to 14,420m^2 to improve the peat habitat in this area.

9.5.71 Table 25 demonstrates that the excavated peat volumes can be balanced by appropriate re-use.

9.5.72 The peat depths at Tower 85 and Tower 86 are too deep for reinstatement. Piling will be undertaken in these areas so that the amount of peat excavated will be substantially reduced and reinstatement is possible. Other tower locations may require pilling which could further reduce the volumes of peat excavated. These will be identified at the pre-construction phase.

Table 24: Peat Reuse Volumes – G-T

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
Existing Access - Widening – to be completely reinstated	5418.60	1.04	5,632.69	487.67	5,145.01
New access – to be completely reinstated	21,280	1.32	28,090	1,915.24	26,174.89
Craigelwhan West Quarry (Q6) – peat reinstated in specific area larger than the extracted area	14,420	1.07	15,429	1,297	14,132
Hind Craig Quarry (Q4) – peat reinstated in the same area and volume as extracted	4244.29	0.80	3,393.51	381.99	3,011.52
Construction Compound 3 – to be completely reinstated	12398.23	0.87	10,752.42	1,115.84	9,636.58
Construction Compound 4 – to be completely reinstated	1259.91	0.73	925.38	113.39	811.99
Tower 7 working area to be reinstated around a 27m2 tower foundation not located on peat*	2.7	0.84	2.25	0.24	2.01
Tower 12 working area to be reinstated around a 29m2 tower foundation not located on peat *	15.7	0.54	8.51	1.41	7.10
Tower 14 working area to be reinstated around a 41m2 tower foundation not located on peat *	50	0.69	34.52	4.50	30.02
Tower 17 working area to be reinstated around a 50m2 tower foundation	1391.1 – 50 = 1,341.1	1.47	1977.16	120.70	1856.46
Tower 18 working area to be reinstated around a 27m2 tower foundation	325 –27 = 298	0.66	197.82	26.82	171.00
Tower 20 working area to be reinstated around a 21m2 tower foundation not located on peat *	341.3	0.71	242.23	30.72	211.51
Tower 22 working area to be reinstated around a 21m2 tower foundation	386.3 – 21 = 365.3	0.93	338.07	32.88	305.19
Tower 23 working area to be reinstated around a 21m2 tower foundation	2,014.6 – 21 = 1,993.6	2.53	5035.63	179.42	4856.21
Tower 24 working area to be reinstated around a 21m2 tower foundation	605.0 –21 = 584	1.18	686.82	52.56	634.26
Tower 25 working area to be reinstated around a 21m2 tower foundation not located on peat *	50.0	0.57	28.62	4.50	24.12
Tower 28 working area to be reinstated around a 29m2 tower foundation not located on peat *	13.4	0.76	10.16	1.20	8.96

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
Tower 29 working area to be reinstated around a 32m2 tower foundation not located on peat *	12.2	0.59	7.27	1.10	6.17
Tower 30 working area to be reinstated around a 27m2 tower foundation	226.3 – 27 = 199.3	0.71	142.02	17.93	124.09
Tower 31 working area to be reinstated around a 24m2 tower foundation not located on peat *	75.0	0.58	43.42	6.75	36.67
Tower 33 working area to be reinstated around a 21m2 tower foundation	335.6 – 21 = 314.6	0.71	223.36	28.32	195.04
Tower 34 working area to be reinstated around a 41m2 tower foundation not located on peat *	191.4	0.64	122.05	17.23	104.83
Tower 36 working area to be reinstated around a 24m2 tower foundation not located on peat *	276.0	0.87	241.46	24.84	216.62
Tower 38 working area to be reinstated around a 27m2 tower foundation not located on peat *	7.5	0.75	5.59	0.68	4.92
Tower 41A working area to be reinstated around a 21m2 tower foundation	138.2 – 21 = 117.2	1.07	125.39	10.54	114.85
Tower 41 working area to be reinstated around a 24m2 tower foundation not located on peat *	209.7	0.56	118.17	18.87	99.30
Tower 42 working area to be reinstated around a 24m2 tower foundation	671.8 – 24 = 647.8	0.78	505.20	58.30	446.90
Tower 46 working area to be reinstated around a 41m2 tower foundation not located on peat *	252.8	0.66	166.54	22.75	143.79
Tower 48 working area to be reinstated around a 21m2 tower foundation	414.0 – 21 = 393	2.09	821.98	35.37	786.61
Tower 49 working area to be reinstated around a 29m2 tower foundation not located on peat *	50.0	0.65	32.38	4.50	27.88

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
Tower 50 working area to be reinstated around a 32m2 tower foundation	1520.7 – 32 = 1,488.7	2.01	2991.66	133.99	2857.67
Tower 51 working area to be reinstated around a 27m2 tower foundation	579.7 –27 = 552.7	2.17	1198.63	49.75	1148.89
Tower 54 working area to be reinstated around a 50m2 tower foundation not located on peat *	335.3	0.72	241.85	30.17	211.68
Tower 59 working area to be reinstated around a 31m2 tower foundation not located on peat *	222.8	0.60	133.18	20.05	113.13
Tower 63 working area to be reinstated around a 26m2 tower foundation not located on peat *	50.0	0.64	31.77	4.50	27.27
Tower 69 working area to be reinstated around a 27m2 tower foundation	273.3 – 27 = 246.3	0.54	132.90	22.17	110.73
Tower 70 working area to be reinstated around a 21m2 tower foundation	321.2 – 21 = 300.2	0.65	194.52	27.02	167.50
Tower 72 working area to be reinstated around a 32m2 tower foundation	782.5 – 32 = 750.5	0.90	678.14	67.54	610.60
Tower 74 working area to be reinstated around a 50m2 tower foundation not located on peat *	233.1	0.76	176.28	20.98	155.30
Tower 85 working area to be reinstated around a 24m2 tower foundation	529.8 – 24 = 505.8	3.04	1536.47	45.52	1490.94
Tower 86 working area to be reinstated around a 24m2 tower foundation	3866.6 – 24 = 3,842.6	4.23	16264.85	345.83	15919.01
Tower 88 working area to be reinstated around a 33m2 tower foundation not located on peat *	70.7	0.56	39.85	6.36	33.49
Tower 89 working area to be reinstated around a 32m2 tower foundation	2019.3 – 32 = 1,987.3	1.38	2738.56	178.85	2559.70
Tower 90 working area to be reinstated around a 27m2 tower	33.2	0.62	20.48	2.99	17.49

Infrastructure on peat	Reinstatement area (m^2)	Average peat depth over infrastructure area (m)	Volume of peat reused (m^3)	Volume of acrotelm peat reused (m^3)	Volume of catotelm peat reused (m^3)
foundation not located on peat *					
Tower 94 working area to be reinstated around a 50m2 tower foundation not located on peat *	471.0	0.71	336.42	42.39	294.03
Tower 98 working area to be reinstated around a 21m2 tower foundation not located on peat*	9	0.55	4.95	0.81	4.14
Total	77,90		102,060	7,011	95,048

* Note: where 20% or less of the Tower working area footprint is on peat it is assumed that the tower foundation will not be located on peat.

Table 25: Net Peat Balance – G-T

	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Excavated Peat	6,989	95,035	102,024
Potential Peat Reuse	7,011	95,048	102,060
Total Balance	-23	-13	-36

Peat Balance for the KTR Project as a Whole

9.5.73 The total peat balance for the KTR Project as a whole is set out in Table 26. Over the life time of the Proposed Development it is expected that there will be a potential for all the peat to be reused on the site. This is due to the temporary nature of the majority of the infrastructure and the capacity of the quarries to allow an appropriate reinstatement of peat to enable the habitat to be restored and potentially extended.

Table 26: Net Peat Balance – KTR OHL as a Whole

	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Excavated Peat	7,809	106,151	113,960
Potential Peat Reuse	7,839	106,146	113,985
Total Balance	-30	5	-25

Handling Excavated Materials

Excavation

9.5.74 The following methodologies for excavation of peat will be undertaken:

- Areas of peat within the footprint of any excavation will have the top layer of vegetation stripped off as turf by an experienced specialist contractor prior to construction. When excavating areas of peat, excavated turfs should be kept as intact as possible. Often it is easiest to achieve this by removing large turfs up to 500mm to keep the peat intact.
- Excavated soils and turfs will be handled so as to avoid cross contamination between distinct horizons, for example separating out of peat from soils and peat turfs from acrotelmic and catotelmic peat and to ensure reuse potential is maximised.
- Prior to any excavations, the Contractor will produce a detailed PMP as part of the Construction Method Statement identifying where and how excavated peat will be used in reinstatement or landscaping works (such as edges and verges). Specific requirements for the excavation, handling, storage and reinstatement of peat will be outlined in this Method Statement. The Contractor will consider potential impacts on downstream hydrological receptors and also the potential for instability issues associated with the excavated material in accordance with the Peat Landslide Hazard Risk Assessment (see Appendix 9.5 of the EIA Report).
- Care will be taken when stripping and removing topsoil and peat turfs and appropriate storage methods will be used on site, i.e. excavated material will be stored in separate horizons and vegetation rich top layers will be stored vegetation side up.
- Classification of excavated materials will depend on their identified re-use in reinstatement works. At this site it is anticipated that the material to be excavated will comprise peat (which may be sub-divided into turf, acrotelm and catotelm/amorphous), peaty soils and mineral soils (subsoil and topsoil).

Temporary Storage

9.5.75 Following excavation, peat will require to be temporarily stored before reuse, although peat restoration will commence in locations as soon as feasible e.g. in quarries as they are completed. Excavated peat will be stored in stockpiles to minimise carbon losses while being stored.

9.5.76 Turfs will be stored adjacent to the construction area in a way that ensures they remain moist and viable Excavated turfs should be as intact as possible to minimise carbon losses.

9.5.77 The removed and stored peat will be kept damp (in accordance with the Carbon and Water Guidelines 2012). The moisture content of stored/stockpiled peat will be monitored monthly and if it falls below 25% of the moisture content in surrounding, intact peat then it will be watered.

9.5.78 Areas for temporary storage required for peat will be identified in the Principal Contractors Method Statement and CDEMP taking into account constraints and mitigation requirements identified in pre-construction investigations. This will describe any intended drainage, pollution prevention and material stability mitigation measures that may be required. The following general guidelines will be adhered to where possible:

- Temporary storage areas for excavated peat will also be as close to the excavation as practicable.
- Temporary peat storage will be located alongside the proposed tracks in areas where the ground conditions are suitable for some loading, the peat slide risk is low (Appendix 9.6), they are outside of the main watercourse buffers and the gradients are low. This will be supplemented by smaller peat storage areas near to each section of infrastructure where the peat is extracted and to be re-used to minimise the handling and transportation requirements.
- The design and location of stockpiles, including incorporated drainage elements, will be agreed with the ECoW and Geotechnical Consultant / Geotechnical Clerk of Works prior to excavation works commencing.
- Temporary peat storage areas will be located so that erosion and run off is limited, leachate from the material is controlled, and stability of the existing peatland in the vicinity is not affected.
- Excavated material will be stockpiled at least 50m away from watercourses. This will ensure that any wetting required on stored peat does not runoff and discharge into adjacent watercourses.
- Any edges of cut peat that may remain exposed, or areas of peat excavation on steep slopes, will be covered with geotextile or similar approved. This will allow re-turfing and re-vegetation and reduce erosion risks.
- Suitable storage areas will be appropriately sited in areas with lower ecological value and low slopes. Cleared areas of forestry are preferred to areas of higher ecological value or areas close to watercourses.
- Temporary peat storage will be in locations where the water table can be kept artificially high.
- An up-gradient cut off ditch will be installed around the edge of the storage bund to collect up-gradient surface water runoff and divert water run-off from eroding the toe of the bund.
- It is desirable to keep haul distances of excavated peat as short as possible and as close to intended re-use destinations to minimise plant movements in relation to any earthworks activity including peat management. This will minimise the potential impacts on the peat structure. It is important that temporary storage is safe and keeps the material suitable for its planned reuse.

- The handling and storage of peat will seek to ensure that excavated peat does not lose either its structure or moisture content. Peat turves require careful storage and wetting and to be maintained to prevent drying out and subsequent oxidisation to ensure that they remain fit for re-use.
- Stockpiling of peat will take due regard to potential loading effects. Higher stockpiles are more likely to become dewatered, while smaller piles expose a greater area to evaporation. Piles will be bladed off at the side to minimise the available drying surface area. Reducing mound size may also increase likelihood of erosional losses as particulate organic carbon (POC). Overall volumes of stockpiling will therefore be designed to allow height and surface areas to be kept to a minimum – for example, a maximum of 1m high and against rock faces in quarries where possible.
- Stockpiles will be battered to limit instability and erosion and will be bunded or covered using impermeable material. The bunds will extend to a level above the toe of the stockpiled material to provide restraint to surface runoff.
- When planning the temporary storage areas any additional disturbance areas will be minimised.
- Transport of peat to temporary storage areas or restoration areas will be by low ground pressure vehicles to avoid excessive compaction of the peat.

Reuse of Peat in Infrastructure and Quarry Restoration

Bare Peat

9.5.79 The following measures will be put in place where there is exposure of bare peat:

- The amount of time any bare peat will be exposed will be minimised to preserve its integrity.
- The phasing of work will be carried out to minimise the total amount of exposed ground at any one time. By stripping turf and replacing as soon as possible after peat has been re-distributed there will be minimal areas of bare peat.
- Any peat areas on steep ground or that remains partially bare will be covered using geotextile or a similar method to stop erosion.
- Any areas of bare peat, where vegetation is not re-growing, will be seeded with a seed mixture obtained from the existing habitat.

9.5.80 This approach has been shown to be effective on other peat sites and the turfs re-grow quickly both establishing vegetation and consolidating the peat. The re-vegetated areas will be monitored regularly by the ECoW. Any areas of bare peat, where vegetation is not re-growing, will be seeded with a seed mixture obtained from the existing habitats nearby. Stock exclusion in these areas will continue until vegetation is properly established.

Peat Re-use within Infrastructure Footprint

9.5.81 Peat reuse around and within infrastructure areas is an important aspect of the KTR Project as it allows an opportunity to maintain the integrity of the excavated peat, enhance habitats, and create new habitats. This will be undertaken using the measures set out below:

- The Principal Contractor will be required to provide appropriate plant for undertaking all reinstatement works such that no unnecessary disturbance of the ground surface occurs. To minimise disturbance and damage to the ground surface, any mobile plant required for reinstatement and landscaping works will be positioned on constructed access tracks, hard standing areas or existing disturbed areas wherever possible. The use of a long reach excavator for excavations and reinstatement works is preferable as it enables sufficient room to allow initial side casting and subsequent pulling back of turves over reinstated peat or soil.
- Excavated catotelm or amorphous peat will only be used in restoration works where the topography allows straightforward deposition with no pre-treatment or containment measures, and without risk to the environment. Suitable scenarios may be present in those disturbed areas where natural topography profile allows such use. A fibrous layer of acrotelm and turf will be placed above any catotelm or amorphous peat reinstated.
- Reinstatement of vegetation will be focused on natural regeneration utilising peat vegetated turfs. To encourage stabilisation and early establishment of vegetation cover, where available, peat turfs (acrotelmic material) or other topsoil and vegetation turves in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.
- Appropriate drainage will be required where peat is used in reinstatement, for instance track verges and reinstatement of construction compounds, etc. so that the peat will be maintained in a saturated condition.
- Any reinstatement and re-profiling proposals will consider, and mitigate against, identified significant risks to environmental receptors. In particular, in areas of replaced peat, water management will be considered in the Contractor's Construction Method Statements to ensure that, as far as possible, an appropriate hydrological regime is re-established within areas of disturbance. Particular attention will be paid to maintaining hydrological continuity and preventing the creation of preferential subsurface flow paths (for instance within the backfilled cable trench).
- Peat turfs will be replaced on all disturbed areas, including constructed roadside drainage channel embankments where possible.
- When constructing/upgrading tracks rapid restoration will be undertaken as track construction progresses.
- Immediately following construction some turfs will be replaced along the track edges to allow quicker re-vegetation and to soften the track edges
- Any landscaping or road batters will be limited to the areas of ground already disturbed.
- Track edges and passing places will be reinstated post construction through the removal of capping material and the reuse of peat turves. Where peat turves are used to reinstate track edges this will be done in a manner to ensure works tie in with the surrounding topography, landscape and ground conditions.
- The design and construction of tracks on peat shall be done in such a way so as to reduce impacts on the existing peat hydrology at the site. The built track will allow for the transmittance of water, so natural drainage can be maintained as far as possible.
- The re-vegetation of temporary hardstanding areas (e.g. working areas and construction compounds) will depend on the identified reinstatement use and associated vegetation character bounding the areas of restoration, with the aim being to match turves and topsoil to similar ground conditions. Where appropriate, excess peat turves, if acrotelm in nature and considered suitable by the ECoW, could be used for landscaping in conjunction with reseeding. The seed mix used on site would be agreed with the ECoW and SNH and would use local native species akin to the local ecological baseline.

Summary

9.5.82 A high density grid of over 7,000 peat probes and associated cores has been completed at all site infrastructure where mapping or other evidence has suggested the potential presence of peat, to obtain a detailed understanding of peat variability, depth and characteristics at the site.

9.5.83 The total volume of excavated peat associated with the infrastructure footprint has been calculated at approximately 113,950m^3 with about 7,800m^3 of acrotelmic peat and 106,150m^3 of catotelmic peat.

9.5.84 The potential reuse of excavated peat has been calculated based on SEPA guidance and on the basis that there is capacity in the quarries that currently contain peat to reinstate more peat than currently calculated, the volumes have been adjusted so that a balance is achievable. The peat will therefore be reinstated in situ for the majority of the KTR Project (as the majority of the infrastructure footprint is temporary), and in the two of the three quarries that currently contain peat in the thickness currently present with some additional peat used to allow the peat habitat to better link to the surrounding peat habitat. The potential reuse volumes are therefore essentially the same as the peat excavation volumes i.e. a balance is achieved. This is mainly due to the temporary nature of the large majority of the works so that any peat can be reinstated where excavated, and also due to the limited amount of peat on site and the avoidance of peat by design.

9.5.85 The peat depths at Tower 85 and Tower 86 are too deep for reinstatement. Piling will be undertaken in these areas so that the amount of peat excavated will be substantially reduced and reinstatement is possible.

9.5.86 Further investigations will be undertaken prior to works commencing to confirm peat depth, distribution and characterisation. The additional survey data will be used to inform any micro-siting within the ILA, and potentially further minimise the volume of peat extracted. The outline peat management plan will be further updated using the additional survey data and detailed infrastructure design.

9.5.87 An ECoW will maintain a record of actual peat volumes excavated and the subsequent peat re-use to compare the predicted and actual peat volumes. This record during the construction, operation, decommissioning (of N and R route) and restoration phases of the KTR Project will be made available for review by regulators as and when required.

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