

Handover of Geotechnical As-Built Information

Technical Guidance Note

May 2023

1.1 Purpose of the document

Many schemes undertaken on the Strategic Road Network (SRN) managed and operated by National Highways (NH) result in construction of, or modification to, geotechnical assets. These additions and modifications are reflected in the as-built information for a scheme. This information will include reports produced in accordance with CD 622 geotechnical certification procedures; as-built drawings; AGS data associated with ground investigations, and modifications to the Geotechnical Asset Database (GAD) within the Geotechnical and Drainage Management Service (GDMS).

As the current asset management information system, GDMS records the current inventory and condition of the geotechnical assets on the SRN. When a scheme either adds new assets, or modifies existing assets, there is a requirement for the as-built information of these changes to be updated within GDMS. This document sets out the means by which these changes can be carried out.

This document covers:

- The preparatory steps required to facilitate the transfer of as-built information into GDMS
- The process, with user guidance, for:
 - ensuring that all relevant reports documenting the scheme development are correctly referenced and held on GDMS
 - ensuring that all relevant ground investigation data (including AGS data) is correctly referenced and held on GDMS
 - preparation and upload of the Geotechnical Feedback Report (GFR), including as-built drawings, produced in accordance with CD 622: 'Managing Geotechnical Risk', to GDMS
 - ensuring that ground-related hazards that impacted on the scheme are correctly recorded in the Geotechnical Asset Database (GAD)
 - updating the information held in the Geotechnical Asset Database (GAD) to reflect the addition of new geotechnical assets, or the modification of existing ones
 - ensuring that any Special Geotechnical Measures (SGMs) installed as part of the scheme are correctly recorded in the Geotechnical Asset Database (GAD)

1.2 Process diagrams

The processes set out in this document are described in a series of flow diagrams in Appendix A.

The process diagrams in Appendix A are as follows:

- Figure 1 Completion and validation of as-built documentation
- Figure 2 Recording of residual hazard information
- Figure 3 Overview of GAD modifications to reflect as-built situation
- Figure 4 Detail of GAD modifications to reflect as-built situation

Figure 1 to Figure 3 are split into a series of “swim lanes” which relate to which role undertakes a particular action within the process. These roles are described in Section 1.3. Figure 4 is split into a series of “swim lanes” which relate to the different types of GAD modifications that are required depending on the specifics of the scheme.

1.3 Roles and responsibilities

The roles that are required to complete the as-built information handback process are set out in Table 1 below.

Table 1: Roles and responsibilities in the as-built information handback process

Role Name	Role Description	Responsibilities
Delivery Partner	Named individual(s) within the organisation that delivered the scheme for National Highways	This role carries out the majority of the as-built information handback tasks
Geotechnical Maintenance Liaison Engineer (GMLE) ¹	Named individual for National Highways region within which the scheme lies. A region may comprise one or more Maintenance Area. E.g. Area 1 and Area 2 form the South West region.	Agreeing the specifics of how user/GAD Area rights will be applied in the process Approval of geotechnical asset data associated with the National Highways Area(s) including data passed to them as part of the handback process.
GDMS Support	Technical support team for GDMS	Technical and engineering support to the as-built information handback process
National Highways Records Manager	GDMS administrator for National Highways	Approval of report record. Upload of PDF reports to GDMS.
National Highways Geotechnical Advisor (GA) ²	National Highways Geotechnical Advisor for the region within which the scheme lies.	Confirmation of availability of documents relating to the scheme. Overview of geotechnical elements of the handback process. Reviewer of documentation submitted in accordance with CD 622.
National Highways Project Sponsor	National Highways Project Sponsor for the scheme	Overview of the as-built information handback process

¹ The Geotechnical Maintenance Liaison Engineer (GMLE) is the role as defined within CS 641: Managing the maintenance of highway geotechnical assets. Responsible for operational geotechnical management activities, including geotechnical data within the National Highways Area(s).

² The National Highways Geotechnical Advisor (GA) is the role as defined within CS 641: Managing the maintenance of highway geotechnical assets, responsible for overview of the asset performance and agreement of management strategy and plans

1.4 Preparatory Tasks

Prior to commencement of the as-built information handback process set out in this document, a series of preparatory tasks should be completed, as set out below.

1.4.1 Determination of Delivery Partner role

As described in Table 1, the Delivery Partner role carries out the majority of the as-built information handback tasks. This role should be undertaken by the organisation that was responsible for the construction of the scheme (either acting as the contractor or the designer, unless the GMLE specifies otherwise), and hence prepared the as-built information for the completed scheme. However, the NH Asset Data Management Manual (ADMM), does allow for this role to be undertaken by the GMLE for the region within which the scheme lies. In such cases, close liaison between the Delivery Partner and the GMLE will be of critical importance. Prior to the commencement of the as-built information handback process the Delivery Partner role must be determined between the parties to the scheme, and agreed with the NH Geotechnical Advisor and Project Sponsor for the scheme. This may be as defined within the contract for the scheme.

1.4.2 Request for GDMS user rights

Once the Delivery Partner role has been agreed, a named individual (or individuals) must be set up with appropriate user rights in GDMS. Even if the individual(s) are already GDMS users, they may not have the appropriate rights required to carry out the Delivery Partner tasks.

- To create report records and upload AGS data, editing rights for Reports Archive (Reports) and Exploratory Locations (ELDB) modules are required.
- To reflect the addition of new geotechnical assets, or the modification of existing ones editing rights for the Geotechnical Asset Database (GAD) (specific to the NH Maintenance Area within which the assets lie) are required (see further details 1.4.3)

A request for appropriate access should be made to the GDMS Support Team (support@hagdms.com). This request should state that access is required for an as-built information handback task and should state the name of the NH Geotechnical Advisor for the scheme, who will then need to authorise the request. Approval of GAD editing rights will need to be authorised by the relevant GMLE.

1.4.3 Determination of GDMS GAD rights

As will be described in Section 5, the majority of tasks within the as-built information handback process relate to the Geotechnical Asset Database (GAD) in GDMS. This section of the system operates around an Area-based security model, such that named users can only edit data for the NH Maintenance Area(s) within the region in which they work.

In order for the Delivery Partner to undertake the GAD related tasks within their role, they must have edit level rights to the NH Maintenance Area within which the scheme sits. This can be achieved in one of two ways:



1. The Delivery Partner is given access to the actual NH Maintenance Area within which the scheme sits. This method is simplest, but does mean that it will be theoretically possible for the Delivery Partner to edit **any** GAD data in that NH Maintenance Area (including for locations outside of the scheme extents). A level of trust is required between the Delivery Partner and the GMLE for the region in which the NH Maintenance Area sits, for this method to be used. The GDMS Support Team must have **confirmation from the GMLE** that a Delivery Partner can be given access rights for this method before it can progress
2. The geotechnical assets of the scheme can be created “off-network” and assigned to a temporary NH Maintenance Area for the period of the as-built information handback activities. On completion of the tasks, the assets can be snapped to the NH Maintenance Area in which they geographically sit. This method is considerably more involved than method 1, and should not be used as a preference.

The methodology to be used should be agreed with the Delivery Partner and relevant GMLE. Transfer of geotechnical asset data to and from a temporary NH Maintenance Area and provision of necessary user rights can be arranged by the GDMS Support Team on the basis of the agreed methodology.

Should the Delivery Partner or the GMLE for the region in which the scheme sits wish to discuss further the methods outlined above, prior to making a decision on how to proceed, the GDMS Support Team would be very happy to provide assistance.

1.5 Support and Training

Technical support for GDMS is available from: support@hagdms.com
 Specific engineering support for the as-built information handback process is also available through the GDMS Support Team. Training in the processes detailed in this document can be provided on request. A series of ‘how-to’ videos for all required actions are also available from GDMS help menu. All requests for support must come via the support@hagms.com email to ensure they can be dealt with effectively.

1.6 Glossary

ADMM	Asset Data Management Manual
AGS Format	Non-proprietary electronic data transfer format for ground investigation data, developed and supported by the Association of Geotechnical and Geo-environmental Specialists
Delivery Partner	Organisation appointed by National Highways to undertake a specific role.
GA	Geotechnical Advisor
GAD	Geotechnical Asset Database
Geodata file	A digital file that contains geotechnical or geoenvironmental data derived from exploratory locations e.g. an AGS file



Geodata set	A “container” for exploratory locations, associated geodata file and metadata relating to the geodata production.
Geotechnical asset	The man-made or natural earthworks below the road pavement layers and the adjacent land beside the road
GFR	Geotechnical Feedback Report, a requirement of the CD 622 standard (Managing Geotechnical Risk, DMRB 4.2.7)
GMLE	Geotechnical Maintenance Liaison Engineer
GDMS	Geotechnical and Drainage Management Service, the asset management information system for geotechnical asset information currently utilised by National Highways
SGM	Special Geotechnical Measure. Measure taken to improve the resilience to geotechnical failure relative to that of a conventional geotechnical asset and/or mitigate a known geotechnical hazard
SRN	Strategic Road Network

2. GDMS Data check process

This section describes the process of checking that all documents and data relevant to the geotechnical scheme have been uploaded to GDMS.

2.1 Are all existing reports available?

1. From desk based study undertaken as part of the project work, and considering reports created as part of the scheme, identify any reports (including hard copies) relevant to the scheme.
2. Request confirmation from the NH Geotechnical Advisor that they are not aware of any further available relevant reports in either hard copy or electronic format.
3. Check whether all of these reports are available in GDMS. If they are, continue to Section 2.6.
4. If reports have been identified that are not yet uploaded to GDMS, continue to Section 2.2.

2.2 Create the report record on GDMS

1. To create a new report record on GDMS, follow the instructions on the ‘Adding a report’ page of the GDMS manual and/or watch the relevant guidance video. Once completed, make a note of the GDMS report number.
2. Continue to Section 2.3.

2.3 Are the reports available in electronic format?

1. If the report for which a new GDMS report record has been created is available in electronic (indexed PDF) format continue to Section 2.4.
2. If the report for which a new GDMS report record has been created is only available in paper format, continue to Section 2.5.

2.4. Prepare electronic format copy of report for upload to GDMS

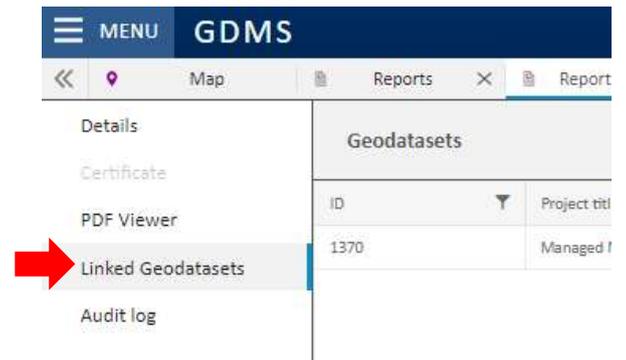
1. From the report details page for the relevant report record on GDMS, select the Download XML button and save the downloaded XML file to your local system.
2. If you do not already have the current version of the PDF Toolkit installed, this is available from the downloads page via the Help menu or <https://help.gdms.assetia.cloud>.
3. Install the PDF Toolkit and follow the instructions in its user manual to create a report package file.
4. Issue the report package file to the NH Geotechnical Advisor, and the Records Manager will upload it to GDMS.
5. Continue to section 2.6.

2.5 Scan the paper format copy of the report

1. If a paper format copy of the report is available, provide a copy to the NH Records Manager for scanning. Then once the scanned file has been received, proceed to Section 2.4.

2.6 Is all the available GI factual data uploaded to GDMS in AGS format?

1. Following desk study for the scheme and the completion of any scheme specific ground investigation, check whether all available GI factual data (in AGS format) can be accessed through the Linked Geodatasets tab of relevant reports. A list of geodatasets uploaded to GDMS is also available from the Geodataset Summary.



2. If all available GI factual data is available in AGS format, continue to Section 3. If not proceed to Section 2.7.

2.7 Is the AGS data available?

1. Confirm whether AGS data has been received or generated by the Delivery Partner (from paper records for example) in each case where it has not been included with a report associated with the scheme.
2. If AGS data has not been received or generated, request it where possible. If it cannot be obtained, continue to Section 3.
3. If additional AGS data has been identified, continue to Section 2.8.

2.8 Upload AGS data to GDMS

1. To add new AGS data to GDMS, following the instructions on “Adding Geodatasets and Exploratory Locations” from the Help menu and/or watch the relevant guidance video. If a report exists that the AGS data can be associated with follow the instructions on “Linking Geodatasets to Reports and Roads”. If a report does not exist go to Section 2.2, then link geodataset.



3. Completion and validation of feedback and as-built documentation

This section describes the completion and upload to GDMS of feedback and as-built information, including the Geotechnical Feedback Report and as-built drawings. It should be read in conjunction with Figure 1 in Appendix A.

3.1 Complete Geotechnical Feedback Report (GFR) in accordance with CD 622

1. Prepare a Geotechnical Feedback Report and accompanying geotechnical certificate in accordance with the requirements of CD 622 'Managing Geotechnical Risk'.
2. As described in Section 2.2, create a report record corresponding to the Geotechnical Feedback Report on GDMS. Include the generated GDMS report number clearly in the Geotechnical Feedback Report if possible (may not be applicable if the GFR has already been completed, and the process is being applied retrospectively).
3. Issue the Geotechnical Feedback Report and accompanying Geotechnical Certificate to the NH Geotechnical Advisor for the Project.
4. The NH Geotechnical Advisor will review the Geotechnical Feedback Report and respond in accordance with CD 622.
5. On receipt of a countersigned Geotechnical Certificate following the CD 622 review process, continue to Section 3.2.

3.2 Complete As-Built Drawings

1. Produce as-built drawings in accordance with the contract requirements and create PDF copies for inclusion with the Geotechnical Feedback Report.

3.3 Upload any additional created AGS data

1. If any AGS data has been created, but has not already been uploaded as a geodataset and linked with another relevant report, upload the data as described in Section 2.8.
2. Where AGS data tables have been added to an existing AGS data file, for example by digitising additional data, a combined AGS file comprising the full data set should be uploaded as a new geodataset and linked with the relevant report for which it has been produced. A list of obsolete exploratory locations from the original AGS file can be provided to support@hagdms.com for removal from the database to avoid duplication.
3. Continue to Section 3.4.

3.4 Produce packaged report file for upload to GDMS

1. Produce and submit a packaged report file for the GFR using the PDF Toolkit as described in Section 2.4. Pass to the NH Geotechnical Advisor and Records Manager. The software, accompanying user manual and tutorials for creating a packaged report file are available from the downloads page via the Help menu or <https://help.gdms.assetia.cloud>.

2. The signed Geotechnical Certificate prepared in Section 3.1 to be passed to NH Records Manager.
3. NH Records Manager uploads GFR and certificate to GDMS

4. Recording of residual hazard information

This section describes the process for the communication of information regarding addressed and residual ground related hazards encountered either during investigation or construction. It should be read in conjunction with Figure 2 in Appendix A.

4.1 Sources of information on ground related hazards

Information on ground related hazards can come from:

- Hazards encountered during the investigation phase of a scheme, recorded in one or more of the Ground Investigation Report (GIR), Geotechnical Design Report (GDR) or Geotechnical Feedback Report (GFR) depending on the timing of the investigation within the scheme development,
- Hazards encountered during construction and recorded in the Geotechnical Feedback Report (GFR).

4.2 Ensure reports make clear reference to the hazards using standard terminology

1. As required in CD 622, details of any residual hazards should be included in the Geotechnical Feedback Report in the sections relevant to the affected part of the scheme, as well as Sections 14.0 and 15.0 as appropriate.

2. Once GDMS records have been created for the relevant reports as described in Section 3, continue to Section 4.3.

4.3 Have all hazards been addressed by the scheme?

1. An assessment should be carried out to determine whether ground related hazards that impact on the scheme have been fully addressed by construction or mitigation.
2. If hazards have not been completely addressed by the scheme, continue to Section 4.4.
3. If all hazards have been completely addressed by the scheme, continue to Section 4.5.

4.4 Recording residual hazards in GAD

1. Residual hazards in this context are known, confirmed hazards associated with the ground that have not been addressed by a Special Geotechnical Measure or standard geotechnical assets construction, these may be accepted, a mitigation plan may have been put in place, or they may be uneconomical to mitigate. To record residual hazards in GAD, a 'general hazard' condition item should be added to asset records during the GAD update process detailed in Section 5. The general hazard condition item should be added to a condition set and classified as Class 2 in accordance with CS 641 using the methodology described in the 'Creating GAD Objects' page of the GDMS User Manual.

A new activity will be required to be created before adding condition items or condition sets as described in the 'Activities' page of the GDMS User Manual.



The general hazard condition item should cover the length of the Strategic Road Network (SRN) affected by the hazard in question. If the hazard affects a length of the SRN longer than a single geotechnical asset, a separate condition item must be entered per asset.

The Location Index used for the classified condition set should correspond with the definitions given in CS 641 and should be representative of the most critical area of the highway estate or third-party property affected by the hazard. The Subsequent (or 5 year) Class and Location Index are likely to be the same as those for the current condition, but if development of a minor or major defect is expected, an appropriate selection should be made.

A detailed description of the hazard should be included in the condition item/set description. Any relevant characteristics should also be captured in the condition item/set details if available.

Images can also be added to the condition item/set as an attached file.

Appropriate Causal Hazards should be recorded for the condition set relevant to the hazard in question, as described in the 'Creating GAD objects' page of the GDMS User Manual. This allows selection of separate primary, secondary, and tertiary hazards in order of importance / severity. It is likely, however that each hazard will have a different extent and that the relative importance of each hazard will be difficult to assess. As such the use of separate condition items and sets may be more appropriate. Table 2 below gives suggested equivalent primary and possible secondary Casual Hazards for several hazard topics. It is recommended that these are used for consistency.

2. Once any residual hazards have been recorded in GAD, continue to Section 4.5.

Table 2: Hazard topics, suggested primary and secondary casual hazards

Hazard Topic	Primary Casual Hazard	Possible Secondary Casual Hazard
Compressive ground	Weak founding strata	Localised geological conditions
Dissolution features	Cavities – natural	
Groundwater flooding	Localised geological conditions	
Landfill sites	Cavities – man-made	
Mining (coal, non-coal and quarrying)	Cavities – man-made	
Soil & groundwater chemistry	Localised geological conditions	Weak founding strata
Soil landslides	Localised geological conditions	
Rock landslides	Localised geological conditions	
Shrink swell	Localised geological conditions	

4.5 Recording addressed hazards in GAD

1. Where a hazard has been partially or fully addressed, this is most likely to have been achieved through the implementation of a Special Geotechnical Measure. The details of such measures should be recorded as described in Section 5. A classification of Class 3 in accordance with CS 641 should be assigned to the associated condition set. The Location Index should relate to the most critical location where the mitigation has been made at that location.
2. Once relevant condition items and condition sets for addressed hazards have been entered in GAD, continue to Section 4.6.

4.6 Recording non-routine maintenance requirements

1. Any non-routine maintenance requirements associated with the Special Geotechnical Measures or residual hazards should be recorded in GAD as described in Section 5.
2. Once these have been entered, continue to Section 4.7.

4.7 Provide summary of relevant residual hazard information to NH Geotechnical Advisor

1. In order to ensure transmission of any residual hazards identified and maintenance requirements to the relevant GMLE, highlight any relevant information that has been included in the GFR or in GDMS such that relevant information relating to any asset management requirements can

be included in their Geotechnical Asset Management Plan (GeoAMP) as required by CS 641. This could practically be achieved by the production of a table with the summary of GAD objects associated with the scheme, referencing sections of the geotechnical reporting as appropriate. The data for these tables can be generated by use of the relevant GAD object summary grids available from the Geotechnical menu on GDMS.

Information to be transmitted should be issued to the NH Geotechnical Advisor.

2. Continue to Section 4.8.

4.8 Provide summary of relevant hazard information to relevant GMLE(s)

1. The NH Geotechnical Advisor should pass on the summary information on residual hazards to the relevant GMLE. Should a scheme span more than one region, more than one GMLE may need to be passed this information.
2. Out with this data handback process, the GMLE(s) should review the relevant hazard information provided to them by the NH Geotechnical Advisor, and incorporate hazards as appropriate into their asset management planning, documented in the GeoAMP (Geotechnical Asset Management Plan).
3. Continue to Section 5.

5. GAD modifications to reflect as-built situation

This section describes the update of the GDMS Geotechnical Asset Database (GAD) with new asset data following completion of a scheme. Section 5.1 presents a summary of the general process with subsequent sections providing details on the various possible methods to be used. It should be read in conjunction with the flow charts Figure 3 and Figure 4 in Appendix A.

5.1 GAD Overview

5.1.1 Determine and agree sources of scheme geotechnical asset Information

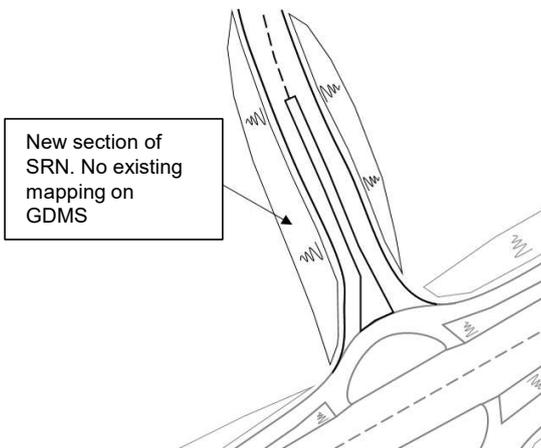
1. Access to assets following construction, particularly in the case of online schemes, for example Smart Motorways projects, can be difficult and carry a high level of health and safety risk. As-built construction records, which should be accurate and representative of the constructed assets, provide a useful source of asset data relating to geotechnical asset and feature locations, planted vegetation, drainage provision, geotechnical asset geometry and details of Special Geotechnical Measures (SGMs). Results of ground investigation associated with the scheme, and information reported in the Geotechnical Feedback Report regarding the sources of fill used within the scheme should allow appropriate in situ and embankment geology codes to be confirmed.

If they have been confirmed during sign-off of the scheme, BIM models or 3D CAD models for the scheme should allow slope angle and length data to be reliably determined at all locations along the scheme, particularly where an geotechnical asset is present. Where there is uncertainty regarding data quality, or where the geotechnical asset assets are readily accessible, confirmation of slope angles and lengths in the field using conventional survey techniques may be appropriate. Alternatively, and in all cases, the use of remote sensing techniques such as LiDAR could be considered, particularly as substantial vegetation is unlikely to have developed in the time between construction of new assets or modifications to existing assets, improving the reliability of interpretation of ground surface levels.

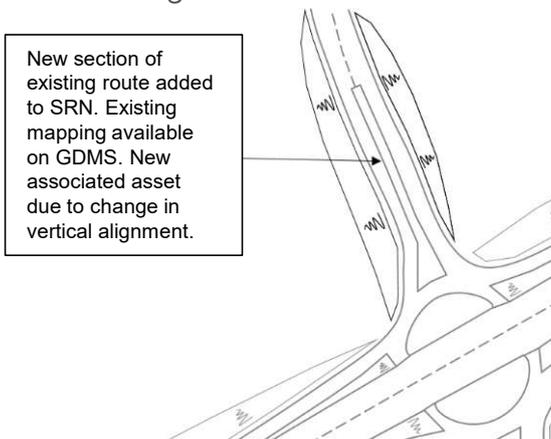
2. The source or sources of scheme geotechnical data to be used should be agreed with the NH Geotechnical Advisor.
3. Continue to Section 5.1.2.

5.1.2 Is GDMS mapping available for the location of the scheme?

1. If the scheme has involved construction associated with a new section of road, away from the previously existing highway network, base mapping for the new road alignment is unlikely to be available on GDMS for some time. See the schematic below for an example of this case:



2. If the scheme has involved modification of an existing asset and the road alignment has not changed, then the alignment should be available on GDMS. For example, a vertical alignment may have been changed to accommodate changes at a junction, requiring new geotechnical assets on an existing section of the SRN:



3. In all cases (not for these examples alone), details of the newly constructed or modified geotechnical asset can be entered using as-built information associated with the scheme but the method of entry will differ. Figure 4 in Appendix A, gives specific details of the different methods of entry. Three 'swim lanes' on Figure 4 (1, 2 and 3) relate to variants of data entry where mapping on GDMS does, or does not exist.
4. The processes described in this Section refer to data entry using the online GDMS system. It may be possible in some cases to use TabletGAD, the Tablet based inspection tool, noting archiving of assets is only possibly through the online GDMS.
5. If base mapping for the scheme is available on GDMS, continue to Section 5.2.
6. If the base mapping for the scheme is not available on GDMS, continue to Section 5.3.

5.2 Entry of Geotechnical Asset Data where mapping exists on GDMS

1. There are several different variants of how a scheme may modify geotechnical assets on the SRN, each of which requiring updates to the GAD in GDMS in different ways. Schemes may fit wholly into one of these variants, or may be a combination of one or more.

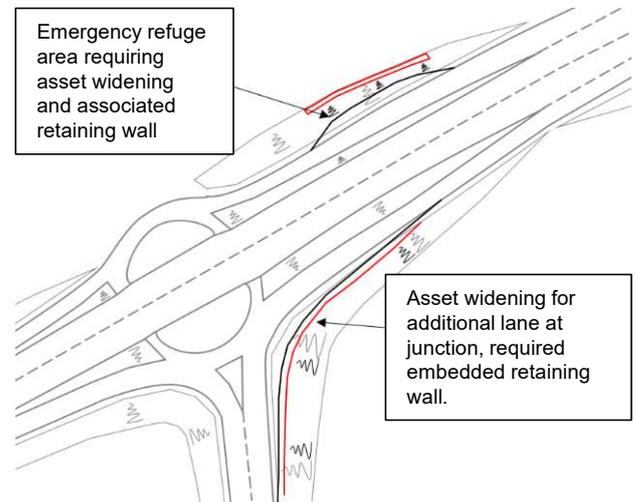
Figure 4 in Appendix A, gives specific details of how each of these variants will influence the way that modifications are undertaken to GAD. This section corresponds to swim lanes 2 and 3. GAD information can be entered using standard GDMS functionality for the entering of new geotechnical asset, inventory and condition data. See the Geotechnical Asset Data (GAD) section of the GDMS manual and the individual pages of the manual describing the procedures for entering details of Inspections, Assets, Inventory and Condition objects. Video guidance on how to complete these actions are also available from the Help menu.

2. Continue to Section 5.2.1.

5.2.1 Determine and agree approach for GAD data entry

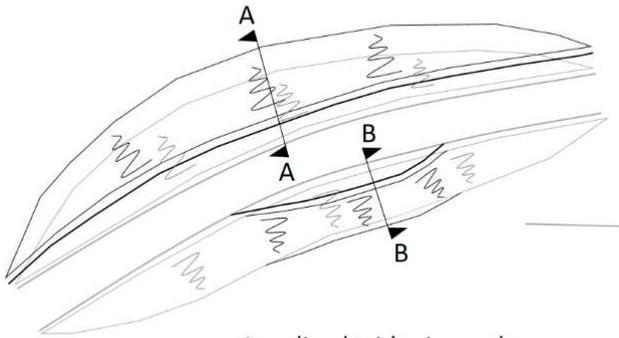
1. There are two general cases that will apply where mapping exists on GDMS, summarised as follows with indicative sketches of examples provided:
 - Creation of new geotechnical asset where either a new geotechnical asset has been constructed or an geotechnical asset has been substantially modified such that a new slope is formed (swim lane 2 in Figure 4).

- Modifications to an existing geotechnical asset where no significant changes to the exposed geotechnical asset slopes have been made (swim lane 3 in Figure 4). See right for example.



2. Determining which variant applies (and hence which swim lane is relevant) requires consideration of the scheme details. The following figure shows examples where extensive widening has been undertaken along the whole length of an geotechnical asset (Section A-A) and localised widening has been undertaken on a short length of an geotechnical asset (Section B-B). For the example shown in Section A-A, swim lane 2 of Figure 4 would apply; here the stability of the slope is mainly governed by the newly placed soils. For the example shown in Section B-B, swim lane 3 of Figure 4 would apply; here the stability is mainly governed by the existing soils.

Extensive widening – slope stability mainly governed by newly placed soils.



Localised widening – slope stability mainly governed by existing soils.

3. The approach to be adopted for data entry to GDMS should be agreed with the NH Geotechnical Advisor for the scheme.
4. Continue to Section 5.2.2.

5.2.2 GAD data entry (swim lanes 2 and 3)

1. Swim lane 2 - Creating New Geotechnical Asset Records

In the case of the creation of new and replacement assets, standard functionality is used, as described in the GDMS user manual. Sources of asset information would be expected to be as determined and agreed in Section 5.1.1.

Where SGMs have been constructed within the asset, these should be recorded as described for swim lane 3 below.

2. Swim lane 2 – Archiving existing geotechnical assets

Where a significant change has been made to the full length of an asset or assets, for example by widening an embankment over such a width that any critical slip surfaces would not be expected to pass through the original

embankment fill and such that any previous records of slope characteristics are no longer relevant, the original asset or assets should be archived and a new asset created.

NB: Archiving of assets is not easily reversed and these steps should only be undertaken when you are certain this is an appropriate approach, agreed with the NH Geotechnical Advisor. This is achieved as follows:

- For each asset record to be replaced, follow the instructions for “Archiving a GAD object” in the GDMS User Manual. This will inform the user of what information will be archived, including associated data. The reason for archiving should generally be selected as “Significant re-construction” in this case. See below.

Any files attached to the archived objects will also be archived.

Archive Reason	Other
Archive notes	Created in error
	De-trunked network
	Significant re-construction

NB: Before archiving an asset which you subsequently wish to replace with a new asset, make a note of the geotechnical asset ID number, in the format 1_A1_12345.

- Create a new geotechnical asset over the appropriate length as described for swim lane 2.
- In the description of the new asset refer to the previous asset ID.

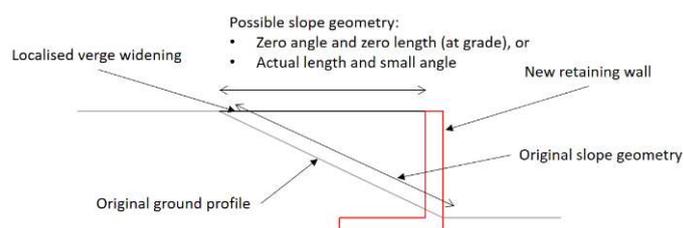
3. Swim lane 3 - Localised modification of geotechnical assets

Where a modification is made to an geotechnical asset with an existing record in GAD over part of its length, the modification should be recorded as an inventory item on the geotechnical asset. Such modifications will fall within the definition of Geology/Materials or SGM inventory item types. A drop-down list allows the vertical extent of an inventory item to be selected as either 25%, 50%, 75% or 100% of the geotechnical asset height.

Information regarding modifications should be recorded as follows:

- Where defects are present over part or all of the length of the modification, see Section 5.4. In general it is expected that defects in modifications will have been addressed during construction. The NH Geotechnical Advisor must be informed of any remaining defects.
- Slope geometry, as slope angle, length and bearing should be recorded at the start and end of the modification. Additional slope sections should be included as separate slope geometries to define any significant changes in slope geometry along the length of the modification. The slope geometry used should relate to the section of soil or rock slope, not including retaining structures. Where a retaining wall or similar supports the full height of the geotechnical asset, leaving a level verge, this may result in a zero height point within a significant geotechnical asset which under normal circumstances would form the end of

the geotechnical asset (as per the rules set out in CS 641). This rule can be ignored in this instance, and a zero height within the geotechnical assets extents is acceptable. Often, a small angle of slope above the retaining wall may exist, and should be measured and recorded. The methodology for recording such sections should be agreed with the relevant GMLE, to ensure a consistent approach with how such features are recorded elsewhere in their region.



- Record relevant characteristic(s) appropriate to the modification that has been made. Additionally, select an appropriate vertical extent. If multiple inventory item types have been installed at the same location over different vertical extents, for example a gabion wall at the toe of the slope over 25% of the slope height and a material replacement of the embankment fill over 75% of the slope height, two separate overlapping inventory items should be created. In the description text box in the inventory item details, include a full description of the modifications made.

Multiple inventory items can be added to an inventory set to show their engineering relationship.

- If there is an ongoing additional maintenance requirement associated with the modification made, for example inspection of soil nail heads and head plates, a relevant Non-Routine Maintenance Requirement should be assigned. See section 5.6 for more details.
 - On completion of data entry, the ‘QuASaR’ tool on GDMS should be run to ensure a high quality of data entry and to flag any errors. Please see the ‘QuASaR’ page of the GDMS user manual for instructions on how to run and use the QuASaR tool.
4. Once GAD data entry is complete, continue to Section 5.4.

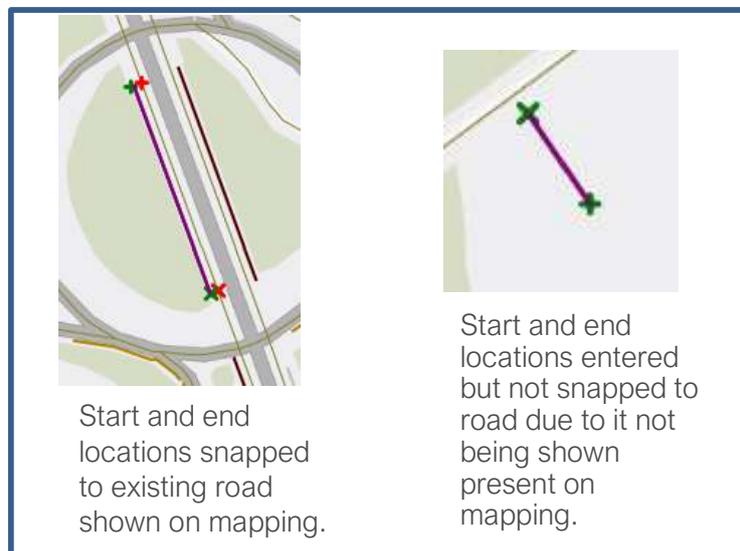
5.3 Entry of Geotechnical Asset Data where mapping does not exist on GDMS

1. There are several different variants of how a scheme may modify geotechnical assets on the SRN, each of which requiring updates to the GAD in GDMS in different ways. Schemes may fit wholly into one of these variants, or may be a combination of one or more.
2. Figure 4 in Appendix A, gives specific details of how each of these variants will influence the way that modifications are undertaken to GAD. This section corresponds to swim lane 1. GAD information can be entered using standard GDMS functionality for the entering of new GAD objects. See the Geotechnical Asset Data (GAD) section of the GDMS manual and the individual pages of the manual describing the procedures for entering details.
3. Continue to Section 5.3.1.

5.3.1 GAD data entry (swim lane 1)

1. Where mapping does not exist in the location of new assets, data entry requirements are similar to those for new assets in GAD (see the GDMS user manual). However, it will not be possible to snap GAD objects to the road alignment.

When creating the asset, the “off-network” tick box should be ticked, and “On network (network not yet available)” reason selected. This will dictate the subsequent locating asset process. In this case users must enter the Area manually.



2. To ensure that the intended locations of GAD objects are correctly snapped eventually in GDMS it is important that they are unambiguous and obey the rules for locating geotechnical assets in GDMS (such as assets cannot cross a side road). In addition to the guidance in the GDMS user manual and the requirements of CS 641, when locating GAD objects:

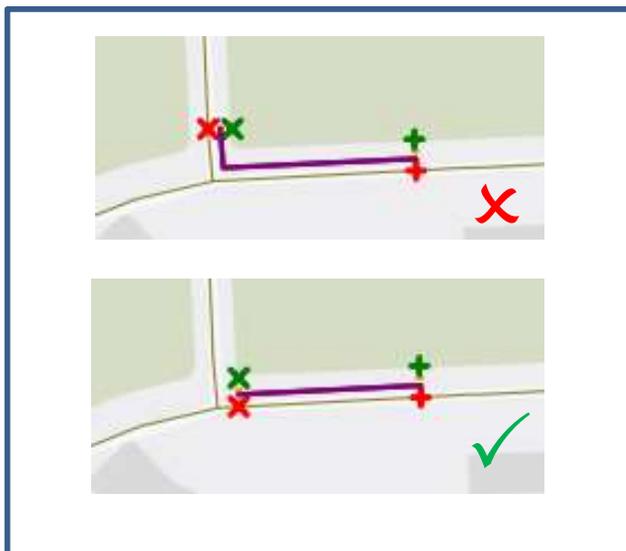
- Ensure start and end locations are on the correct and same side of the road:



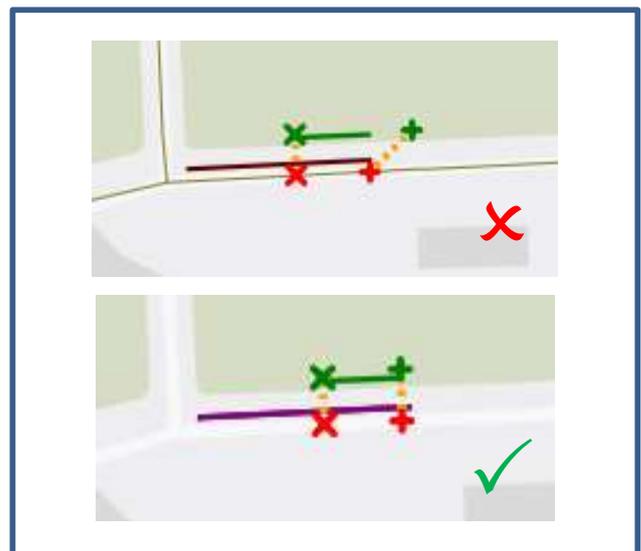
- Do not allow assets to cross roads:



- Use unambiguous start and end points, as close as possible to the correct side of the road alignment. In the example below, the top figure has an start point snapped to a local side road, rather than the intended main carriageway.



- Make sure inventory and condition items are located within the extents of the relevant asset



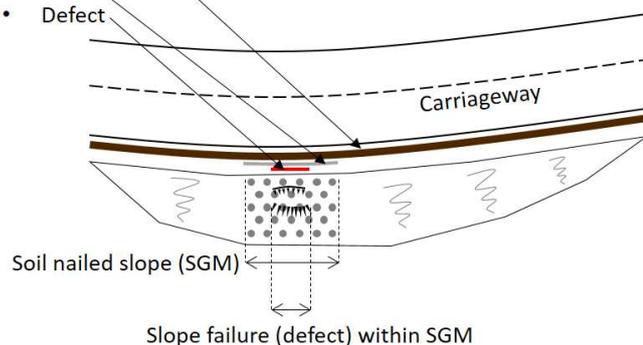
3. Off-network assets can be found via the GAD dashboard.
4. On completion of data entry, the 'QuASaR' Data Analytics tool on GDMS should be run to ensure a high quality of data entry and to flag any errors. The tool includes instructions on how to run and use QuASaR.
5. Once GAD data entry is complete, continue to Section 5.4.

5.4 Recording residual defects in new inventory items

1. Where a defect remains following construction, associated with a modification recorded as a Geology Materials or SGM inventory item, this should be recorded as a new condition item. The extent of the defect within the inventory item, should be recorded as a condition item associated to the inventory item – see below.

Representation in GDMS of:

- Geotechnical asset
- SGM
- Defect



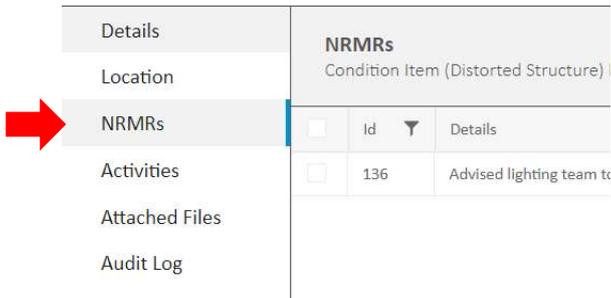
2. Where a defect has multiple features, the relevant condition items and associated details should all be created on the inventory item. To classify features the condition item(s) should be added to a condition set and relevant details including photographs causal hazards and defect triggers captured. If a defect and condition set pre-existed at the location, the new items can be added to the existing set and details updated accordingly. If the condition item pre-existed it can not be associated to the new inventory item.
3. The presence of any residual defects within the extents of SGMs constructed as part of the scheme must be brought to the attention of the NH Geotechnical Advisor.
4. Continue to Section 5.5.

5.5 Recording of remediated defects

1. Where the inventory item was constructed to repair an existing defect a new condition item type "repair" should be created on the new inventory item recording the extent which is acting as the repair. This condition item should then be added to the existing defect condition set and the set updated accordingly, including the reclassification of set to a Class 3 and archiving of any condition items which are no longer present.

5.6 Recording non-routine maintenance requirements (NRMRs)

1. GAD functionality allows non-routine maintenance requirements to be assigned to Condition Sets, Condition Items and Inventory Items. These are added from the NRMRs section on the relevant object as shown below:



Details		NRMRs	
Location		Condition Item (Distorted Structure)	
NRMRs		<input type="checkbox"/>	Id ▾ Details
Activities		<input type="checkbox"/>	136 Advised lighting team t
Attached Files			
Audit Log			

2. A requirement can be selected from the drop-down list and an 'Other' option is available. The details of the requirement should be entered in the relevant text box and a frequency should be selected of between 1 and 9 weeks, months, or years from the relevant pair of drop-down lists. It is recommended that the "to be confirmed" checkbox is ticked to flag to a review to the receiving GMLE. Attachments should be included with the object where relevant providing further detail, for example the locations of instruments, required equipment and initial readings.

Create NRMN ✓ Save

Type	Monitoring (with installations) ▾
Details	<input type="text"/>
Frequency	1 ▾
Frequency unit	Months ▾
To Be Confirmed	<input type="checkbox"/>

3. Continue to Section 5.7.

5.7 Summary of modified GAD data

1. To ensure that the scope of GAD modification is clear and to allow for cross-checking that all relevant information has been included, it is recommended that tables are produced providing a summary of relevant GAD objects details associated with the scheme. The data for these tables can be generated by use of the relevant GAD object summary grids available from the Geotechnical menu on GDMS.
2. On completion, this information should be passed to the NH Geotechnical Advisor for the scheme and the GDMS Support team (to inform the 'snapping' of GAD data to the SRN when the road based mapping has been added to GDMS) . There will often be a time lag between data entry and availability of the updated mapping, during which time the parties to the data handback process are likely to have moved on. Hence, the snapping activity will be carried out by the GDMS Support Team.
3. The NH Geotechnical Advisor will pass the information to the relevant GMLE.
4. Continue to Section 5.8.

5.8 Validation and approval of data on GDMS

1. For schemes where no mapping is available currently on GDMS (swim lane 1), the data will sit in GDMS, though not snapped to the map, until the GDMS mapping is updated (following updated mapping being available from the Ordnance Survey).
2. Once mapping has been updated to include the new part of the SRN, the GDMS Support team will snap the previously entered GAD data to the new road.
3. Irrespective of whether GAD data has been updated via swim lanes 1, 2 or 3, prior to approving entered GAD data, the receiving GMLE shall run the QuASaR (Quality Assurance: Surveys and Reporting) tool in GDMS on the entered data.
4. The checks can be limited to a specific Area and Road, and to Preliminary data.
5. This final approval completes the process for GAD modifications to reflect the as-built situation.

Appendix A

- Figure 1 Completion and validation of as-built documentation
- Figure 2 Recording of residual hazard information
- Figure 3 Overview of GAD modifications to reflect as-built situation
- Figure 4 Detail of GAD modifications to reflect as-built situation

Figure 1 Completion and validation of as-built documentation

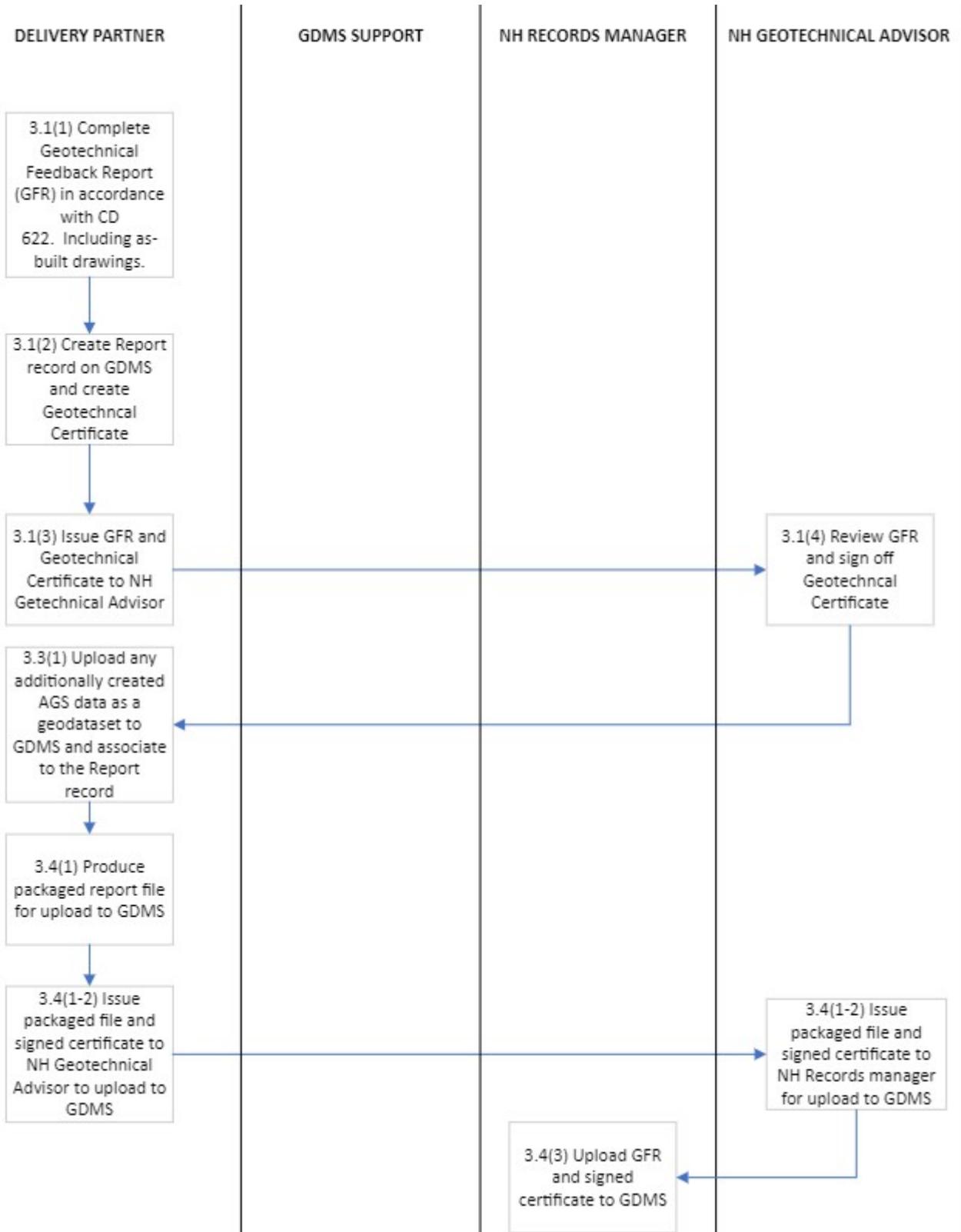


Figure 2 - Recording of residual hazard information

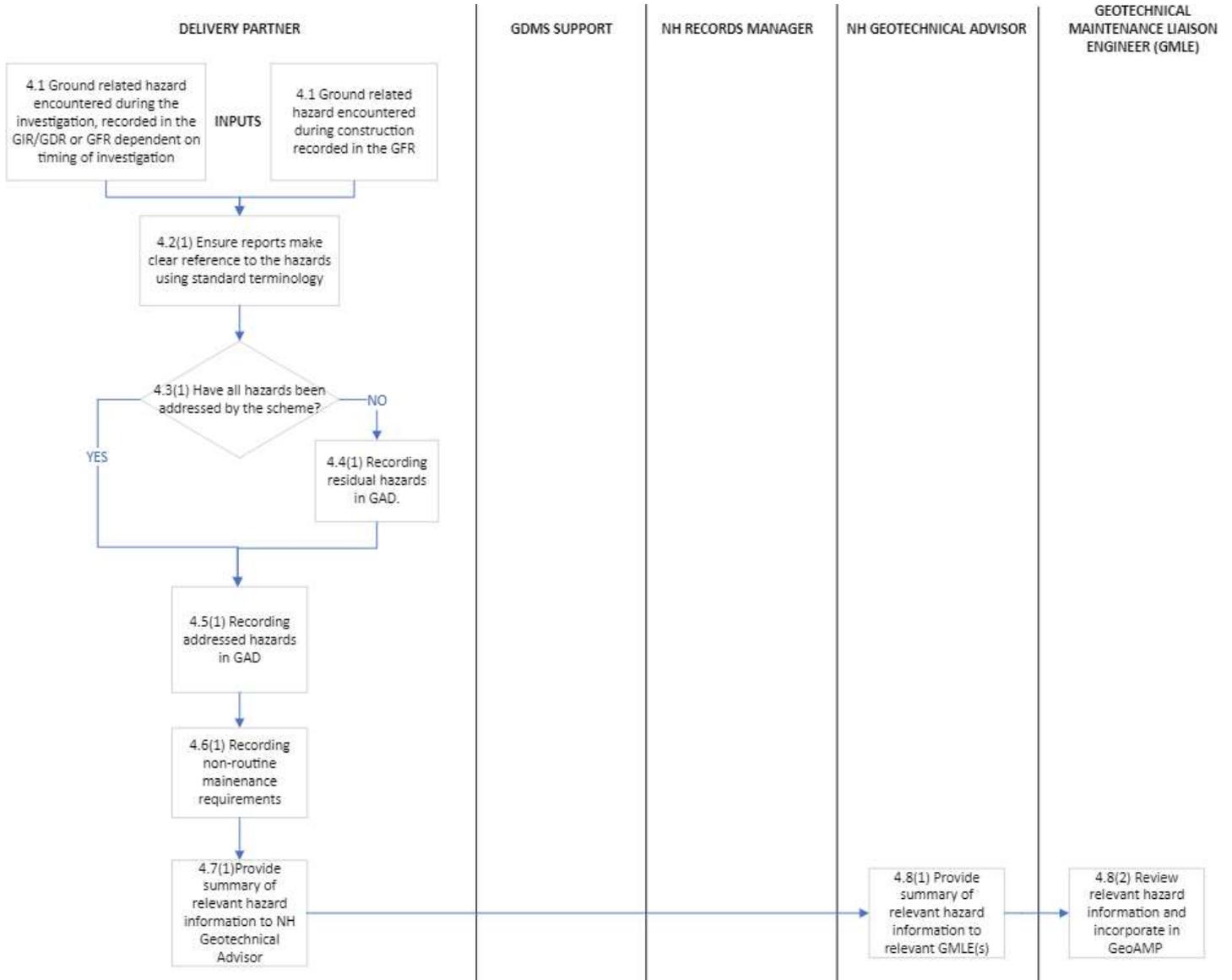


Figure 3 - Overview of GAD modifications to reflect as-built situation

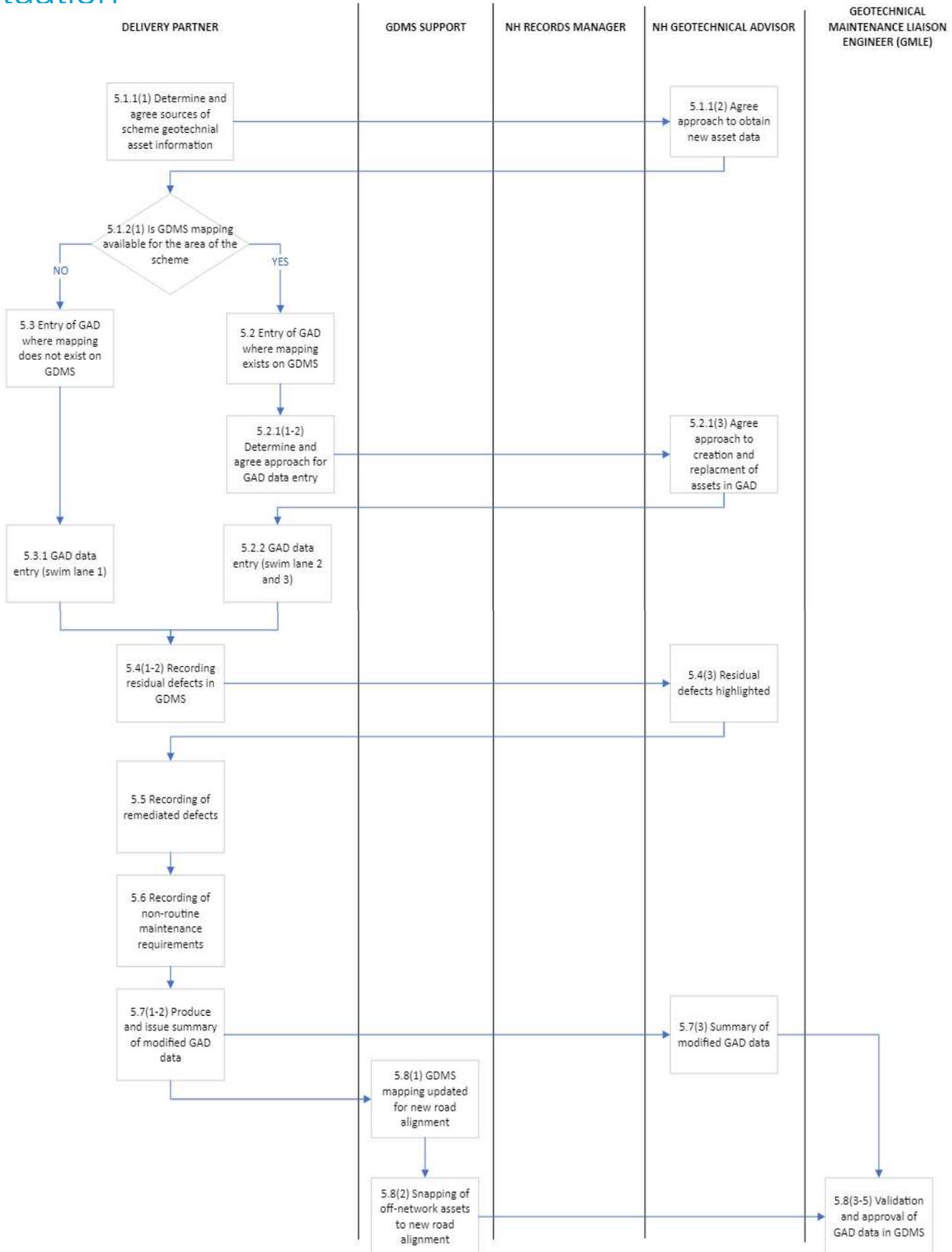
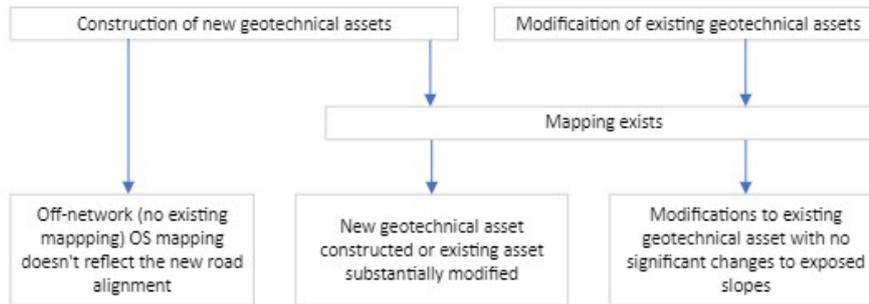


Figure 4 - Detail of GAD modifications to reflect as-built situation



Swim lane	1	2	3	Section of GDMS Help document
GDMS usage	GAD details entered but not snapped to network. - OS co-ordinates needed - Cannot be linked to OS or IAMS network	GAD details entered by normal GDMS functionality. - Details needed in OS co-ordinates	GAD details entered by normal GDMS functionality. - Details needed in OS co-ordinates	Geotechnical Asset Database (GAD)
Existing Geotechnical Assets	N/A	Archived and referenced to existing geotechnical assets that are removed.	Existing geotechnical assets generally left as is and modified through details and additions of new inventory items/sets and condition items/sets.	Archiving GAD Objects
Geology	In situ and embankment codes entered as per GDMS functionality	In situ and embankment codes entered as per GDMS functionality	No major modification to asset - use existing codes	Creating GAD Objects - Creating a Geotechnical Asset
Geometry	Enter slope geometry as per requirements of CS 641	Enter slope geometry as per requirements of CS 641	Update/add slope geometry where there has been modification to the existing slope.	Creating GAD Objects - Creating Slope Geometries
Age	Enter date of construction	Enter date of construction	Maintain (or update if required and data available) the existing year of construction	Creating GAD Objects - Creating a Geotechnical Asset/ GAD Items
SGMs	Enter SGM in accordance with adding a new inventory item functionality and guidance in this document			Creating GAD Objects - Creating GAD Items
Vegetation	Enter as per GDMS functionality and requirements of CS 641	Enter as per GDMS functionality and requirements of CS 641	Existing vegetation inventory items to be modified and/or new added to describe the new vegetation mix on the asset	Creating GAD Objects - Creating GAD Items
Drainage	Enter as per GDMS functionality and requirements of CS 641	Enter as per GDMS functionality and requirements of CS 641	Existing drainage inventory items to be modified and/or new added to describe the new drainage provision on the asset	Creating GAD Objects - Creating GAD Items
Inventory or Condition items or sets	Any features present not listed above to be entered as a relevant inventory item(s)/set(s) or condition item(s)/set(s). This included residual hazards which should be added as condition item then added to a condition set and classified as a Class 2 in accordance with CS 641.			Creating GAD Objects - Creating a GAD Items