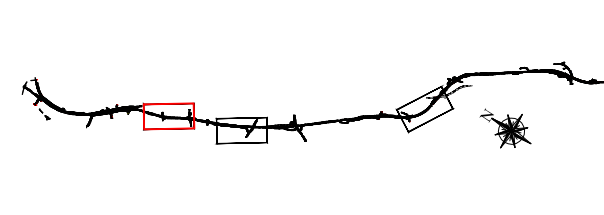


- DESIGN MEASURES**
1. A 1.0 m thick Class 6C drainage blanket should be constructed at the base of the short section of embankment within the disused quarry at Ch. 3+400. All fill material within the quarry shall be initially removed to expose the underlying rock (approx 1.0 m). If any zones of concentrated flow are encountered from springs in the rock then they should be intercepted by suitably sized perforated drainage pipes (min 150 mm diameter).
 2. A drain should be constructed along the toe of the embankment within the quarry to intercept the seepage from the Class 6C drainage blanket and channel it into the existing watercourse flowing into Lackagh Fen.
- The following design mitigation measures apply to the section of embankment within Lackagh Fen (Ch. 3+180 to 3+870):
3. All peat, marl and soft fine-grained alluvium shall be excavated out from under the embankment within a maximum of 2.0 m from the toe of the embankment at the original ground surface. Temporary support such as sheetpiles shall be provided at the boundary of the soft ground excavation where required to prevent any disturbance of the peat outside this zone.
 4. A min. 1.0 m thick starter layer/drainage layer of Class 6C granular fill shall be placed on the fine-grained glacial till at the base of the embankment between Ch. 3+300 and 3+860, and where soft ground is excavated out from along the side roads in Doorly and Knocknagroagh. Class 6A rockfill should be used below standing water.
 5. The rest of the embankment shall be constructed using acceptable Class 2C cohesive fill up to sub-formation level with 1V:2H side slopes. A suitable geotextile separator or Class 6H blinding layer should be used at the interface with Class 6A fill.
 6. Culverts should be constructed under the mainline embankment at approx. Ch. 3+520 (Culvert C1) and 3+680 (Culvert C2) to preserve the existing hydrology.
 7. Hydraulic barriers shall be constructed across the full width and depth of the Class 6C starter layer at the locations shown to prevent any longitudinal drainage along the base of the embankment into any of the existing watercourses and drains. The barriers can be constructed using wet lean mix fill in trenches through the Class 6C fill down to the underlying glacial till, or with plastic sheetpiles in a trench filled with cement bentonite grout.
 8. An open interceptor drain should be constructed at the toe of the embankment on the west side of the mainline carriageway to intercept surface runoff flowing towards the fen and divert it to the culverts under the mainline carriageway at Ch. 3+520 and 3+680.
 9. A sealed open drain should be constructed at the toe of the embankment on the east side between approximately Ch. 3+480 and 3+530 to connect the existing drains in the peat at this location. The drains can be constructed with a HDPE liner or as purpose-built open channels along the toe of the embankment lined with min. 1.0 m of low-permeability Class 2C1 cohesive fill or reinforced concrete.

Legend

	Indicative outline of excavate/replace;		Existing surface water flow;		Townland Boundary;
	Drainage layer at base of embankment;		Proposed Open Drain;		CPO Boundary;
	Perforated drainage pipes;		Proposed Culvert;		Land Made Available (LMA);
	Temporary support such as Sheet piles at 2m off embankment, also indicative of LMA;		Hydraulic Barrier;		Townland Names;
			Approx. extent of PEAT/MARL;		Design Chainage;
					Constructed Wetland;



NOTE:
 All proposed road levels indicated are based on a Design prepared for Phase 3 and 4 of the NRA PMG and may be revised at the Detailed Design Stage. Modifications may be made to avail of opportunities to improve the design in the light of experience on the ground or other innovations provided this has no significant adverse environmental effects.

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Date	By	Revision

Project N4 Collooney to Castlebaldwin Proposed Road Development

Title Specific Design Mitigation: Lackagh Fen

Scales (@A3) 1:3,000	Date December 2013	Job No. SO/01/150
Design AGL Ltd.	Design Team Review FM	Approved AS

Figure No.: Fig.: 4.8.1

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