AGENDA ITEM 6

APPENDIX 18

2018/0151/DET

GROUND WATER & SURFACE WATER MANAGEMENT PLAN

Dalwhinnie Quarry

Ground Water & Surface Water Management Plan

Revision 2

July 2018

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1 Introduction

Water Management at Dalwhinnie Quarry can be assessed in two stages.

1. De-Watering the Existing Quarry
2. Management of Water within Proposed Development.

2 De-Watering the Existing Quarry

The initial stage of water management in this development is to remove the rainwater which has collected in the existing quarry since operations ceased to allow quarrying to re-start.

The previous quarry operator intermittently worked the quarry and managed the water level within the quarry by pumping, into an area to the East of the site. Since operations stopped, the quarry has gradually filled with water, stabilising at the current water level of between 390.5 – 391.0m AOD. The adjacent ground to the South is at a level of between 393 – 394m AOD.

All precipitation which falls within the bunded area is captured within the quarry bowl / void (the existing quarry catchment). The water level is maintained at the current level by a combination of both evaporation and infiltration into both natural joints and blast induced fractures within the rock body.

There is no information on any groundwater seepage into the quarry during the period it was operated by the previous operator.

2.1 Abstraction

The trapped rainwater will be removed from the quarry by pumping. The submersible pump will be installed on a float or raft to ensure that the risk of picking up any sediment from close to the floor of the quarry is minimised as the water level drops. This is *'best practice'* in the quarrying industry where submersible pumps are used. A float switch is used to control pump operation and manage water levels.

At Dalwhinnie there is no surface water flow in to the quarry with no ditches, field drains or burns in the vicinity of the quarry.

From survey data the existing water body covers an area 0.695ha.

Survey data was used to calculate the total volume of water to be pumped / abstracted from the quarry at between 25,000 and 27,000m³.

2.2 Abstraction Authorisation

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide states that SEPA will not require authorisation for the following abstraction activities:

'Abstraction of rainwater from construction site excavations or quarries of volcanic or metamorphic rocks (e.g. basalt, granite and schist). Note that the abstraction of groundwater from excavations is a controlled activity to which GBR15 applies (see Sections 4.1 and 4.3) as is the abstraction of groundwater from quarries.'

The water in the quarry is sourced from rainwater.

GBR15

For reference if the water in the quarry is assessed as groundwater the abstraction *(dewatering)* of the waterbody in the existing quarry meets the requirements of GBR 15

GBR15 states:

'GBR15: The temporary abstraction of groundwater where roads, railways, buildings, pipelines, communication links are being constructed or maintained by means of pumping groundwater:

- *directly from any excavation(s) on the site; or*
- *from any well or borehole on the site, to help dewater any other excavation(s) on site.*
- *and where desired, the subsequent discharge of the abstracted groundwater to the water environment.'*

'Rules:

a) Groundwater may only be abstracted at the site for a maximum of 180 consecutive days, in geological strata where groundwater flow rates are low (e.g. silts).

b) Groundwater may only be abstracted at the site for a total of five separate days, in any 180 consecutive day period, where excavations, wells or boreholes that abstract groundwater are constructed in geological strata where groundwater flow is high (e.g. sands and gravels and sandstones).

c) Groundwater must not be abstracted from any excavations, wells or boreholes that are within 250m of a wetland

d) Groundwater must not be abstracted from any excavations, wells or boreholes that are within 250m of an abstraction that is not used solely for dewatering an excavation.

e) All reasonable steps must be taken to ensure that the quantity of sediment in the abstracted water is minimal.

f) Any subsequent discharge of the abstracted water from the excavation or run-off that has collected in the excavation must be via a surface water drainage system authorised under CAR, subject to the consent of the person having operational control of the system.

2.3 Ground Conditions

As part of the initial site investigation for re-opening and expanding Dalwhinnie Quarry several trial pits were excavated within the proposed extension area to assess the soil and overburden depths and to allow the proposed quarry design to be accurately modelled.

All trial pits had a similar character with a thin topsoil averaging 0.2m. This agrees with the depths recorded in the Peat Probing survey undertaken as part of the EIAr. *(Hydrology, hydrogeology and peat assessments MNV Consulting Ltd).*

The top soil directly overlay a granular overburden with a high percentage of angular rock fragments. This overburden is identical to the exposures visible above the bedrock within the existing quarry.

The trial pits were excavated using a 360° tracked excavator and all were excavated to bedrock level. No groundwater was encountered in any of the trial pits although two had a trace of water at the soil / overburden interface. No aquitards or impermeable layers were identified within any of the trial pits.

The results of the trial pits confirmed that the overburden in the area was a free draining granular material of glacial origin and the groundwater table was below the overburden / bedrock interface.

2.4 Infiltration Rate

The trial pits encountered a granular glacial overburden which is assessed as a very good infiltration media with no evidence of silt or clay identified within the overburden.

Typical infiltration rates for this material are the range of 3×10^{-4} to 3×10^{-2} m/s(1).

No infiltration tests were undertaken during the site investigation excavations since the uniform geological nature of the overburden, along with the lack of any water in the trial pits confirmed the overburden was a permeable material.

(1) Table 25.1 Typical Infiltration coefficients based on soil texture, C753 CIRIA SuDS Manual 2015

2.5 Settlement Ponds

A tracked excavator will be used to excavate a sequence of temporary shallow settlement ponds to the north of the existing quarry, within the application boundary. The ponds will cover a total area of approximately 45m by 25m, as indicated in Drawing RG547/SWMP/F/01A.

Top soil will initially be removed prior to excavating the overburden to a depth of approximately 1m to form the ponds. The overburden will be used to form an edge protection bund around the pond and the soil and vegetation will be placed on the outer face of the bund.

The discharge pipe from the submersible pump will flow into the first pond in the sequence. Water in the settlement pond will infiltrate through the permeable overburden at the base of the pond. No pollutants will be introduced into the groundwater regime by this method of indirect discharge.

The average overburden depth in this area is approximately 2.25m and leaving an average of 1.25m of overburden undisturbed will ensure that infiltration can take place through the overburden.

Paragraph 25.2.2 in C753 CIRIA SuDS Manual 2015 states

'Groundwater level
Groundwater levels should be investigated to ensure that the base of the proposed infiltration component is at least 1m above the maximum anticipated groundwater level (taking account of seasonal variations in levels and any underlying trends).'
and
'A 1m separation distance ensures a depth of unsaturated soils to help ensure the infiltration performance of the component and protect underlying groundwater from contamination.'

While there is a low silt content in the water in the quarry, the use of settlement ponds will minimise the potential for pollution. A second float switch within the settlement ponds connected to the pump will manage water level in the ponds, if the settlement ponds are full of water then the pump will not switch on. When the water level in the ponds drops due to infiltration, the float switch triggers the pump, re-filling the pond until the water level rises to trigger the float switch when the pump is switched off again.

3 Management of Water Within Proposed Development.

3.1 Rock Permeability

The metamorphic rock at Dalwhinnie quarry has a low permeability, the permeability is principally controlled by the discontinuities in the rock. During extraction of rock by blasting, the effect of explosives detonating is to open the joints and fractures which preferentially follow the existing metamorphic structures in the rock. These blast induced fractures will locally increase the rock permeability.

The Hydrologeological map of Scotland indicates the rock in this area is a 'low productivity aquifer with small amounts of groundwater in the near surface weathered zone and secondary fractures'.(1)

(1) BGS 1:625,000 Hydrologeological map of Scotland

3.2 Quarry Sump

When the quarry is operational a sump, 3 – 5m deep, will be formed in the floor of the quarry. The sump will be excavated by blasting, this will locally increase the permeability of the rock in the area surrounding the sump. Water within the sump will disperse by evaporation and through infiltration directly into the rock through the blast induced fractures in the floor of the sump.

As the quarry expands in area the initial sump will be increased in area as required.

Water from the sump will be used for dust suppression during rock processing and for conditioning the haul roads in the quarry.

A submersible pump operated by a float switch will be used to maintain the water level in the sump during periods of high rainfall or reduced water-use. When the water level in the sump increases to a set level the float switch will trigger the pump which will discharge to the settlement ponds utilised for the initial dewatering of the quarry void, as illustrated in Drawing RG547/SWMP/F/02A.

No water is abstracted from neighbouring watercourses.

3.3 Quarry Floor

The surface of the quarry floor will be maintained using a layer of crushed rock to allow quarry plant to operate efficiently. The crushed rock surface layer has a high permeability which helps minimise any surface water ponding and run-off on the quarry floor. All surface water (from rainfall) within the quarry catchment is retained inside the quarry. The quarry floor will be formed with a shallow gradient to direct all water towards the quarry sump which will be at the lowest point in the quarry. Any run-off from ramps and internal haul roads in the quarry will also be directed to the quarry sump.

Incident rainfall within the excavation area of the quarry either infiltrates directly into the quarry floor through naturally occurring joints and blast induced fractures or disperses towards the quarry sump.

3.4 Shallow Settlement Ponds / Water Infiltration

As discussed in sections 2.3 – 2.5 above site investigation has confirmed the overburden in the area where the quarry is located is of glacial origin with a high permeability / infiltration rate.

Use of water from the sump for dust suppression when the quarry is operational will reduce the volume of water which is stored in the sump. Ongoing management of the water level in the sump using a submersible pump controlled by float switch will minimise the volume of water that has to be managed in the shallow settlement ponds at any one time.

As discussed in Section 2.5 above, the ponds will be approximately 1m deep with the discharge pipe from the submersible pump pumping water into the first pond in the sequence. Water in the settlement ponds will infiltrate through the permeable overburden at the base of the pond. No pollutants will be introduced into the groundwater regime by this method of indirect discharge.

It is anticipated that Phase 1 will take 13 years to complete, upon the completion of Phase 1 and as Phase 2 develops the shallow settlement ponds will be relocated, the position of which will be determined during the operation of Phase 1.

3.5 Quarry Margins

Outside the screening bunds the existing hydrological system will be unaffected by quarrying. Shallow catch ditches will be excavated at the outer edge of the screening bund to ensure any run-off from the bund is captured.

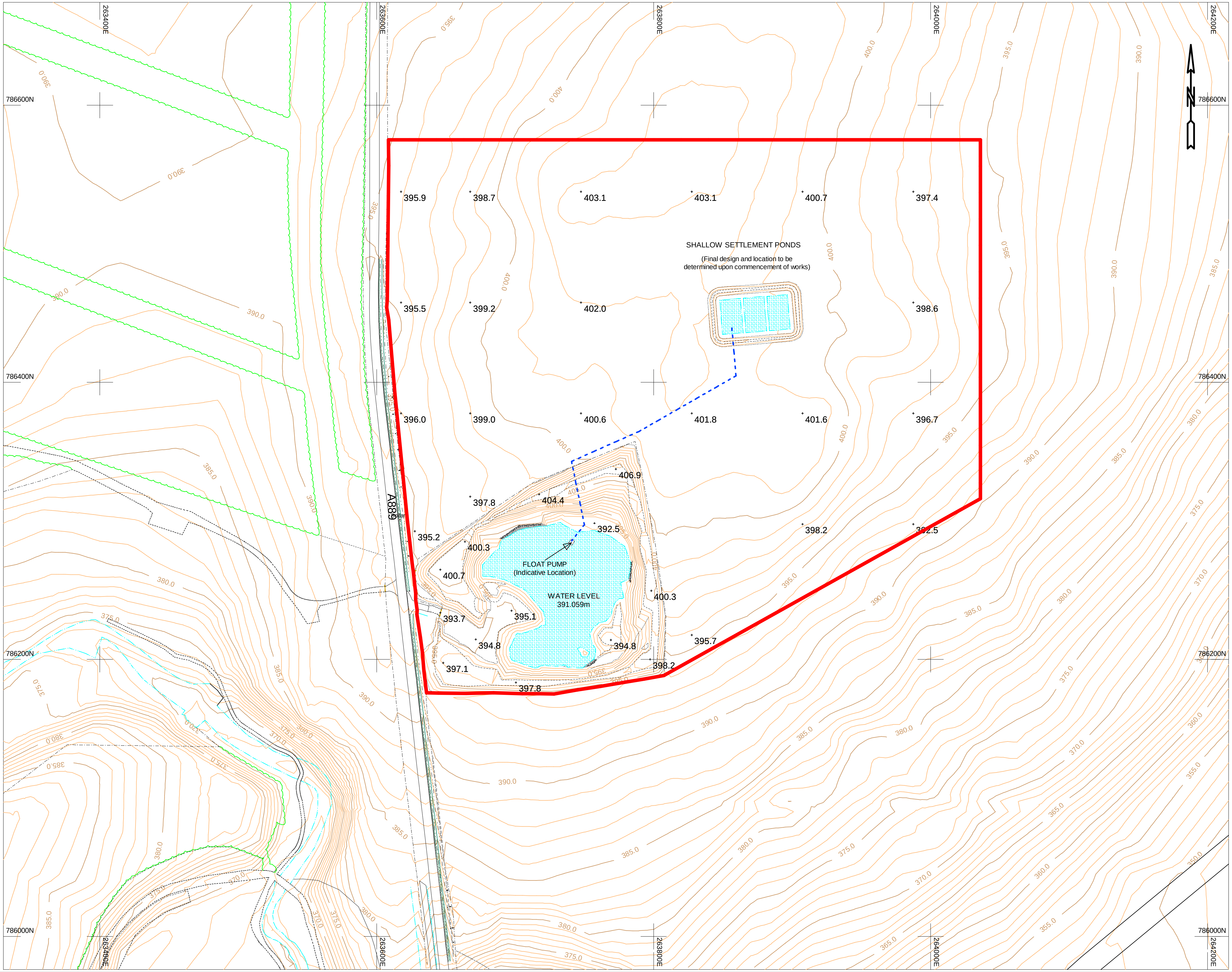
3.6 Abstraction / Discharge Authorisation

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide states that SEPA will not require authorisation for the following abstraction activities:

'Abstractions from artificial treatment systems, including Sustainable Urban Drainage Systems (SUDS) and quarry settlement lagoons'

The abstraction of water from the sump in the quarry floor does not require a CAR authorisation.

With the use of water from the sump for dust suppression levels of water discharge to the settlement ponds are expected to be low. The volume of water which requires management by this method cannot be assessed until quarry operations restart.



LEGEND

- APPLICATION BOUNDARY
- QUARRY FACE
- TOP OF BANK
- BOTTOM OF BANK
- EDGE OF WATER
- ROAD
- TRACK
- FENCE

NOTES

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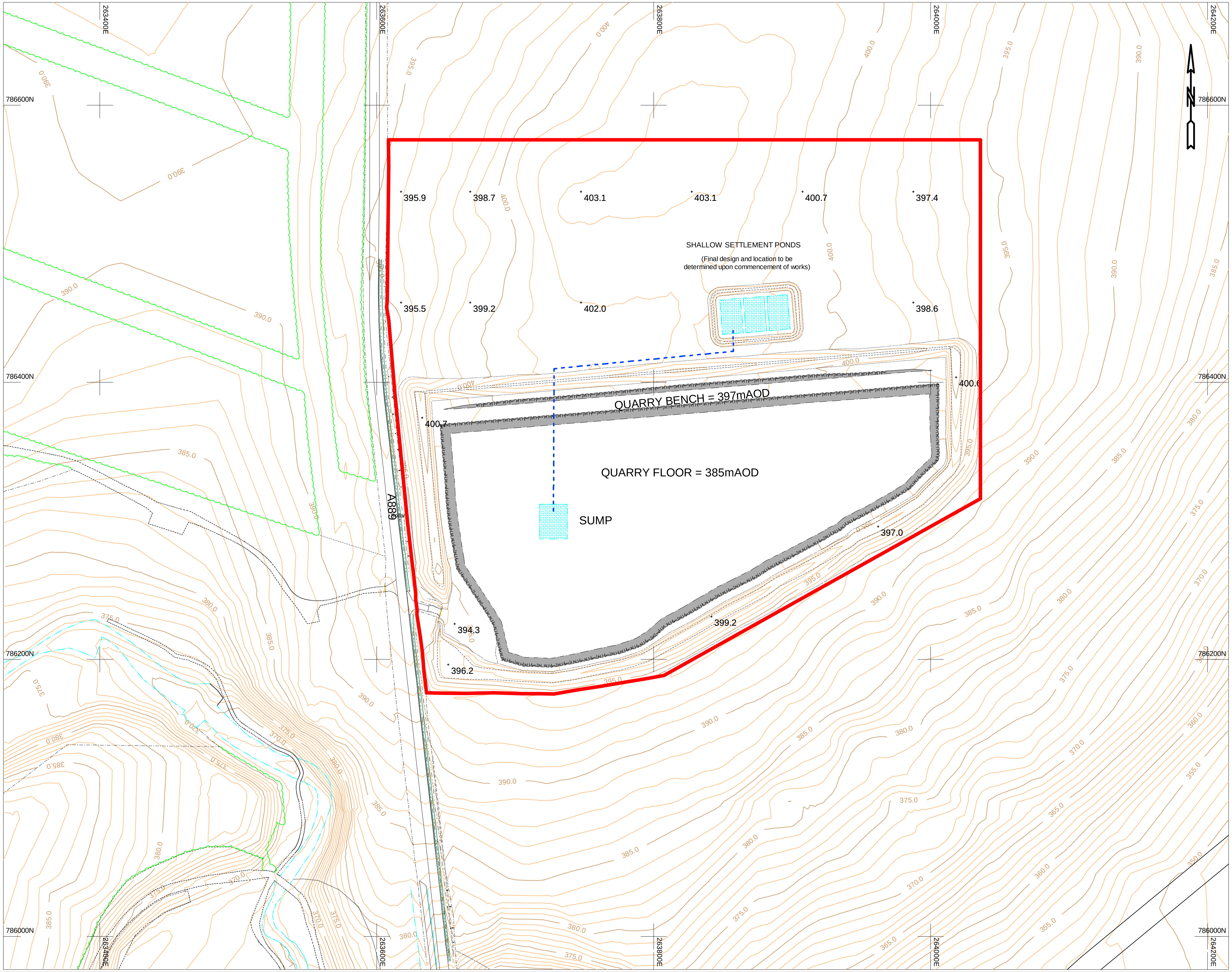
LEITHS

DALWHINNIE QUARRY

QUARRY DEWATERING

Drawn By	Approved By
RK	
Scale	**Original Plan Size**
1 : 2500	A3
Date Plotted	**Drawing No.**
02-JULY-2018	RG547/SWMP/F/01A



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LEITHS

DALWHINNIE QUARRY

PHASE 1
SWMP

Drawn By	Approved By
RK	
Scale	Original Plan Size
1 : 2500	A3
Date Plotted	Drawing No.
02-JULY-2018	RG547/SWMP/F/02A