Appendix H5

Flood Risk Assessment

A77 Maybole Bypass

Flood Risk Assessment

Document reference: CON-HW/25000182/DOC-029

Revision: 0

Issued: October 2013

Document Control Sheet

Project Name:	A77 Maybole Bypass
Project Number:	CO25000182
Document / Report Title:	Flood Risk Assessment
Document / Report Number:	CON-HW/25000182/DOC-029

Issue Status/Amendment	Prepared	Reviewed	Approved
Issue 0	Name: Ian Holland Signature: Date: 18/10/13	Name: Gordon MacDonald Signature: Date: 21/10/13	Name: Gordon MacDonald Signature: Date: 21/10/13
(Enter Details of Amendment)	Name: (print) Signature: Date:	Name: (print) Signature: Date:	Name: (print) Signature: Date:
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Contents

1. Introduction

1.1. The proposed scheme is for the realignment of a section of the A77 Trunk Road at Maybole, South Ayrshire (Refer Location Map, Drawing No. 25000182/LND/024 included within Appendix A of this report). The scheme commences to the south of Maybole, passes to the north-west then ties into the A77 north of the railway line at Smithston, between national grid reference (NGR) NS 28848, 09551 (south of Maybole) and NS 32137, 12957 (north of Maybole).

1.2. The existing A77 passes through the centre of Maybole along the High Street, the main retail area of the town. The High Street has been developed since the Medieval Ages and has restricted carriageway and footway widths, which results in poor conditions for pedestrians and road users.

1.3. The scheme comprises a 5km single carriageway bypass with climbing lanes. There are roundabout junctions at the north and south tie in locations with the existing A77 and with the B7023 Culzean Road approximately 600m north of the south roundabout. There are three remaining road crossings of routes radiating out of Maybole, all of which are grade separated. An underpass at the south end of the bypass serving as a farm access is also included in the scheme. The proposed scheme layout is shown on Drawing Number 25000182/ENV/1.2 included within Appendix A of this report.

1.4. In April 2012, Armey were appointed by Transport Scotland to progress the design of the scheme through Stage 3 Route Assessment. There has been a route selected and the design has developed towards the publication of scheme Orders and Environmental Statement.

1.5. As part of the scheme development process, consultations have taken place with key stakeholders including SEPA, SNH and South Ayrshire Council. SEPA has confirmed that the watercourse within the study area affected by the bypass are minor in nature, the scheme affecting the upper reaches of catchments and that any flooding issues are localised and the responsibility of the local council. South Ayrshire Council highlighted that the only flooding that they were aware of was on the Laigh Grange Road at Bankend Bridge near the north tie in.

1.6. This report assesses the risk for flooding as a result of the scheme and has been prepared in accordance with the SEPA guidance document “Technical Flood Risk Guidance for Stakeholders” and the DMRB (2009), Volume 11, Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 10 (HD 45/09); Road Drainage and the Water Environment. There has been no flood risk assessment carried out at the earlier stages of the proposed scheme.

1.7. This report assesses the potential flood risk from fluvial, pluvial, groundwater, & existing drainage infrastructure sources. The impact of the proposed scheme on flood risk elsewhere is also considered. Where a potential source of flooding or impact is identified, the report provides details of the proposed mitigation measures to be adopted.

1.8. The proposed scheme is sufficiently far inland that there are no flood risks from coastal sources such as high tides, storm surge or wave action and therefore these are not considered any further in this report.

2. Existing Situation

2.1. Location and Topography

2.1.1. Maybole is located to the south of Ayr in the District of South Ayrshire – See Drawing No. 25000182/LND/024 - Location Plan in Appendix A.

2.1.2. The scheme is situated generally on the south facing slope of a hillside. The land falls from Knoweside Hill (282m) above and to the north west of West Brockloch to the proposed road between 120m and 90m, Maybole town centre at approximately 90m and to Chapelton, south east of Maybole at approximately 50m height. See Drawing No. 25000182/GEN/025 – Watercourses in Appendix A.

2.1.3. The proposed road circles Maybole on the higher ground to the north and west. See Drawing No. 25000182/GEN/025 – Watercourses in Appendix A.

2.2. River Doon

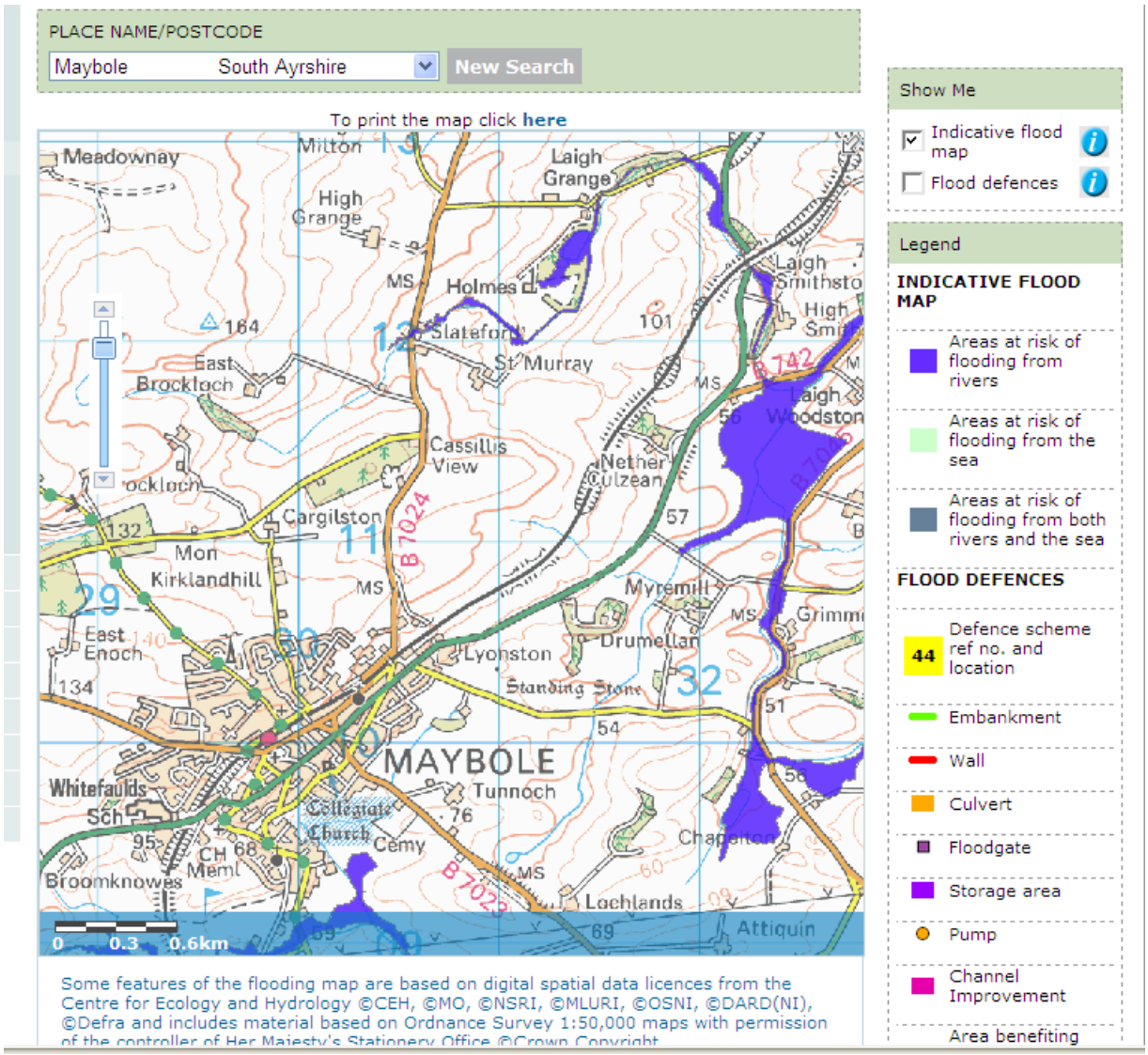
2.2.1. The River Doon is one of the two main watercourses in the proximity of Maybole. This river flows out of Loch Doon which is used for hydroelectric power generation. Loch Doon is located south of Dalmellington which is some 12 miles south east of Maybole. The River Doon reaches the sea at the south end of Ayr.

2.3. River Girvan

2.3.1. The River Girvan is the other of the two main watercourses in the proximity of Maybole. It commences at the Loch Girvan Eye bellow Shalloch on Minnoch also in the Galloway Hills. This lies some 11 miles south east of Maybole. The river meets the sea within the township of Girvan.

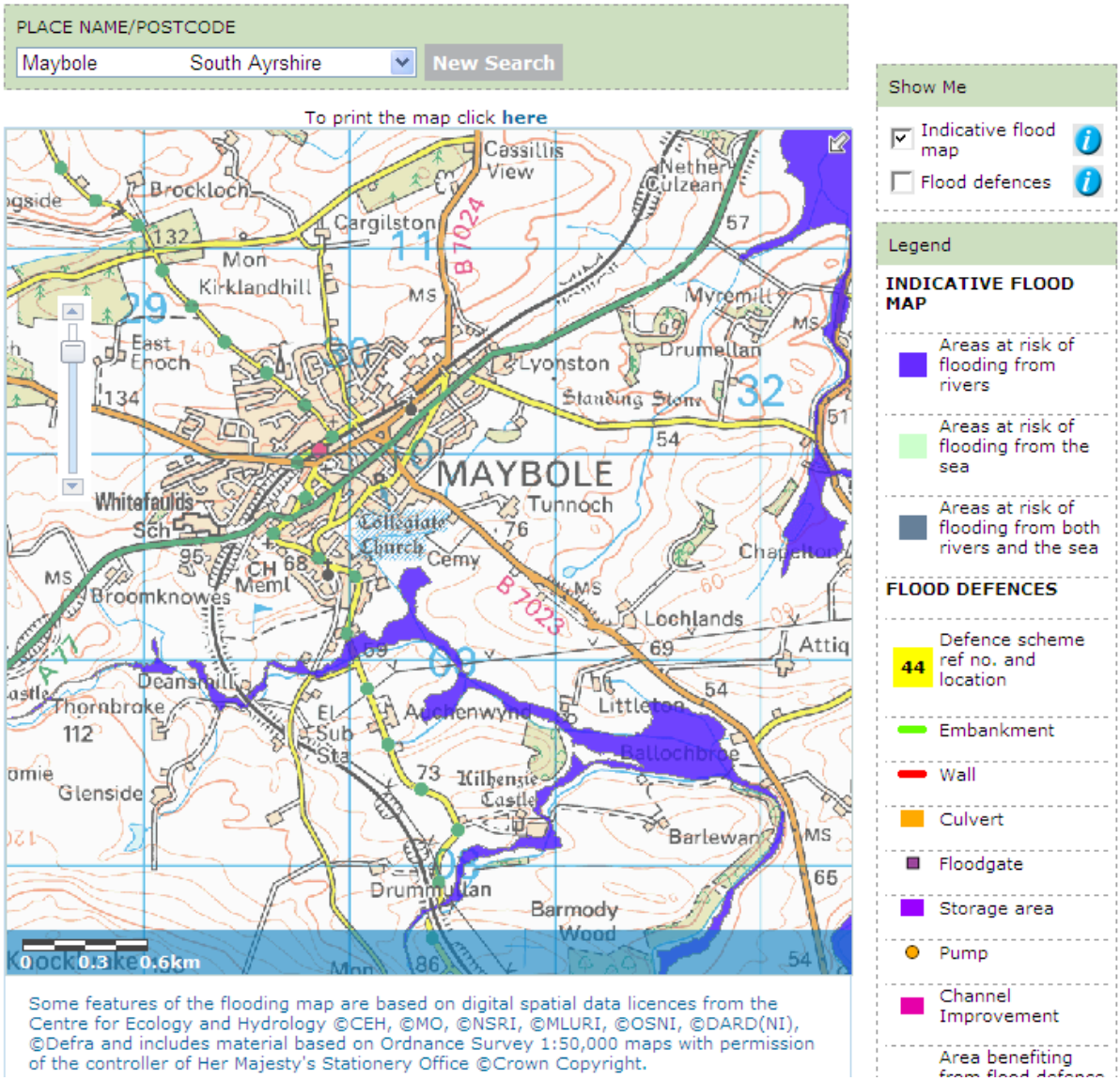
2.4. Chapelton Burn

2.4.1. The Chapelton Burn is one of the two lesser watercourses which collect the water from the hillside on which Maybole lies. It then feeds the River Doon. The SEPA Flood Map indicates that there are areas at risk of flooding associated with this burn, namely at Laigh Woodstone and Chapelton Farms.



2.5. Abbeymill Burn

2.5.1. The Abbeymill Burn is the other of the two lesser watercourses which collect the water from the hillside on which Maybole lies. It then feeds the River Girvan. The SEPA Flood Map shows that there is some potential flooding areas, particularly in the vicinity of Ballochbrae Farm a short distance downstream of the southern tie in at Broomknowes.



2.6. Minor Watercourses and Ditches

2.6.1. There are three minor watercourses which traverse the location of the proposed bypass and to which water from the bypass will be directed – see Drawing No. 25000182/GEN/025 – Watercourses in Appendix A:

- The Parish March Burn starts its life as a ditch near Cultezeoun Farm and travels southwards and then eastwards before turning south easterly and passing just to the west of Broomknowes Farm. It then feeds into the Abbeymill Burn.

- The Blackglen Burn joins the Chapelton Burn and starts as a ditch close to the junction of Gardenrose Path, Maybole and the C-class Road between St Murray's and West Enoch. It travels eastward to Alloway Road and then to above Nether Culzean Farm where it turns southwards and passes under the railway and existing A77 to meet the Chapelton Burn.

- The Brockloch Burn prior to 1856 took water from a reservoir lying just below Low (Laigh) Grange Farm. Sometime after 1910 this reservoir was filled in and a new loch was created just south of Laigh Grange Farm. The burn itself starts at a ditch north of Mid Brockloch and travels generally eastwards to this small loch. The SEPA map shows that there is some potential localized flooding from the burn between the Laigh Grange Road and Smithston Bridge and again between Smithston Bridge and where it meets the Chapelton Burn. The flooding at Bankend Bridge is the only flooding noted by South Ayrshire Council.

2.6.2. There is also a minor unnamed watercourse/ditch with lies just north of the B7023 Culzean Road. It flows towards the housing where it enters a pipe.

2.7. Groundwater

2.7.1. SEPA advises that there is no known abstraction of water in the vicinity of the proposals.

2.7.2. In the past there have be numerous wells in the vicinity of the proposed bypass but these are all redundant and all landowners have confirmed that water supply to the farms, including water troughs is by connection to the Scottish Water network.

2.8. Existing Flooding Incidents

2.8.1. There is no recorded flooding which has affected housing or the public highway within Maybole. All flooding has been restricted to the agricultural land lying south of Maybole with the exception of a low point at Bankend Bridge on the Laigh Grange Road at the north end of the scheme. See Drawing No. 25000182/GEN/032 – Outline Drainage Proposals – Sheet 3 in Appendix A.

3. Proposed Scheme

3.1. The main purpose of bypassing Maybole is to remove through traffic from the historic township and also to provide overtaking opportunities.

3.2. The scheme is predominantly situated on the hills to the north-west of Maybole and therefore is routed through the upper reaches of watercourse catchments. The proposed bypass commences west of Broomknowes Farm and then climbs up to the north and west of Maybole. From there it is follows the boundary of the township and then approximately parallel to the railway along land boundaries to meet the existing A77 north of Smithston Bridge. The length of the scheme is just greater than 5 kilometres.

3.3. The proposed route meets the existing A77 at either end in at-grade roundabouts. It also meets the B7023 Culzean Road at an at-grade roundabout. The proposed road is taken under Gardenrose Path and Kirklandhill Path without connection. It is also taken over the B7024 Alloway Road without connection. There is a proposed underpass to provide access to Cultezeoun Farm at the south end of the scheme.

3.4. The proposed scheme and drainage proposals are shown on drawings 25000182/GEN/029 to 032 included within Appendix A of this report.

4. Legislation and Design Standards

4.1. Scottish Planning Policy (SPP) defines functional floodplains as areas with "generally greater than 0.5% (1:200) probability of flooding in any one year". These areas are defined as medium to high risk and development should only take place here when it is essential for operational reasons (e.g. transport infrastructure). "In such cases, the development should be designed to remain operational in times of flood and not impede water flow, and the effect on the flood water storage capacity should be kept to a minimum."

4.2. The Flood Risk Management Act (2009) introduces a more sustainable approach to flood risk management, including a requirement for assessing the impacts of climate change. The Act places specific roles and responsibilities on local authorities and SEPA in relation to flood risk management. The Act also requires that all sources of flooding be considered in the assessment of flood risk including fluvial, coastal, pluvial, sewers and groundwater.

4.3. This report aims to satisfy the requirements of SPP and the Flood Risk Management Act by assessing the potential impact of the proposed A77 Maybole Bypass scheme in accordance with the following guidance documents:

- Design Manual for Roads and Bridges (DMRB) (2009), Volume 11: Environmental Assessment, Section 3: Environmental Assessment Techniques, HD45/09: Road Drainage and the Water Environment.
- SEPA Document SS-NFR-P-002: Technical Flood Risk Guidance for Stakeholders. Version 6, 2010.

5. Fluvial Flood Risk

5.1. Constraints

5.1.1. There are existing bridges/culverts that currently act as constraints to the flow of the watercourses located at:

- The Parish March Burn Bridge and an associated culvert a short distance downstream where the watercourse passes under the existing A77, at the southern extents of the scheme marked as A on Drawing No. 25000182/GEN/025;
- The Blackglen Burn Culvert under Glasgow-Ayr-Stranraer Railway, approximately half way through the scheme a short distance north-west of the B7024 Alloway Road marked as B on Drawing No. 25000182/GEN/025;
- The Blackglen Burn has also been culverted by the landowner for a length of approximately 300m immediately east of B7024 Alloway Road marked as E on Drawing No. 25000182/GEN/025;
- At the north tie in, Bankend Bridge under Laigh Grange Road marked as D on the drawing and a culvert a short distance downstream marked as C on the drawing where the watercourse passes under the A77 at Smithston Bridge.

5.1.2. Each of these watercourses will be used as outfalls for surface water drainage from the proposed road. With the exception of Bankend Bridge these constraints are all downstream of the outfalls from the proposed scheme.

5.1.3. These existing culverts/bridges have been assessed to CIRIA C689 Culvert Design Guide as substandard causing flooding of adjacent agricultural land. Only Bankend Bridge has been identified through consultation as a flood risk / issue, although the properties within the vicinity are relatively remote from the bridge.

5.1.4. The existing culverts act as constraints to the downstream receiving watercourses, the Abbeymill and Chapelton Burns. Both the downstream watercourse have known flooding issues as discussed in Section 2.4 and 2.5 of this report. With the exception of Bankend Bridge, the scheme does not include any proposals to alter these existing bridges or culverts. Flooding downstream of these constraints will therefore not be affected. Outline drainage proposals are shown on Drawing 25000182/GEN/030 to 031 contained within Appendix A of this report.

5.1.5. As the existing culverts are substandard to current design standards, the flow from the scheme will be attenuated upstream of each outfall to reduce the allowable discharge to less than the calculated existing greenfield run-off rate. This will assist in alleviating existing flooding of agricultural land caused by the lack of capacity at the existing culverts.

5.1.6. The realignment of Laigh Grange Road at the north roundabout affects Bankend Bridge, which will be replaced with a culvert designed to the current standards. This will relieve existing flooding issues at this location. To mitigate for reliving flow at this constraint, in addition to limiting the outflow from the proposed scheme, a flood plain area between Bankend Bridge and the downstream culvert under the A77 will be created by lowering the bank height on the side adjacent to the bypass.

5.1.7. These measures will ensure that not only will there not be an exacerbation of the existing potential flooding associated with the Rivers Doon, River Girvan, Chapelton Burn and Abbeymill Burn but also there will be an improvement due to the reduction of the present greenfield run-off rates at the existing bridges/culverts.

6. Pluvial

6.1. Natural Catchment Drainage

6.1.1. In the event that rainfall exceeds the infiltration capacity of the natural ground, excess water will flow overland. This may create a flood risk to the proposed bypass where existing ground levels fall towards the road.

6.1.2. The runoff from natural catchment areas that drain towards the scheme will be intercepted and drained through cut-off drains, thereby reducing flood risk. This will be installed where the road is on embankment and also at the top of cuttings where the ground falls towards the road, to intercept overland surface water run-off.

6.1.3. The cut-off drains or ditches will be designed in accordance with the requirements of the Design Manual for Roads and Bridges (DMRB) (2006), Volume 4: Geotechnics and Drainage, Section 2: Drainage, Part 1, HD106/04: Drainage of Runoff from Natural Catchments.

6.2. Road Surface Drainage

6.2.1. The proposed drainage design for the Maybole Bypass will comprise of a number of new and independent gravity drainage networks designed to collect and convey surface water runoff from impermeable surfaces.

6.2.2. Drainage of the road surface will be by conveyance pipework, which will be designed in accordance with the Design Manual for Roads and Bridges (DMRB) (2006), Volume 4: Geotechnics and Drainage, Section 2: Drainage, Part 3, HD33/06: Surface and Sub-surface Drainage systems for Highways.

6.2.3. The new drainage pipes (carrier and filter) will be designed to accommodate a 1 in 1 year storm plus an allowance for climate change, without surcharge. The drainage will then be checked against a 1 in 5 year storm event, plus an allowance for climate change, to ensure no surface flooding occurs.

6.2.4. Where this capacity is exceeded by an event greater than 1 in 5 year plus climate change, surface flooding of the carriageway may occur. This may lead to more severe flooding if it collects on the carriageway for example at low points in the road profile. To mitigate this, the carriageway will be designed to ensure the surface runoff does not collect, but is directed off the carriageway at discrete locations. Safe overland flood routes will be chosen to ensure flood risk is not increased downstream, for example into SuDS basins and the cut-off drainage ditches which will act as additional storage capacity for overland and excess drainage network flows.

7. Groundwater

7.1. Introduction

7.1.1. Groundwater levels have been determined along the proposed route through ground investigation works. This is close to surface in the lower lying areas towards the watercourses at the north and south tie ins where the bypass is on embankment. Through the majority of the site where the route traverses the hills to the north-west of Maybole, the groundwater level is significantly lower.

7.2. Road on Embankment

7.2.1. Where the road is on embankment, the potential effect on groundwater is limited to the effects from the drainage networks. Attenuation and treatment ponds, with spillage containment facilities including lined inverts will be utilised to permit spillages to be managed and to protect watercourses and groundwater from contamination.

7.3. Road in Cutting

7.3.1. In general within cuttings on road schemes, there is the potential for groundwater levels exceed the proposed carriageway level which could result in flooding or the potential for the lowering of groundwater levels and the quality of the groundwater to be affected by the road drainage system.

7.3.2. Excavations will be required in areas for the construction of the proposed scheme, including excavation into bedrock. This could have potential impact on groundwater levels and associated flows. However, the ground investigation within the cutting sections showed the depth of groundwater is below the level of excavation, Table 2. There should therefore be no effect on groundwater levels or flows.

7.3.3. There remains however the potential for contaminants being released into shallow groundwater through spillage. Generally where the road is in cutting there will require to be filter drains installed to drain the sub-formation of the carriageway and also the verge and cut slopes. Where the filter drain takes water from the carriageway, this will be taken to a treatment and attenuation basin.

7.3.4. Following discussion with SEPA, where the cutting is in rock then the rock trap should not be used for carriageway drainage because of the potential for contaminates reaching the groundwater directly through fissures in the rock. To mitigate against this, it is proposed that the rock trap is sealed and the water conducted then via a primary filter medium to a second treatment location.

Table 1: Depths of cutting at associated groundwater boreholes on the Proposed Scheme		
Cut area	**Max cut depth (m below ground level)**	**Typical highest groundwater level recorded (m below ground level)**
Chg 0m – 650m Broomknowes to Culzean Road Rbt (B7023) BH104R AND BH106R	12m	Boreholes dry to 15m (full depth of borehole)
Chg 1201m to 1700m Gardenrose Path to Kirklandhill Road BH118R, BH120, BH121R, BH123,	11m	13.4m
Chg 1701m to 2300m Kirklandhill Road to Alloway Road (B7024) BH126, BH128R	3m	9.7m
Chg 2301m to 5080 Alloway Road to Smithston Rbt (A77) BH177, BH137, BH172, BH139, BH136R, BH141, BH174, BH175, BH144, BH146	9m	11.5m

7.4. Mine Workings

7.4.1. There are no mine workings in the proximity of the proposed bypass.

8. Drainage Infrastructure

8.1. Existing Sewers

8.1.1. Existing sewers have the potential to cause flooding in the event that flows exceed their capacity or they become blocked. In either case, flows may surcharge manhole covers and flow overland, creating a flood risk to roads and properties.

8.1.2. Investigations have been carried out into the location of existing services in the vicinity of the proposed Scheme. This suggests that there are no existing Scottish Water sewers in the direct vicinity of the proposed scheme.

8.2. Existing Culverts and Watercourses

8.2.1. Where watercourses are culverted beneath existing roads and housing areas, they have the potential to become blocked. In addition, culverts that were not designed according to the latest standards may be undersized and could form a restriction in extreme events. If this occurs, flows will back up and spill out of the channel and flow overland, creating a flood risk to properties and roads.

8.2.2. There are several watercourses which will require to be culverted beneath the proposed road layout .(refer Drawings 25000182/GEN/030, 031 & 032 – Outline Drainage Proposals in Appendix A):

a) Parish March Burn – This is culverted under the existing A77 and will require to be extended for the scheme.

b) Un-named ditch just north of Culzean Road – This will be caught into the cut-off ditch and then culverted under the proposed trunk road. The road is in some 8 metres embankment in this section.

c) Un-named ditch at south end of B7024 Alloway Road Realignment – This culvert will require to be replaced due to minor level and road widening changes.

d) Blackglen Burn from the B7024 Alloway Road for some 280 metres eastward – This section of the burn was culverted under the existing Alloway Road and then extended by the landowner before returning to a ditch. Alloway road is in a low embankment at this location.

e) The Blackglen Burn – This requires to be culverted under the bypass embankment. The embankment is some 3.2 metres above the upstream end of the culvert.

f) The Brockloch Burn – Bankend Bridge. This minor bridge on the Laigh Grange Road requires to be replaced due the increase in height of the embankment and also widening of the road. The proposed Laigh Grange Road will be some 2.5 metres above the upstream end of the burn.

g) The Brockloch Burn – This will require to be culverted under the proposed bypass which is in some 5 metres embankment at this location.

h) The Brockloch Burn. This will require to be culverted under a Maintenance Access located close to the tie-in of the proposed Maybole North Link Road.

i) The Un-named Burn crossing the Laigh Grange Road. This culvert will require to be replaced. The proposed Laigh Grange Road will be some 3.2 metres in embankment at this location.

9. Impact on Flood Risk Elsewhere

9.1. Introduction

9.1.1. In accordance with the requirements of the DMRB, Volume 11, Environmental Assessment, this section identifies the potential impacts of the proposed Scheme on flood risk elsewhere. Where a potential impact is identified, mitigation measures to be adopted at the detailed design stage have been proposed.

9.1.2. Potential impacts and sources of flood risk include the road drainage network, new culverts on watercourses, new watercourse diversions, groundwater and the new bridges.

9.2. Road Drainage Network

9.2.1. The construction of the proposed scheme will increase the proportion of impermeable surfaces in the catchment area. This will increase the volume and rate of surface runoff via the road drainage network. The uncontrolled discharge of surface runoff from the road drainage network to existing watercourses during storm events has the potential to cause localised flooding and increase the risk of flooding downstream with consequential damage and disturbance to residential and commercial properties as well as to natural features.

9.2.2. The proposed surface water drainage strategy will therefore employ Sustainable Drainage Systems (SuDS) to mitigate the potential impacts of increased surface runoff rates and reduce flood risk in the receiving watercourse.

9.2.3. The SuDS proposals will be designed in accordance with the guidance in CIRIA Report C697 “The SUDS Manual”, 2007, the DMRB, Volume 4, Section 2 “Drainage”, and Planning Advice Note (PAN) 61 “Planning and Sustainable Urban Drainage Systems”. The SUDS proposals for the proposed road development would promote the use of source control methods such as filter drains and swales. The site controls such as extended detention basins for attenuation and treatment of surface runoff prior to discharge to the existing watercourses would be an essential part of the drainage design. In accordance with the DMRB the attenuation basins will be designed for the 1 in 200 year flood event with a 0.5m high freeboard above the 1 in 200 year water level.

9.2.4. The locations of the SuDs ponds are shown on Drawings Number 25000182/GEN/030. 031 & 032 Outline Drainage Proposals in Appendix A. In the event of exceedance of the SuDS basin design capacity or blockage of the outfall, water levels may rise above the top level of the basin and spill into the surrounding land. The basins will be designed to ensure that the spill is directed away from buildings and roads via overland flow routes or overflow outfall pipes and into the nearest receiving watercourse. For properly maintained basins, this will be an extreme event given the ponds will be designed to accommodate 1 in 200 year event with freeboard.

9.2.5. With the exception of SuDS basins located at the south ends of Alloway Road and Gardenrose Path, all overland flow routes between the SuDS basins and the receiving watercourse are located on agricultural land with no property or infrastructure at risk of inundation. In these cases, additional basins are located close to housing to attenuate the water from the 100 metre length of carriageway immediately adjacent to the housing.

9.3. Exceedance of Road Drainage Capacity

9.3.1. Where the capacity of the road drainage system is exceeded by an event greater than 1 in 5 year plus climate change, surface flooding of the carriageway may occur. This may lead to flooding of surrounding properties if allowed to runoff uncontrolled. To mitigate this, the carriageway will be designed to ensure the surface runoff is directed off the carriageway at discrete locations. Safe overland flood routes for example into SuDS basins and the cut-off drainage ditches which will act as additional storage capacity will be provided at these locations to ensure flood risk to properties is not increased downstream.

9.4. Watercourse Diversions

9.4.1. The Blackglen Burn will be diverted along the north side of the proposed road embankment for some 30 metres to reduce the long skew road crossing required.

9.4.2. The Brockloch Burn will be diverted to eliminate a long skew crossing of the proposed road. It will then be taken into the adjacent Unnamed Burn which will be widened to accommodate the flows. The later burn then re-joins the Brockloch Burn. There will be a section of the Brockloch Burn which will be removed.

9.4.3. The Unnamed Burn crossing the Laigh Grange Road will be diverted into the Brockloch Burn at the point where the latter crosses the proposed bypass.

9.5. Existing Flooding

9.5.1. To mitigate the existing minor flooding at the upstream side of the Parish March Burn where it crosses the proposed Bypass South Link Road, it is proposed to reduce the level of the east bank of the burn to form a small flood plain. This will localise the flooding and reduce the effect of the present greenfield run-off and the potential flooding on the Abbeymill Burn area. It is further proposed to restrict the allowable outflow from the SuDs basin to reduce the effect downstream.

9.5.2. Similarly between the Laigh Grange Road and the proposed bypass, to mitigate the improvement in capacity of the replacement Bankend Bridge, a small flood plain will be introduced. This will reduce effect of the greenfield run-off and the potential flooding in the Chapelton Burn area. Likewise the allowable flow from the SuDs basin will be restricted to reduce the effect downstream.

9.5.3. At the Blackglen Burn the flow from the SuDs basins will be reduced to hold back water and reduce the flooding of the agricultural land north of the railway.

10. Conclusions

10.1.1. The surface water drainage will be designed to the current standards.

10.1.2. The scheme is predominantly situated on the hills to the north-west of Maybole and therefore is routed through the upper reaches of catchments, crossing and outfalling to minor watercourses. Culvert crossings required will be designed to current standards.

10.1.3. The proposals are to maintain or improve the status quo of the water flows down-stream of the Parish March Burn Culvert under the existing A77, the Blackglen Burn Culvert under the Railway and the Brockloch Burn Bridge under the existing A77. The potential flooding associated with all the watercourses south and east of Maybole and also south and east of the railway will therefore be marginally improved by the proposals.

10.1.4. This improvement will be achieved by the use of SuDs basins and small flood plains.

10.1.5. There will be no impact or flood risk associated with groundwater as a result of treatment and spillage containment measures and the depth of excavation remaining above groundwater levels.

11. References and Supporting Information

11.1. Design Manual for Roads and Bridges (DMRB), Volume 5; Assessment and Preparation of Road Schemes, Section 1; Assessment of Road Schemes, Part 2, Scheme Assessment Reporting, (TD37/93). 2006.

11.2. Design Manual for Roads and Bridges (DMRB), Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 10, Road Drainage and the Water Environment, (HD45/09). 2006.

11.3. Design Manual for Roads and Bridges (DMRB), Volume 4; Geotechnics and Drainage, Section 2; Drainage, Part 1, Drainage of Runoff from Natural Catchments, (HD106/04). 2006.

11.4. Design Manual for Roads and Bridges (DMRB), Volume 4; Geotechnics and Drainage, Section 2; Drainage, Part 3, Surface and Sub-surface Drainage Systems for Highways, (HD33/06). 2006.

11.5. Roads (Scotland) Act, Section 20A and 55A. 1984.

11.6. SEPA, Technical Flood Risk Guidance for Stakeholders, SS-NFR-P-002. 2010.

11.7. SEPA, Engineering in the Water Environment, Good Practice Guide, River Crossings. 2010.

11.8. Scottish Planning Policy (SPP), Flooding and Drainage. 2010.

11.9. PAN 61, Planning and Sustainable Urban Drainage Systems. 2001.

11.10. Flood Risk Management Act, 2009.

11.11. CIRIA C697 - The SUDS Manual. 2009.

11.12. CIRIA C689 – Culvert Design Guide. 2010.

11.13. White Young Green Environmental, Ground Investigation. 2013.

Appendix A

Drawings

A1 Drawing List

A1.1 The following drawings are included in this Appendix:

- 25000182/LND/024 - Location Plan
- 25000182/GEN/025 - Watercourses
- 25000182/GEN/030 – Outline Drainage Proposals, Sheet 1 of 3
- 25000182/GEN/031 - Outline Drainage Proposals, Sheet 2 of 3
- 25000182/GEN/032 - Outline Drainage Proposals, Sheet 3 of 3

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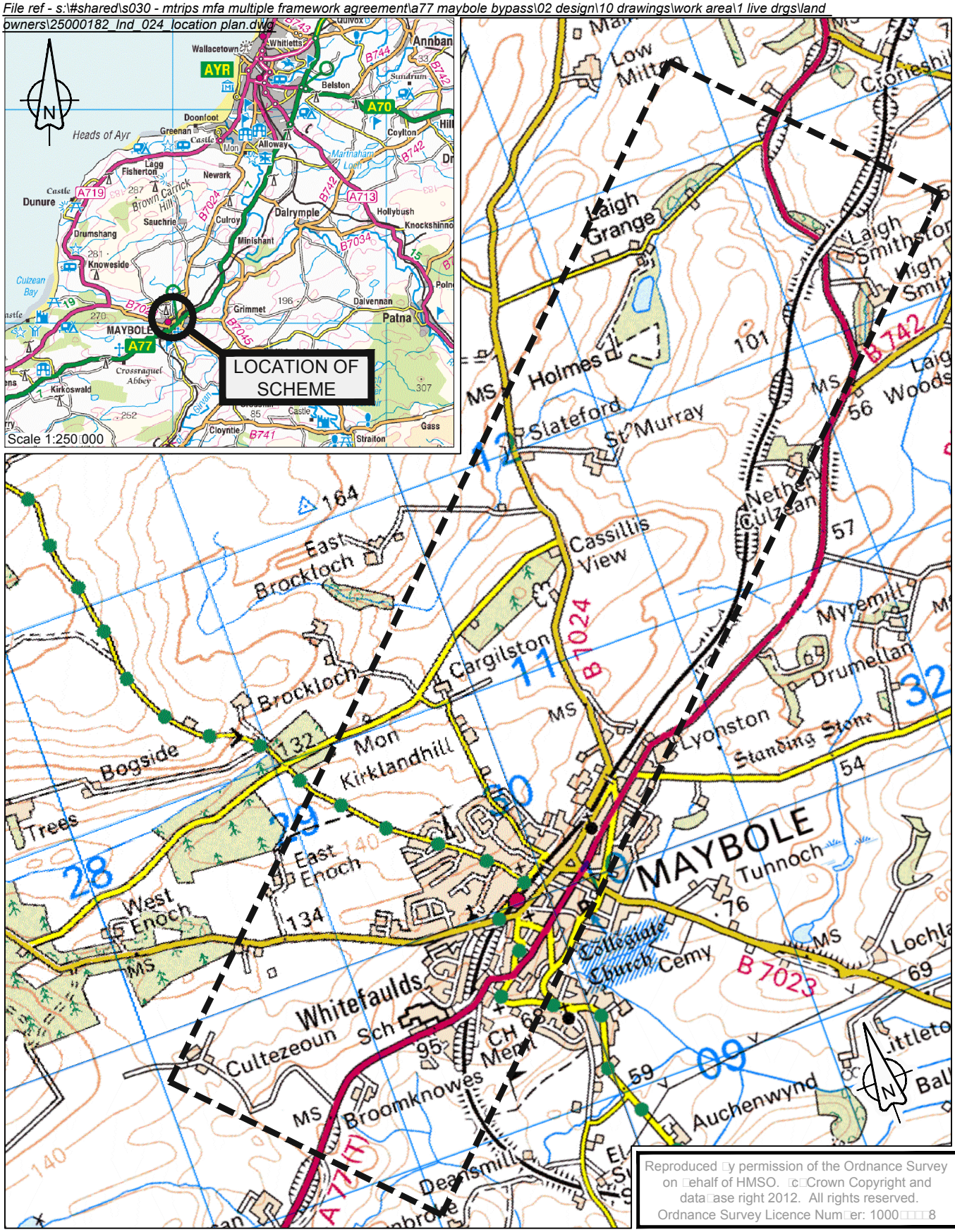
File ref - s:\#shared\s030 - mtrips mfa multiple framework agreement\a77 maybole bypass\02 design\10 drawings\work area\1 live drgs\land owners\25000182_lnd_024_location plan.dwg



KEY

Scheme Extents

Rev	Revision details	Chkd	Appd	Date

Drawn: G		Preliminary	
Design: G		For comment	✓
Chkd: MT		For tender	
Appd: GMD		For construction	
Date: 2/08/2012		As constructed	
		Other	

Project Name

A77 Maybole Bypass

Drawing Title

Location Plan

Original Drg Size : A	Dimensions :
Scale : 1:25000m	Copyright © Amey

amey

Client

TRANSPORT SCOTLAND

Drawing No	Rev
25000182/LND/02	

0 100

File ref - s:\#shared\s030 - mtrips mfa multiple framework agreement\a77 maybole bypass\02 design\10 drawings\work area\1 live drgs\environmental\25000182_env_1.2 rev 1.dwg

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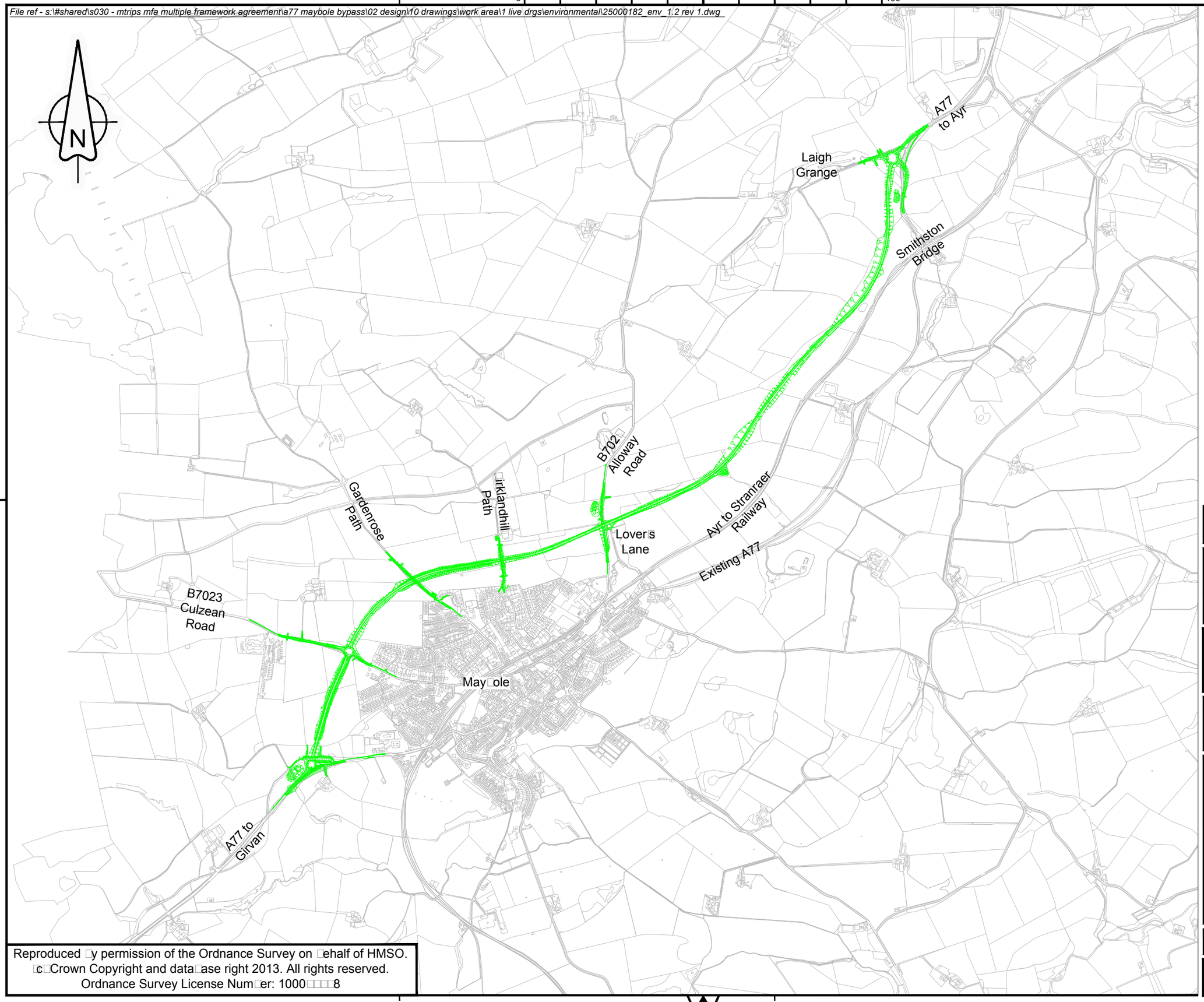

Key

Proposed A77 Alignment

Rev	Revision details	Chkd	Appd	Date
1	Minor layout changes	MR	GM	28/10/13

Drawn: SC	Preliminary	
Design: MR	For comment	✓
Chkd: OF	For tender	
Appd: GM	For construction	
Date: 1□/08/2013	As constructed	
	Other	

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Client

TRANSPORT SCOTLAND

Project Name

A77 May□ole Bypass

Drawing Title

Layout Plan

Original Drg Size : A3	Dimensions : m
Scale : 1:20000	Copyright © Amey

Drawing No	Rev
25000182/EN□/1.2	1

0 100

File ref - s:\#shared\s030 - mtrips mfa multiple framework agreement\a77 maybole bypass\02 design\10 drawings\work area\1 live drgs\general layout\25000182_gen_025 fra.dwg

N

Key

- Preferred Alignment
- Water Feature (River, burn, loch, pond, watercourse)
- Bridge or Culvert
- Flow Direction
- Existing Carriageway
- ① Brockloch Burn
- ② Chapelton Burn
- ③ Abbeymill Burn
- ④ Parish March Burn
- ⑤ Blackglen Burn
- Ⓐ to Ⓔ Existing bridges / culverts

Rev	Revision details	Chkd	Appd	Date

Drawn: SC		Preliminary	
Design: MR		For comment	✓
Chkd: IH		For tender	
Appd: GM		For construction	
Date: 16/10/2013		As constructed	
		Other	

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Client

TRANSPORT SCOTLAND

Project Name
A77 Maybole Bypass

Drawing Title
Watercourses

Original Drg Size : A3	Dimensions : m
Scale : 1:20,000	Copyright © Amey

Drawing No	Rev
25000182/GEN/025	0

File ref - s:\#shared\s030 - mtrips mfa multiple framework agreement\a77 maybole bypass\02 design\10 drawings\work area\1 live drgs\general layout\25000182_gen_030_031_032 outline drainage 161013.dwg

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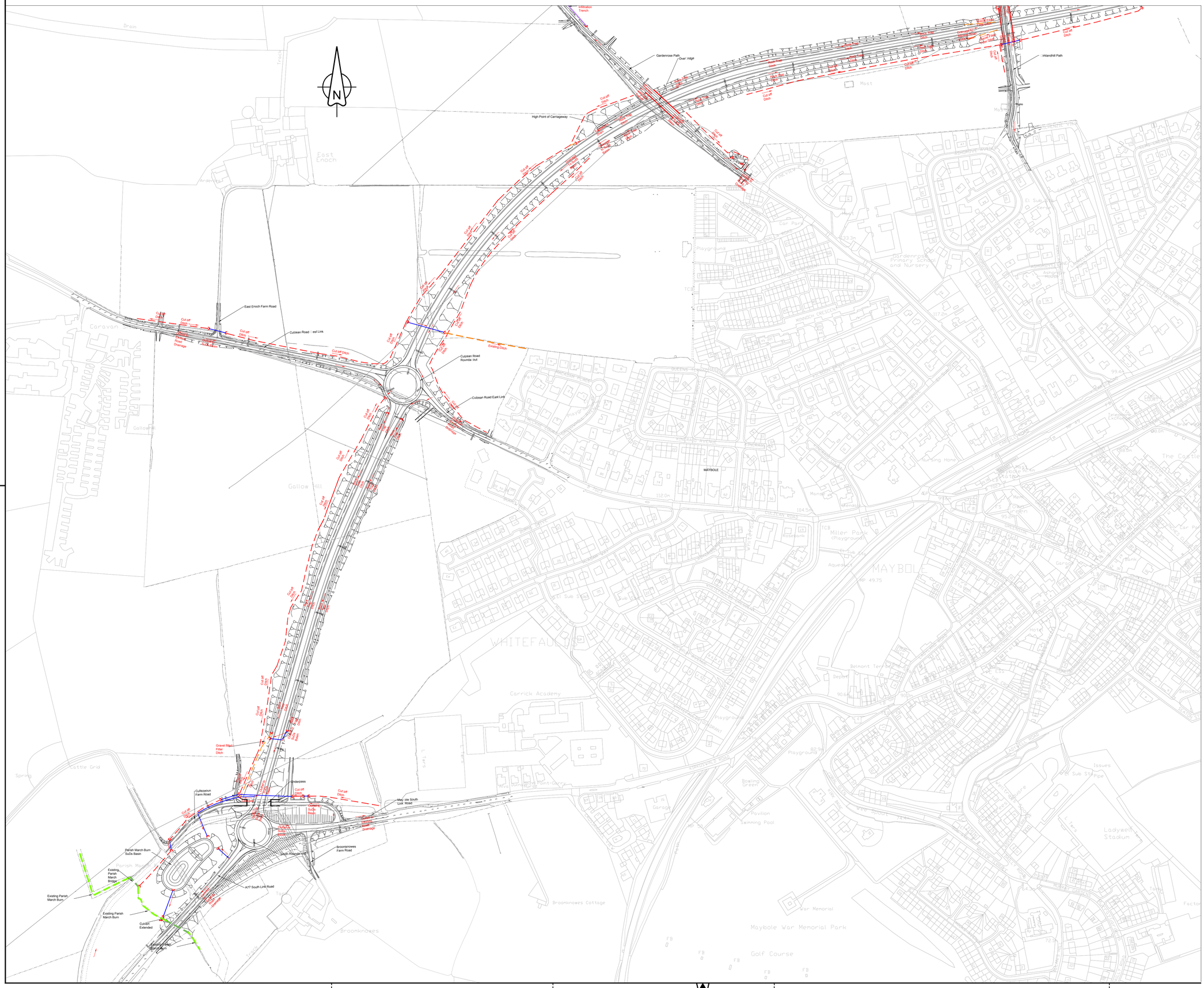

Rev	Revision details	Chkd	Appd	Date
P1	Text	.	.	.

Drawn:	I.H.	Preliminary	✓
Design:	A.B.	For comment	
Chkd:	I.H.	For tender	
Appd:	G.M.	For construction	
Date:	01.10.13	As constructed	
		Other	

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Project Name
A77 MAYBOLE BYPASS

Drawing Title
MTRIPS
OUTLINE DRAINAGE PROPOSALS
SHEET 1 of 3

Original Drawing Size : A1	Dimensions : m.
Scale : 1x2500	Copyright © Amey

Drawing No	Rev
25000182/GEN/030	P0

File ref - s:\#shared\s030 - mtrips mfa multiple framework agreement\a77 maybole bypass\02 design\10 drawings\work area\1 live drgs\general layout\25000182_gen_030_031_032 outline drainage 161013.dwg

0 100

N

Brockloch Castle (remains of)
Cassilis View
Quarry (disused)
St Murray's Plantation
St Murray's Quarry (disused)
Rine Road
Fair Field
Corgliston Cottage
Pond
Corgliston
Kirklandhill
KIRKLANDHILL FARM
Kirklandhill Path
Alloway Road
Underpass
Lovers' Lane
Culvert Replaced
Overbridge
Blackglen Burn
Realorge School
Viewfield
Lyonston
Lyonston Cottage
Lyonpark
Maybole Junction
Standing Stone
Depot
Works
Issues
Track
Well
Pond
Fence
MP 48.25
MP 48.75
111.6m
111m
126.7m
121.9m
118.1m
120.4m
99.1m
161.5m

Existing Ditch Cut-off
Existing Ditch Diverted
Existing Ditch Cleaned out
Blackglen SuDs Basin
Existing Ditch
Existing Inlet Ditch
Blackglen Burn
Alloway Road SuDs Basin
Alloway Road Underpass Drainage
Realign Existing Culvert
Maybole SuDs Basin
Overbridge Drainage
Overbridge Attenuation Basin
Overbridge Swale
Overbridge Filter Drain
Overbridge Outfall Ditch
Cut-off Ditch
Filter Drain
Outfall Ditch
Swale
Attenuation Basin

Rev	Revision details	Chkd	Appd	Date

Drawn:	I.H.	Preliminary	✓
Design:	A.D.	For comment	
Chkd:	G.M.	For tender	
Appd:	G.M.	For construction	
Date:	01.10.13	As constructed	
		Other	

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Client

Project Name
A77 MAYBOLE BYPASS

Drawing Title
MTRIPS
OUTLINE DRAINAGE PROPOSALS
SHEET 2 of 3

Original Drawing Size : A1	Dimensions : m.
Scale : 1x2500	Copyright © Amey

Drawing No	Rev
25000182/GEN/031	P0

File ref - s:\#shared\s030 - mtrips mfa multiple framework agreement\a77 maybole bypass\02 design\10 drawings\work area\1 live drgs\general layout\25000182_gen_030_031_032 outline drainage 161013.dwg

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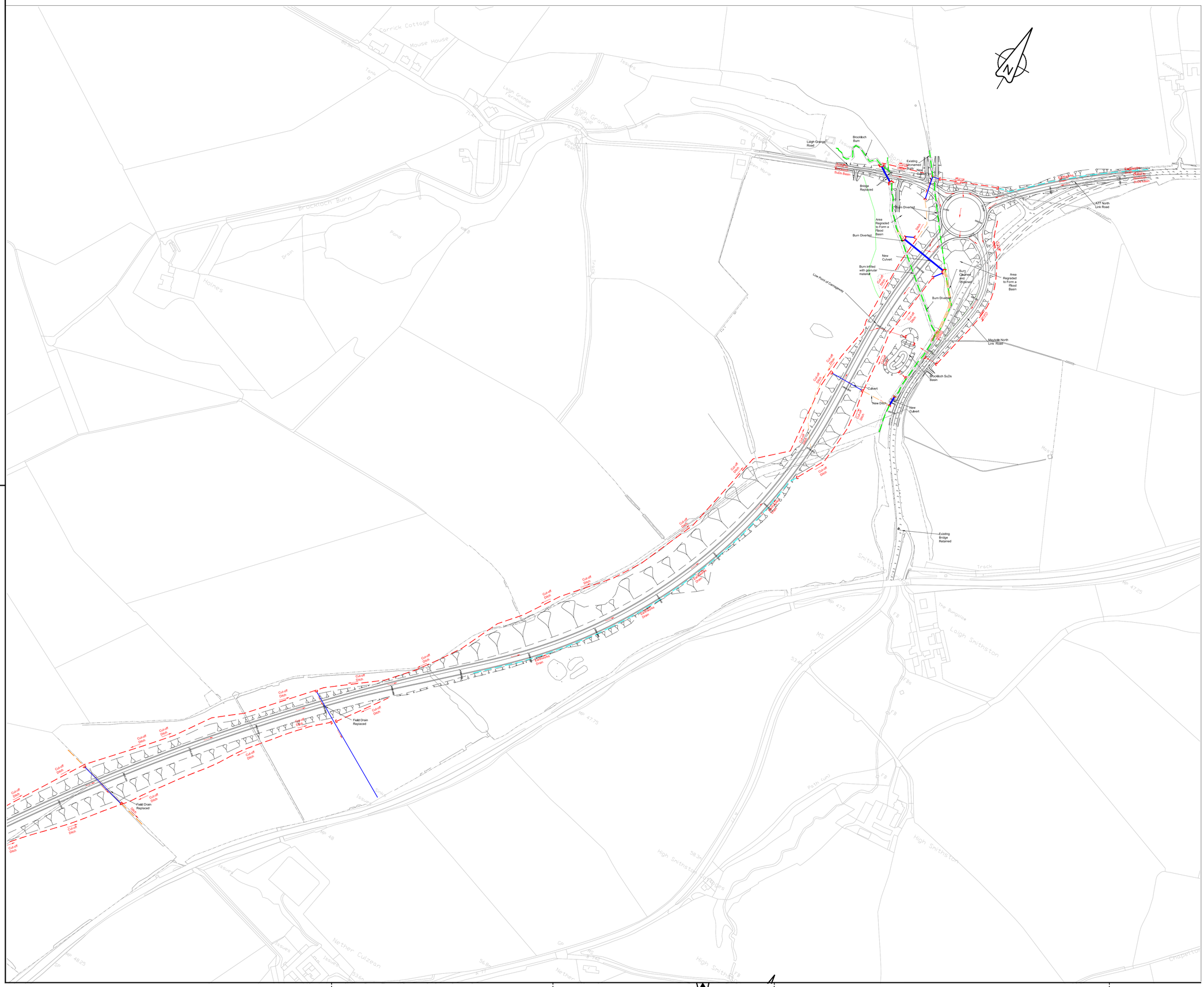

Rev	Revision details	Chkd	Appd	Date
P1	Text	.	.	.

Drawn:	I.H.	Preliminary	✓
Design:	A.D.	For comment	
Chkd:	G.M.	For tender	
Appd:	G.M.	For construction	
Date:	01.10.13	As constructed	
		Other	

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Client

Project Name
A77 MAYBOLE BYPASS

Drawing Title
MTRIPS
OUTLINE DRAINAGE PROPOSALS
SHEET 3 of 3

Original Drawing Size : A1	Dimensions : m.
Scale : 1x2500	Copyright © Amey

Drawing No	Rev
25000182/GEN/032	P0

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