

Handover of Geotechnical As-Built Data

Guidance Document

October 2017

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October 2017

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
1	October 2017	T Bird	C Power	T Spink	First Issue
2	October 2017	T Bird C Power	T Spink	T Spink	Revision for issue to HE
3	October 2017	T Bird C Power	T Spink	T Spink	Revision to include input from Verity Smith (Atkins) on SGM section

Document reference: 377247 | 001 | 3

Information class: Standard

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1 Introduction

1.1 Purpose of the document

Many schemes undertaken on the Strategic Road Network (SRN) managed and operated by Highways England (HE) 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 HD22 geotechnical certification procedures; as-built drawings; AGS data associated with ground investigations undertaken, and modifications to the Geotechnical Asset Database (GAD).

As the current asset management information system, the Highways Agency Geotechnical Data Management System (HAGDMS) records the current inventory and condition of the Geotechnical Assets of the SRN. When a scheme either adds new assets, or modifies existing assets, there is a requirement for the as-built information on these changes to be updated within HAGDMS. 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 HAGDMS
- The process, with user guidance, for:
 - ensuring that scheme details are correctly recorded
 - ensuring that all relevant reports documenting the scheme development are correctly referenced and held on HAGDMS
 - ensuring that all relevant ground investigation data (in AGS format) are correctly referenced and held on HAGDMS
 - preparation and upload of the Geotechnical Feedback Report (GFR), produced in accordance with HD22: 'Managing Geotechnical Risk', to HAGDMS
 - preparation and upload of as-built drawings to HAGDMS
 - ensuring that ground-related hazards that impacted on the scheme are correctly recorded
 - updating the information held in the Geotechnical Asset Database (GAD) of HAGDMS 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 on HAGDMS

1.2 Process diagrams

The processes set out in this document are described in a series of flow diagrams in Appendix A. The reference numbers on these diagrams relate to section numbers in the document, to allow the outline process to be supported by detailed user guidance.

The process diagrams in Appendix A are as follows:

- Figure 1 Set up and validation of a project in HAGDMS
- Figure 2 Completion and validation of as-built documentation
- Figure 3 Recording of residual hazard information
- Figure 4 Overview of GAD modifications to reflect as-built situation
- Figure 5 Detail of GAD modifications to reflect as-built situation

Figure 1 to Figure 4 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 5 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 data handback process are set out in Table 1 below. Contact details for the named roles can be found through Contacts functionality of HAGDMS.

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

Role Name	Role Description	Responsibilities
Delivery Partner	Named individual(s) within the organisation that delivered the scheme for HE or within the Provider organisation ¹ for the HE Maintenance Area within which the scheme lies	This role carries out the majority of the as-built data handback tasks
Geotechnical Maintenance Liaison Engineer (GMLE) ²	Named individual within the Provider organisation for the HE Maintenance Area within which the scheme lies	Agreeing the specifics of how user/Area rights will be applied in the process Approval of geotechnical asset data associated with the HE Maintenance Area including data passed to them as part of the handback process.
HAGDMS Support	Technical support team for the HAGDMS	Technical and engineering support to the as-built data handback process
Highways England Administrator	HAGDMS administrator for Highways England	Modification of project details on HAGDMS
Highways England Geotechnical Advisor (GA) ³	HE Geotechnical Advisor for the HE Maintenance Area within which the scheme lies.	Confirmation of availability of documents relating to the scheme Overview of geotechnical elements of the handback process
Highways England Project Sponsor	HE Project Sponsor for the scheme	Overview of the as-built data handback process

Notes

¹ The Provider may be a Maintenance Service Provider (MSP) under an Asset Support Contract (ASC) or the Asset Delivery Team under an Asset Delivery (AD) contract.

² The Geotechnical Maintenance Liaison Engineering (GMLE) is the role as defined within HD41/15: Maintenance of Highway Geotechnical Assets, responsible for operational management activities within the Provider organisation.

³ The Highways England Geotechnical Advisor (GA) is the role as defined within HD41/15: 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 data handback process set out in this document, a series of preparatory tasks must 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 data handback tasks. It is **highly recommended** that this role is undertaken by the organisation that was responsible for the construction of the scheme (either acting as the contractor or the designer) and hence prepared the as-built information for the completed scheme. However, the HE Asset Data Management Manual (ADMM), does allow for this role to be undertaken by the Provider organisation for the HE Maintenance Area within which the scheme lies. In such cases, close liaison between the Delivery Partner and the Provider will be of critical importance.

Prior to the commencement of the as-built data handback process the Delivery Partner role must be determined between the parties to the scheme, and agreed with the HE Geotechnical Advisor and Project Sponsor for the scheme. This may be as defined within the contract for the scheme.

1.4.2 Request for HAGDMS user rights

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

A request for appropriate access should be made to the HAGDMS Support Team (support@hagdms.co.uk). This request should state that access is required for an as-built data handback task and should state the name of the HE Geotechnical Adviser for the scheme.

1.4.3 Determination of HAGDMS Area rights

As will be described in Section 5, the majority of tasks within the as-built data handback process relate to the Geotechnical Asset Database of HAGDMS. This section of the system operates around an Area-based security model, such that named users can only edit data for the HE Maintenance Area within which they work, under either an ASC or AD operating model.

In order for the Delivery Partner to undertake the GAD related tasks within their role, they must have edit level rights to the 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 HE 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 Area (including for locations outside of the scheme extents). A level of trust is required between the Delivery Partner and the GMLE for the HE Maintenance Area for this method to be used. The HAGDMS 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 area can be moved to a temporary HE Maintenance Area for the period of the as-built data handback activities. On completion of the tasks, the assets can be moved back into the HE 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 Highways England and the Provider's GMLE. Transfer of earthwork data to and from a temporary Area and provision of necessary user rights can be arranged by the HAGDMS support team on the basis of the agreed methodology.

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

1.5 Support and Training

Technical support for HAGDMS is available from: support@hagdms.co.uk

Specific engineering support for the as-built data handback process is also available through the HAGDMS support team. Training in the processes detailed in this document can be provided on application. All requests for support must come via the HAGDMS support team, to ensure they can be dealt with effectively.

1.6 Glossary

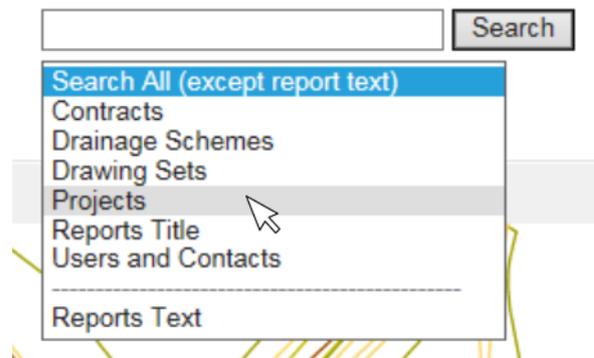
AD	Asset Delivery
ADMM	Asset Data Management Manual
AGS Format	Non-proprietary electronic data transfer format for ground investigation data, developed and supported by the Association of Geotechnical and Geo-environmental Specialists
ASC	Asset Support Contract
GA	Geotechnical Advisory
GAD	Geotechnical Asset Database
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 HD22/08 standard (Managing Geotechnical Risk, DMRB 4.1.2)
GMLE	Geotechnical Maintenance Liaison Engineer
HAGDMS	Highways Agency Geotechnical Data Management System, the asset management information system for Geotechnical Asset information currently utilised by Highways England
Project	Construct within HAGDMS for the storage of information relating to a particular geotechnical scheme.
Provider	Organisation undertaking the role as either the Maintenance Service Provider under the ASC operating model or Asset Delivery Team under the Asset Delivery operating model.
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 Set up and validation of a project in HAGDMS

This section describes the process of setting up and/or verifying the setup of a project on HAGDMS and association of relevant documents and other data. It should be read in conjunction with Figure 1 in Appendix A. A project is an HAGDMS construct for the storage of information relating to a particular geotechnical scheme.

2.1 Is the Project set up in HAGDMS?

1. On the HAGDMS main page, select **Projects** from the drop down list below the search box.



2. Enter an appropriate search term in the box above the drop-down list e.g. road number and multiple words, and click the **Search** button.

The search uses fuzzy search techniques to identify relevant projects and so may return several results.

Check the resulting list of results for the relevant Project title.

3. If the number of results returned is excessive, it may be useful to check the **Match all search terms**: checkbox in the results window and click the Search button to reduce the number of results but this may exclude relevant results if not all the search terms are included in the Project title.
4. If the relevant project is found, click the **Details** link and go to Section 2.2.
5. If the relevant project is not found, close the search results screen and proceed to Section 2.4.

2.2 Are the Project details correct?

1. Check that the entries under the Project Details pane are correct as far as possible. Take note of the System Reference, as this can be used to subsequently locate the Project details.
2. Check whether the Project has been located. A **Zoom To** option will be available at the top of the Project Details page if this is the case.

Click this link if available and check whether the Project extents shown in the HAGDMS mapping window on the main page are correct.



3. If the Project details are correct, and the Project is located with the correct extents, return to the Project Details window and proceed to Section 2.5
4. If the Project Details are incorrect, the Project is not located or the Project extents are incorrect, go to Section 2.3.

2.3 Correct the Project details

1. If the Project Details are incorrect, the Project is not located or the Project extents are incorrect, provide any relevant details to the HAGDMS Support team at support@hagdms.com with the relevant details including the System Reference of the Project.
2. Continue to Section 2.5.

2.4 Set up the Project in HAGDMS

1. Provide the following details, where known to Highways England administrative staff via the Project Sponsor for them to set up the Project:
 - Delivery Partner's Project Reference
 - Project Title including road number where relevant
 - Highways Engand PIN
 - Project Type, one of:
 - Dualling Scheme
 - Highway Improvement Scheme
 - Local Network Management Scheme
 - New Structure Scheme
 - Pilot Scheme
 - Section 278 Agreement Scheme
 - Smart Motorways
 - Structure Replacement Scheme
 - Area/DBFO/Region
 - Client's Representative
 - Contractor
 - Contractor's Designer
 - Start date
 - Planned finish date
 - Actual finish date (if known)
 - Any relevant keywords that could help someone searching for the project (for example 'rock reinforcement' or 'widened embankment')
 - Any general remarks relating to the scheme
 - Geographical extents of the Project as OS grid references defining a rectangle bounding the Project area. These should be pairs of OS grid eastings and northings that define the South West and North East corners of the project area.
2. Obtain the HAGDMS Project System Reference from Highways England following creation of the Project and confirm that the details have been entered correctly. The details can be checked as follows:
 - 2a. Select the **Projects > Search** option from the HAGDMS main page.
 - 2b. Click the **Projects** link.

- 2c. Enter the Project System Reference into the **Project ID** text box and click the **Run** button.
- 2d. A single result should appear in the Project – Results window, which should correspond to the Project that has been added. Check that all the details are correct. Once complete, continue to Section 2.5.

2.5 Is the project associated with any irrelevant information?

1. On the Project Details page for the Project, accessed as described in Section 2.4 Steps 2a to 2d, review the **Linked Items** list as shown to the left. This lists the numbers of Reports and associated Boreholes, Drawing Sets and associated located files, Drainage Schemes, Geotechnical Observations and events linked to the Project.

Follow any links provided and confirm that the items linked are relevant to the project. If non-relevant items are identified the appropriate action will depend on the item type, see following steps.



Linked Items	
1	Reports
26	Boreholes
3	Drawing Sets
7	Located Files
0	Drainage Schemes
0	Observations
0	Geotechnical Events

2. If all associated information within the Project is relevant, continue to Section 2.8.
3. If irrelevant information is found associated with the Project, continue to Section 2.6.

2.6 Request removal of links to any irrelevant information (other than Reports)

1. For irrelevant links from the Project to Drawing sets and located files, Drainage Schemes, and Observations and associated Geotechnical Events, contact Highways England administrative staff.
2. Highways England Administrative staff will remove the irrelevant links.
3. Having confirmed that the relevant links have been removed, continue to Section 2.7.

2.7 Remove links to any irrelevant Reports

1. To remove an association between a Report and the Project, click the Reports hyperlink and click the “Scheme Title” hyperlink for the relevant report.
2. Select the Edit option from the Report menu in the Report Details screen.
3. From the ‘Project that Report is linked to’ drop down list, select the ‘Please Select...’ option and click the Save button to remove the link.
4. Once all links to irrelevant Reports have been removed, continue to Section 2.8

2.8 Does the Project include all of the existing available Reports?

1. From desk based study undertaken as part of the project work, and considering Reports created as part of the Project, identify any Reports (including hard copies) relevant to the Project.
2. Request confirmation from the Highways England Geotechnical Advisor that they are not aware of any further available relevant reports in either hard copy or electronic format.
3. Check whether the Project has been associated with all of these Reports in HAGDMS. If it has, continue to Section 2.9.
4. If reports have been identified that are not yet associated with the Project, continue to Section 2.12

2.9 Is all the available GI factual data uploaded to HAGDMS in AGS format?

1. Following desk study for the Project and the completion of any Project specific ground investigation, check whether all available GI factual data (in AGS format) can be accessed through the link to Boreholes associated with Reports attached to the Project on the Project details page. AGS data attached to reports can be seen on the Reports Details page in HAGDMS:

Linked Data		
Report Available Online	Yes	View
Attached Certificate	No	
AGS Data Available	Yes	View
Report Extents Status	Set	View
Attached Documents	No	

2. If all available GI factual data is available in AGS format, continue to Section 2.18.
3. If all AGS data has been uploaded, proceed to Section 2.18. If not proceed to Section 2.10.

2.10 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 Project.
2. If AGS data has not been received or generated, request it where possible. If it cannot be obtained, the Project is now set-up and validated in HAGDMS – continue to Section 2.18.
3. If additional AGS data has been identified associated with a Report linked to the Project, continue to Section 2.11

2.11 Upload AGS data to HAGDMS

1. From the Report Details page for the relevant report, select the **Import > Upload AGS** menu option.
2. Follow the instructions on the AGS Upload page to prepare a ZIP file containing AGS files to be uploaded.
3. Click the Browse... button to select the ZIP file containing AGS data for upload
4. Click the Import link. HAGDMS will undertake validation checks on the AGS data contained in the ZIP file. If validation is successful, the Report Details screen will be shown with a report of “SUCCESS: AGS data imported successfully”

5. If validation fails a link will be provided to a Submission Status Report describing the issues identified with the data that must be corrected prior to upload.
6. Once AGS data has been successfully uploaded, click the **View** link associated with the attached AGS data (highlighted in the screenshot below). Then click the Open link which appears associated with the “Statistics Viewer”. This provides a summary of the data uploaded.



The screenshot shows a table titled "Linked Data" with the following rows:

Linked Data	
Report Available Online	No
Attached Certificate	No
AGS Data Available	Yes
Report Extents Status	Set
Attached Documents	No

Two "View" buttons are visible on the right side of the table, one of which is highlighted with a red box.

7. By clicking successively on the data rows within the “Group Data” and “Field Data” tables, check that the data has been uploaded successfully.
8. Once all available AGS data has been uploaded, continue to Section 2.18.

2.12 Are the unattached, relevant Reports uploaded to HAGDMS

1. For Reports relevant to the Project that are not associated with it, check whether they are already available on HAGDMS, using the search methods set out in the HAGDMS user guide.
2. If unattached, relevant Reports are found on HAGDMS, they should be associated with the Project, continue to Section 2.17.
3. If unattached, relevant Reports are not found on HAGDMS, continue to Section 2.13.

2.13 Create the Report record on HAGDMS

1. To create a new Report record on HAGDMS, follow the instructions on the ‘Adding a new report’ page of the HAGDMS manual. Once completed, make a note of the HAGDMS Report Number.
2. Continue to Section 2.14.

2.14 Are the reports available in electronic format?

1. If the report for which a new HAGDMS Report record has been created is available in electronic (indexed PDF) format continue to Section 2.15.
2. If the report for which a new HAGDMS Report record has been created is only available in paper format, continue to Section 2.16.

2.15 Prepare electronic format copy of Report for upload to HAGDMS

1. From the Report Details page for the relevant Report record on HAGDMS, select the Export > Toolkit File menu option and save the resulting XML file to your local system.
2. If you do not already have the current version of the HA PDF Toolkit installed, select the Help > Downloads menu option from the HAGDMS main window and click the **Download** link corresponding to the HA PDF Toolkit in the **Software** section.

3. Install the HA PDF Toolkit and Follow the instructions in its user manual to create a report package file
4. Issue the Report package file to the Highways England administrative staff who will upload it to HAGDMS.
5. Once the upload is complete, continue to Section 2.17.

2.16 Scan the paper format copy of the Report

1. If a paper format copy of the report is available, provide a copy to the HE administration team for scanning. Then once the scanned file has been received, proceed to Section 2.15.

2.17 Attach the Report to the Project

1. The created Report can now be attached to the project. Follow the instructions under 'Method A' on the 'Linking data to a Project' page of the HAGDMS help manual to link the Report to the Project.
2. Continue to Section 2.9.

2.18 Project set up and validated in HAGDMS

1. The Project is now set up and validated in HAGDMS.
2. Continue to Section 3.

3 Completion and validation of feedback and as-built documentation

This section describes the completion and upload to HAGDMS of feedback and as-built information, including the Geotechnical Feedback Report and as-built drawings. It should be read in conjunction with Figure 2 in Appendix A.

3.1 Update HAGDMS Project Details

1. Provide relevant details for the updating of the Project Details page, accessed as described in Section 2.4, to the HAGDMS Support team at support@hagdms.com including the System Reference of the Project.

Full details should be available at this stage including the majority of those listed in Section 2.4 Step 1 including updated location details where appropriate.

2. The HAGDMS Support team will update the project details as instructed. These should be checked and any errors notified back to the HAGDMS Support team for correction if required.
3. Once the Project Details are correctly updated, continue to Section 3.2.

3.2 Complete Geotechnical Feedback Report (GFR) in accordance with HD22

1. Prepare a Geotechnical Feedback Report in accordance with the requirements of HD22 'Managing Geotechnical Risk'.
2. As described in Section 2.13, create a Report record corresponding to the Geotechnical Feedback Report on HAGDMS. Include the generated HAGDMS 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. From the Report Details page, select the **Certificate > Generate** option from the menu to download the Geotechnical Certificate for submission with the report to Highways England.
4. Issue the Geotechnical Feedback Report and Geotechnical Certificate to the Highways England Geotechnical Adviser for the Project.
5. The Highways England Geotechnical Adviser will review the Geotechnical Feedback Report and respond in accordance with HD22.
6. On receipt of a countersigned Geotechnical Certificate following the HD22 review process, continue to Section 3.3.

3.3 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.
2. Continue to Section 3.4.

3.4 Prepare drawing set for upload and submit to HAGDMS support

1. Geotechnical and drainage related drawing sets are prepared and submitted following the process in 'Appendix E – HADDMS Drawing Records Specification' of the Drainage Data Formats guidance. This can be downloaded from the 'HADDMS – Drainage Records Specification' section of the HAGDMS Downloads page, accessed from the Help > Downloads menu option from the HAGDMS main screen. All references to HADDMS and the drainage asset within the guidance are equally relevant to HAGDMS and the geotechnical asset.

The guidance should be read in conjunction with the 'Index Spreadsheet for Located & Georeferenced files', also available from the HAGDMS Downloads page. Key points are as follows:

- All relevant geotechnical drawing records are to be compiled, indexed, and submitted in the structure and format described in the specification.
- It is expected that all relevant as built drawings will be available in native electronic format and can be exported directly to PDF, so that scanning will not be required.
- Drawings are structured as a series of File Sets within a Drawing Set. It is anticipated that a single Drawing Set will be used for drawings related to a given scheme.
- A Drawing Set Index and File Set Index must be included with each Drawing Set and File Set respectively. These are to be generated using the template available and exported in .CSV format.
- The required index data for these indices is listed in the specification it is anticipated that:
 - The Drawing Set category will be "Geotechnics"
 - The Drawing Set Title will be the scheme title
 - The import action will be "new", unless drawings are submitted in batches at different stages of the scheme.
- Drawing Set references to be used for the scheme should be agreed with the Provider for the relevant Maintenance Area to ensure that they do not conflict with any other planned uploads to HADDMS
- Where Drawing Sets are being added using the "new" action, any Drawing Set with the same Drawing Set reference will be completely overwritten. It is therefore recommended that a search of HAGDMS is made for existing Drawing Sets, prior to assigning a Drawing Set reference:
 - Select the Search > Search Categories menu option from the HAGDMS main screen
 - Click the **Drawing Sets** link
 - Click the link to the **Drawing Sets** search
 - Select relevant details – for example Area, Road and Record Type and click the 'Run' button.
- It is recommended that georeferenced drawings are provided as described in Section E6 of the HADDMS Drawing Records Specification.

- In any event the corresponding area covered by each drawing is defined by a rectangle, denoted using minimum and maximum Ordnance Survey (OS) eastings and northings in the File Index, to define the south west and north east corners of the rectangle described in the drawing
- Georeferenced drawings must be georeferenced to OS Grid.
- If drawings cover more than one Maintenance Area or DBFO, data for each Area or DBFO must be submitted separately. Drawing Sets should be split between the Areas or DBFOs rather than a single Drawing Set being submitted twice. If there is only a small overlap between Areas (<10% of the number of drawings in the set), a single Drawing Set can be submitted associated with the Area or DBFO that most of the drawings relate to.

Submitted data must be submitted on DVD or USB external hard disk as appropriate and a single Drawing Set must not span multiple DVDs.

Submissions must be sent by Special Delivery or courier to the HAGDMS Support team at the address given in the specification.

2. The HAGDMS Support team will upload the drawing set to HAGDMS.
3. Continue to Section 3.5.

3.5 Upload any additional created AGS data to the Report

1. If any AGS data has been created not already linked with another relevant Report, upload the data as described in Section 2.11.
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 added to the new Report for which it has been produced.
3. Continue to Section 3.6.

3.6 Produce packaged report file for upload to HAGDMS

1. Produce and submit a packaged report file for the GFR using the HAGDMS PDF Toolkit as described in Section 2.15. Pass to the HE Admin team.
2. HE Admin team upload GFR to HAGDMS.
3. Continue to Section 3.8.

3.7 Upload signed Geotechnical Certificate

1. The signed Geotechnical Certificate prepared in Section 3.2 can now be uploaded to the HAGDMS Report record. From the Report Details page for the GFR on HAGDMS, select Certificate > Upload, and follow the instructions to upload the signed certificate.
2. Continue to Section 3.8

3.8 Link the uploaded Drawing Set(s) and GFR to the Project on HAGDMS

1. Once the drawing set(s) and GFR have been uploaded to HAGDMS, confirm that the uploaded files appear as expected. If not, inform the HAGDMS Support Team.

-
2. If the uploaded files are as expected, the GFR to the Project in accordance with Section 2.17.

Drawing sets can be attached to the project using 'Method B' on the 'Linking data to a project' page of the HAGDMS help manual.

-
-
3. Continue to Section 4.

4 Recording of residual hazard information

This section describes the process for communication of information regarding mitigated and residual ground related hazards encountered either during investigation or construction. It should be read in conjunction with Figure 3 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).

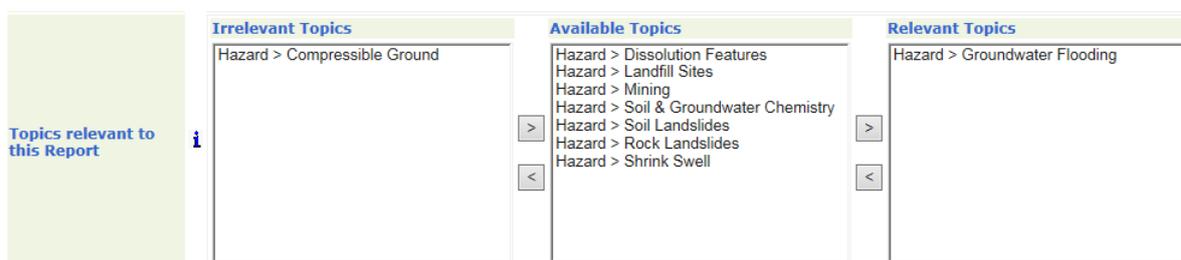
4.2 Ensure reports make clear reference to the hazards using standard terminology

1. The HAGDMS topic search functionality indexes reports based on the presence of a list of key words associated with particular topics. Of particular relevance in this case are the geotechnical Hazard topics, which currently include:
 - Compressible ground
 - Dissolution features
 - Groundwater flooding
 - Landfill sites
 - Mining (coal, non-coal and quarrying)
 - Soil & groundwater chemistry
 - Soil landslides
 - Rock landslides, and
 - Shrink swell
2. As required in HD22/08, 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.
3. Once HAGDMS records have been created for the relevant Reports as described in Section 3, continue to Section 4.3.

4.3 Select applicable hazard related topics

In connection with the topic search as described in Section 4.2 above, individual topics can be indicated as being relevant to Report records. Whilst this does not currently affect the order of results in the topic search the assessed relevance or otherwise to the selected topic is indicated in the results. To associate a topic with a report:

1. From the HAGDMS main screen, enter 'RE:' and the relevant HAGDMS Report Number into the search box and click the Search button. This will take you straight to the Report Details page for the relevant report.
2. Select the Report > Edit menu option
3. Under the 'Topics relevant to this Report' section, select one or more available topics from the Available Topics list – you can use standard Windows multiple select functionality i.e. CTRL-click and SHIFT-click.
4. Click the right arrow button between the Available Topics and Relevant Topics list to move topics from one to the other. Similar functionality can be used to mark irrelevant topics or to move relevant or irrelevant topics back to available topics list.
5. Once the appropriate changes have been made, click the 'Save' button. Relevant topics should now be shown under 'Topics relevant to this Report' in the Report Details screen.



6. Continue to Section 4.4.

4.4 Have all hazards been addressed by the scheme?

1. An assessment should be carried 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 4.5.
3. If all hazards have been completely addressed by the scheme, continue to Section 4.6.

4.5 Recording residual hazards in GAD

1. Residual hazards in this context are known, confirmed hazards associated with the ground that have not been mitigated by a 'Special Geotechnical Measure' – 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, observations should be added to Earthwork records during the GAD update process detailed in Section 5. Residual hazards should be recorded as Class 2 observations in accordance with HD41/15 using the methodology described in the 'Adding an observation to an earthwork' page of the HAGDMS User Manual. A new inspection will be required to be created before adding Observations as described in the 'Adding a new inspection' page of the HAGDMS User Manual.

The observations should cover the length of the Strategic Road Network (SRN) affected by the hazard in question and would generally form an observation within the GAD earthwork. If the hazard affects a length of the SRN longer than a single earthwork, a separate observation must be entered per earthwork.

The Location Index used for the observation(s) should correspond with the definitions given in HD41/15 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, using the standard terminology listed in Section 4.2(1) should be included, particularly as observation descriptions are also searched by the topic search functionality. Any relevant characteristics should also be ticked in the GAD observation if available.

Appropriate Causal Hazards should be selected relevant to the hazard in question, as described in the ‘Adding an observation to an earthwork’ page of the HAGDMS 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 observations may be more appropriate. For each of the hazard topics previously discussed, Table 2 below gives suggested equivalent primary and possible secondary Causal Hazards. It is recommended that these are used for consistency.

Table 2 Hazard topics, suggested primary and secondary causal hazards

Hazard Topic	Primary Causal Hazard	Possible Secondary Causal Hazard
Compressible 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	
Soil landslides	Localised geological conditions	Weak founding strata
Rock landslides	Localised geological conditions	
Shrink swell	Localised geological conditions	

2. Once any residual hazards have been recorded in GAD, continue to Section 4.6.

4.6 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 HD41/15 should be assigned. The Location Index should relate to the most critical location where the mitigation has been made at that location.
2. Observations created as part of the handback process should be associated with the relevant Project in HAGDMS, created as described in Section 2, following the instructions under Method A on the “Linking data to a project” page of the HAGDMS manual.

3. Once relevant observations for addressed hazards have been entered in GAD, continue to Section 4.7.

4.7 Recording non-routine maintenance requirements

1. Any non-routine maintenance requirements associate 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 4.8.

4.8 Provide summary of relevant residual hazard information to HE Geotechnical Advisor

1. In order to ensure transmission of any residual hazards identified and maintenance requirements to the Provider for the Maintenance Area, highlight any relevant information that has been included in the GFR or on HAGDMS to the Provider such that relevant information any asset management requirements can be included in their Geotechnical Asset Management Plan (GeoAMP) as required by HD41/15. This could practically be achieved by production of a table referencing sections of the geotechnical reporting and Observations and Earthworks in GAD as appropriate. Information to be transmitted should be issued to the HE Geotechnical Advisor.
2. Continue to Section 4.9.

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

1. The HE Geotechnical Advisor should pass on the summary information on residual hazards to the Geotechnical Maintenance Liaison Engineer (GMLE) in the HE Area within which the scheme sits. Should a scheme span more than one Area, more than one GMLE may need to be passed this information.
2. Outwith this data handback process, the GMLE(s) should review the relevant hazard information provided to them by the HE Geotechnical Adviser, 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 HAGDMS 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 Figure 4 and Figure 5 in Appendix A.

5.1 GAD Overview

5.1.1 Determine and agree sources of Scheme Geotechnical Asset Information

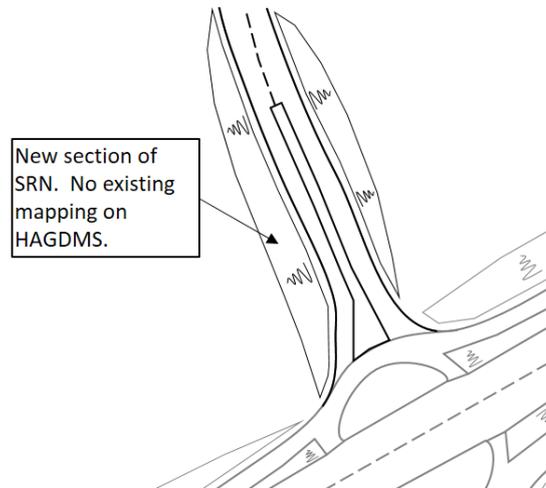
1. Access to earthworks following construction, particularly in the case of online schemes, for example Smart Motorways projects, can be difficult and carry a high level of health and safety risk. As-built construction records, which should be accurate and representative of the constructed assets, provide a useful source of asset data relating to earthwork and feature locations, planted vegetation, drainage provision, earthwork 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 earthwork is present. Where there is uncertainty regarding data quality, or where the earthwork 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.

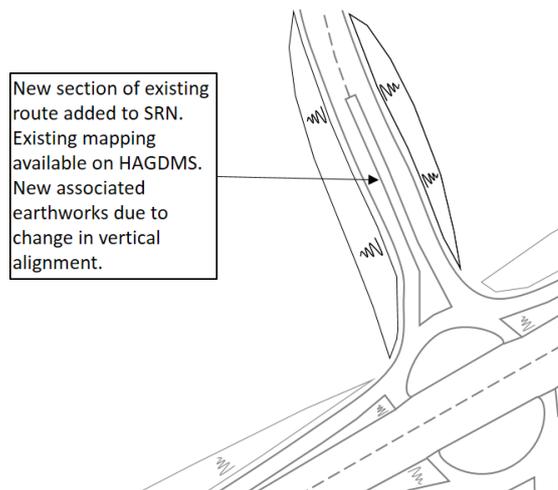
2. The source or sources of scheme geotechnical data to be used should be agreed with the HE Geotechnical Advisor.
3. Continue to Section 5.1.2.

5.1.2 Is HAGDMS mapping available for the area 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 HAGDMS 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 HAGDMS. For example, a vertical alignment may have been changed to accommodate changes at a junction, requiring new earthworks 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 5 in Appendix A , gives specific details of the different methods of entry. Three 'swim lanes' on Figure 5 (1,2 and 3) relate to variants of data entry where mapping on HAGDMS does, or does not exist.

Figure 5 gives the anticipated sources of information for geology, geometry, asset age, Special Geotechnical Measures, vegetation, drainage, and other observations.

4. The processes described in this Section refer to data entry using the online HAGDMS system. Whilst it may be possible in some cases to use PocketGAD, the PocketPC based inspection tool, it will generally not be suitable as it does not include functionality for splitting earthworks, inputting data when there is no road to snap to, or archiving earthworks.
5. If base mapping for the scheme is available on HAGDMS, continue to Section 5.2.

6. If the base mapping for the scheme is not available on HAGDMS, continue to Section 5.3.

5.2 Entry of Geotechnical Asset Data where mapping exists on HAGDMS

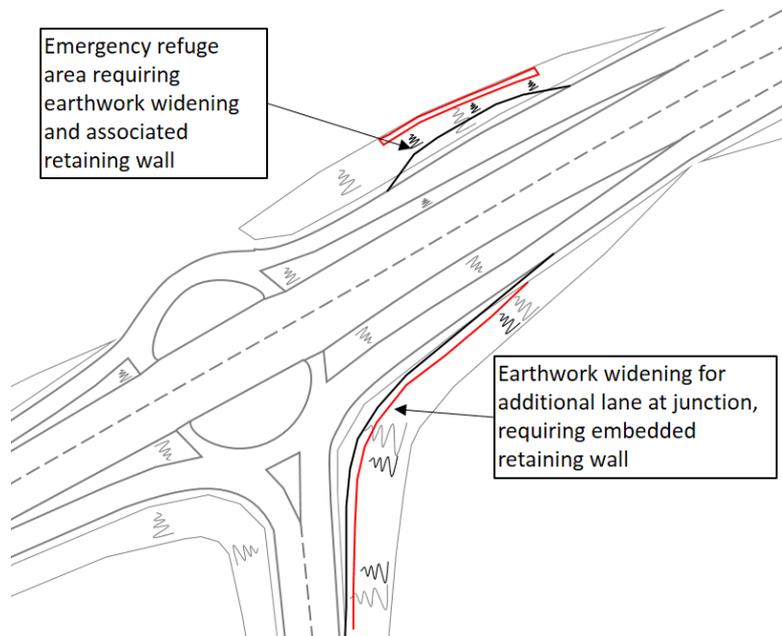
1. There are several different variants of how a scheme may modify Geotechnical Assets on the SRN, each of which requiring updates to the GAD in HAGDMS in different ways. Schemes may fit wholly into one of these variants, or may be a combination of one or more.

Figure 5 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 HAGDMS functionality for the entering of new earthwork and observation data. See the Geotechnical Asset Data (GAD) section of the HAGDMS manual and the individual pages of the manual describing the procedures for entering details of Inspections, Earthworks and Observations.

2. Continue to Section 5.2.1.

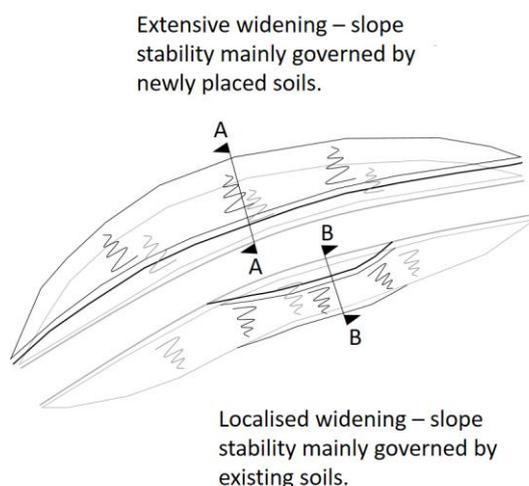
5.2.1 Determine and agree approach for GAD data entry

1. There are two general cases that will apply where mapping exists on HAGDMS, summarised as follows with indicative sketches of examples shown below:
 - Creation of new earthworks where either a new earthwork has been constructed or an earthwork has been substantially modified such that a new slope is formed (swim lane 2 in Figure 5).
 - Modifications to an existing earthwork where no significant changes to the exposed earthwork slopes have been made (swim lane 3 in Figure 5). For example:



2. Determining which variant applies (and hence which swim lane is relevant) requires consideration of the scheme details. The figure below shows examples where

extensive widening has been undertaken along the whole length of an earthwork (Section A-A) and localised widening has been undertaken on a short length of an earthwork (Section B-B). For the example shown in Section A-A, swim lane 2 of Figure 5 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 5 would apply; here the stability is mainly governed by the existing soils.



3. The approach to be adopted for data entry to HAGDMS should be agreed with the HE Geotechnical Adviser 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 Earthwork Records

In the case of the creation of new and replacement earthworks, standard functionality is used, as described in the HAGDMS 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 earthwork, these should be recorded as described for swim lane 3 below.

2. Swim lane 2 - Archiving existing earthworks and linking replacement earthworks

Where a significant change has been made to the full length of an earthwork or earthworks, 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 earthwork or earthworks should be archived and the new earthwork linked to it.

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

For each earthwork record to be replaced, follow the instructions for “Archiving an earthwork and its observations” in the HAGDMS User Manual. This will inform the user of what information will be archived, including associated observation data. The reason for archiving should generally be selected as “Significant re-construction” in this case. See below.

Reason for Archiving

Notes

I confirm that I wish to Archive the above data

---Select---

Created in error

De-trunked network

Significant re-construction

Other (enter detail in Comments box)

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

Create a new earthwork over the appropriate length as described for swim lane 2.

Follow the instructions for “Linking an earthwork to archived earthworks” in the HAGDMS User Manual to form links between the new and original earthworks. The earthwork linkage will be shown on both the new and archived earthworks in the “Associated Earthworks” section of the Earthwork Details page, see below.

Associated Earthworks			
Associated Earthwork	Reason for Association	Relationship to this Earthwork	Date of Association
55343	Archived earthwork replaced	Parent	21/06/2017

The archived earthwork will be designated as the “parent” earthwork and the new earthwork will be the “child”. The reason for the association will automatically be set to “Archived earthwork replaced”.

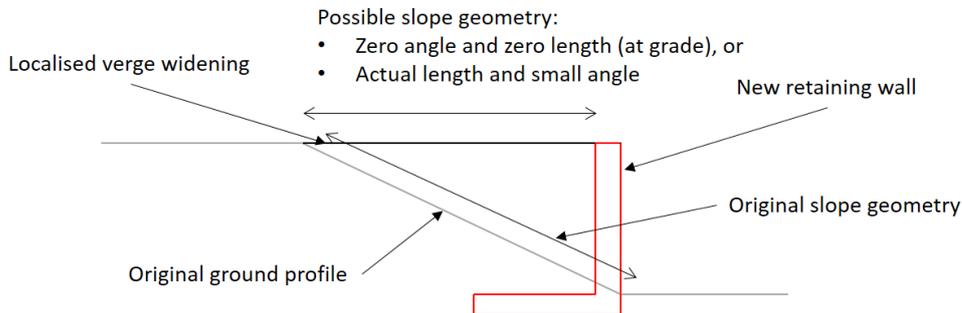
3. Swimlane 3 – localised modification of earthworks

Where a modification is made to an earthwork with an existing record in GAD over part of its length, the modification should be recorded as an observation associated with the earthwork. Such modifications will generally fall within the “Special Geotechnical Measures” group of ticked characteristics on the Observation Details screen, see below. Of note, an additional characteristic is available to be ticked indicating a defect associated with an SGM (not expected to be the case on a newly completed scheme). Also, a drop-down list allows the vertical extent of an SGM to be selected as either 25%, 50%, 75% or 100% of the earthwork height.

Highways England Task 594 defines a list of 72 types of SGM, each allocated a four-letter code, or quad code. A list of categories, sub-categories, and types of SGM including their quad codes is included in Table 3 in Appendix B. Information regarding SGM’s and other modifications should be recorded as follows:

- Record as an unclassified observation unless a defect is present affecting the full length of the SGM or modification. Where defects are present over part or all of the length of the modification, see the Section below. In general it is expected that defects in modifications will have been addressed during construction. The HE 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 observations 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 earthwork, leaving a level verge, this may result in a zero height point within a significant earthwork which under normal circumstances would form the end of the earthwork (as per the rules set out in HD41/15). This rule can be ignored in this instance, and a zero height within the earthworks 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 Provider for the relevant Maintenance Area, to ensure a consistent approach with how such features are recorded elsewhere in their Area.



- Select relevant characteristic(s) appropriate to the modification that has been made and in the case of characteristics within the “Special Geotechnical Measures” group, using the mapping between SGMs and the available tick boxes below, set out in the Table 3 in Appendix B. Additionally, select an appropriate vertical extent. If different measures from this group 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 regrade of the embankment slope over 75% of the slope height, two separate overlapping observations should be used. Vertical extents must be selected for all SGMs. See illustration below:

Special Geotechnical Measures	
<input type="checkbox"/> Geogrid	<input type="checkbox"/> Block Ret. Wall
<input type="checkbox"/> Steel Mesh	<input type="checkbox"/> Crib Wall
<input type="checkbox"/> Interlock. Blocks	<input type="checkbox"/> Granular Replacement
<input type="checkbox"/> GeoTextile	<input type="checkbox"/> Rock Fill
<input checked="" type="checkbox"/> Gabions	<input type="checkbox"/> Sheet Piles
<input type="checkbox"/> Rock Bolts	<input type="checkbox"/> Soil Nails
<input type="checkbox"/> Defect	<input type="checkbox"/> Regrade
<input type="checkbox"/> Concrete Ret. Wall	<input type="checkbox"/> Other
<input type="checkbox"/> Temporary Repair	Vertical Extent: 25 %

In the Description text box in the Observation Details, include a full description of the modifications made relevant to the characteristics ticked under that observation. Where the works comprise one of the SGM types listed in Table 3, include the associated quad code in the description. It is recommended that this is included in the following format to aid easy identification:

SGM Code: BTTR

Where the works combine more than one SGM, multiple SGM codes can be entered, as follows:

SGM Code: (SNAL)

SGM Code: (SNMS)

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 below on Non-Routine Maintenance Requirements for more details.

- On completion of data entry, the ‘QuASAR’ tool on HAGDMS should be run to ensure a high quality of data entry and to flag any errors. Please see the ‘QuASaR’ page of the HAGDMS user manual for instructions on how to run and use QuASaR.

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 HAGDMS

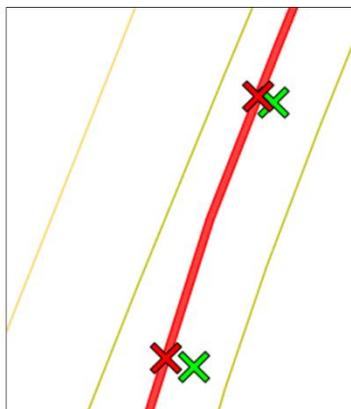
1. There are several different variants of how a scheme may modify Geotechnical Assets on the SRN, each of which requiring updates to the GAD in HAGDMS in different ways. Schemes may fit wholly into one of these variants, or may be a combination of one or more.

Figure 5 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 HAGDMS functionality for the entering of new earthwork and observation data. See the Geotechnical Asset Data (GAD) section of the HAGDMS manual and the individual pages of the manual describing the procedures for entering details of Inspections, Earthworks and Observations.

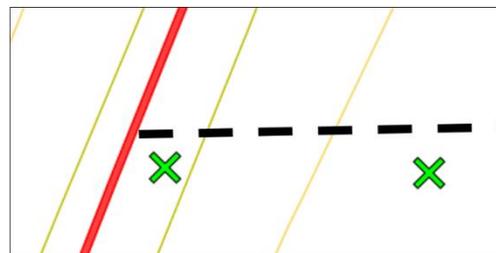
2. Continue to Section 5.3.1.

5.3.1 GAD data entry (swim lane 1)

1. Where mapping does not exist in the area of new earthworks, data entry requirements are similar to those for new earthworks in GAD (see the HAGDMS user manual). However, it will not be possible to snap earthwork and observation locations to the road alignment, see below.



Start and end locations snapped to existing road shown on mapping.

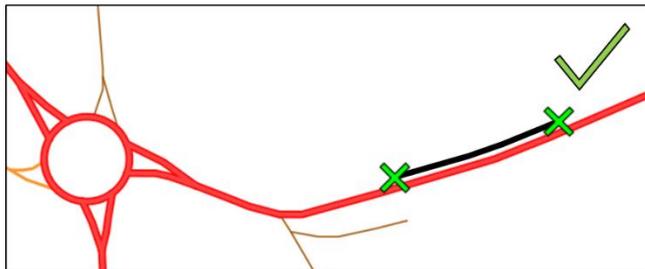
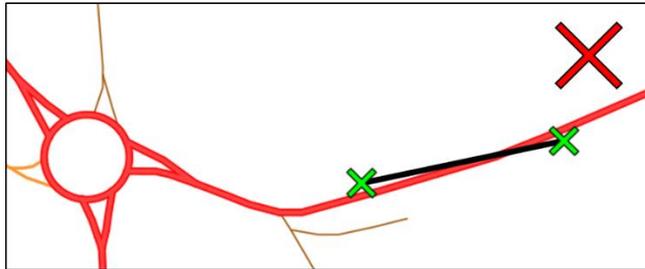


Start and end locations entered but not snapped to road due to it not being shown on HAGDMS mapping

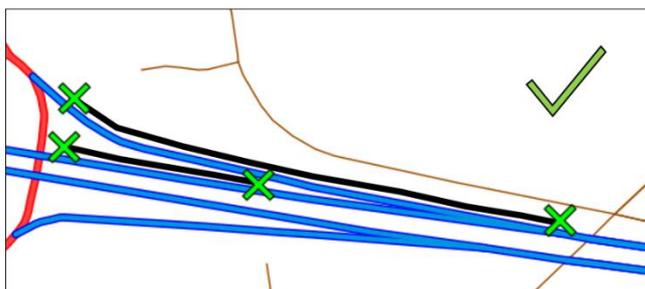
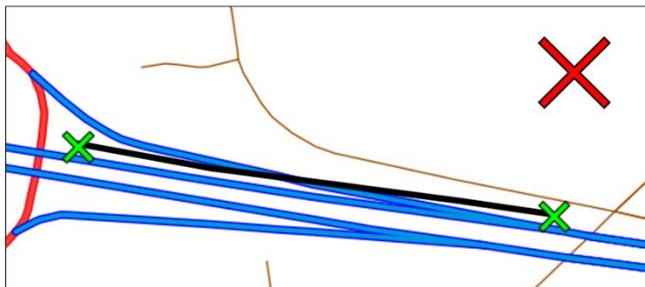
As such the relevant step in the 'Locating an earthwork' page of the HAGDMS User Manual should be omitted.

2. To ensure that the intended locations of earthworks and observations are correctly snapped eventually in HAGDMS it is important that they are unambiguous and obey the rules for locating earthworks in HAGDMS (such as earthworks cannot cross a side road). In addition to the guidance in the HAGDMS user manual and the requirements of HD41, when locating earthworks and observations:

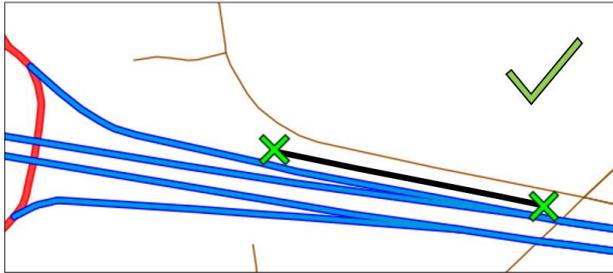
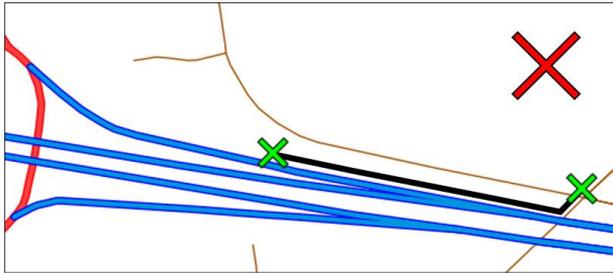
- Ensure start and end locations are on the correct and same side of the road:



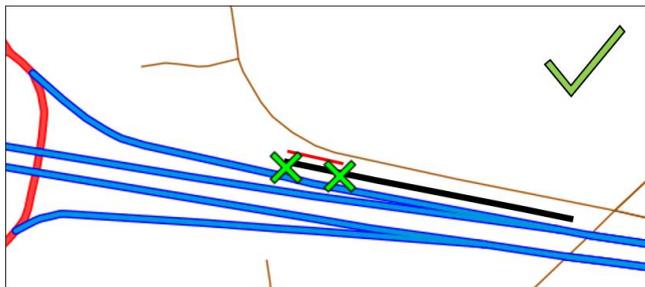
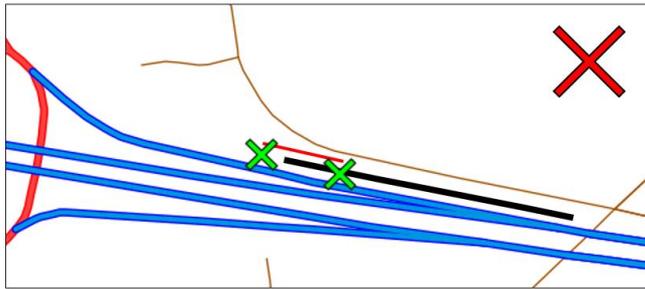
- Don't allow Earthworks to cross roads:



- 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 end point snapped to a local side road, rather than the intended main carriageway



- Make sure Observations are located within the extents of the relevant Earthwork

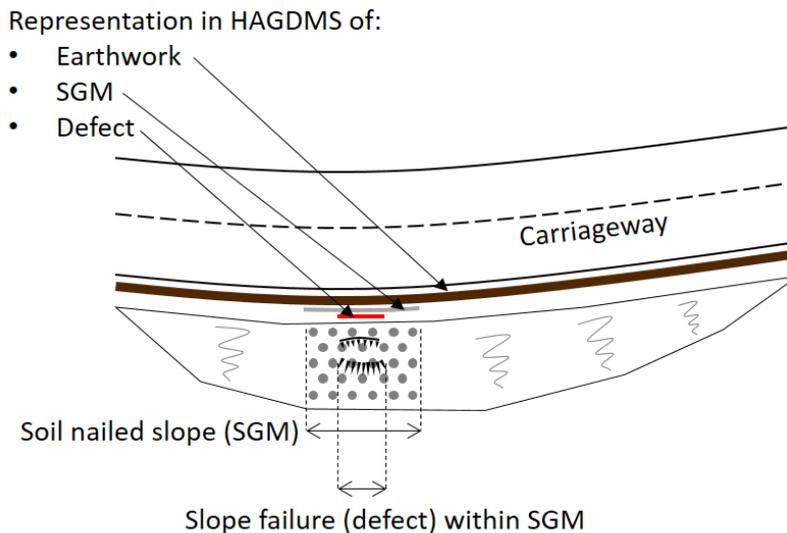


3. Non-snapped earthworks can be found using standard search functionality accessed from the **GAD > Search** menu option and the **Earthwork Search** link on the subsequent 'Search – GAD' screen. Similarly, non-snapped observations can be found using the **Observations Search** link from the same page. The results of these searches include Ordnance Survey Eastings and Northings for the starts and ends of Earthworks and Observations as well as other summary data and these should be checked against the intended locations obtained through the methods described in Section 5.1.1. This is particularly important as snapping of the earthworks and observations to the mapping once available may be carried out by a third party without knowledge of the scheme. This is expected to be the HAGDMS support team following a data refresh.

4. On completion of data entry, the 'QuASAR' tool on HAGDMS should be run to ensure a high quality of data entry and to flag any errors. Please see the 'QuASaR' page of the HAGDMS user manual for 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 Special Geotechnical Measures

1. Where a defect remains following construction, associated with a modification ticked under the Special Geotechnical Measures group on the Observation Details page, this should be indicated as listed below. Depending on the extent of the defect within the "Special Geotechnical Measure", the defect information can either be included with the full length of the "Special Geotechnical Measure" or as a separate observation within the extents of the SGM observation – see below:



2. In both cases the same information is required in the defect observation.
 - Ticking the characteristic representing the "Special Geotechnical Measure" and appropriate relevant details, particularly including quad codes relevant to the SGM type where appropriate
 - Ticking the 'Defect' characteristic in the "Special Geotechnical Measures" group
 - Including any remaining relevant information regarding the defect itself, such as appropriate ticked characteristics, description, class, location index, photographs, causal hazards, and defect triggers.
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 HE Geotechnical Advisor.
4. Continue to Section 5.5.

5.5 Recording non-routine maintenance requirements

1. Recent additions to GAD functionality allow non-routine maintenance requirements to be assigned to observations within GAD. These are entered into the relevant section of the Observation Details page as shown below:

Non Routine Maintenance Requirements	
Requirement	Monitoring (with installations) ▼
Details	2 inclinometers installed to monitor retaining wall deflections. To be read and interpreted. Details provided as an attachment to this observation.
Frequency	Every 6 ▼ Months ▼
	<input checked="" type="checkbox"/> To be confirmed

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 as this will require the receiving GMLE approving the data to review the requirement before approval. Attachments should be included with the observation where relevant providing further detail, for example the locations of instruments, required equipment and initial readings.
3. Continue to Section 5.6

5.6 Summary of modified GAD data

1. To ensure that the scope of earthwork and observation snapping required 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 Earthwork and Observation details associated with the scheme. The data for these tables can be generated by use of the **Earthwork Search** and **Observations Search** functions available on HAGDMS. These tables should include the following:

Earthworks

- Earthwork Number
- Area/DBFO
- Road
- Principal Inspection Form reference if relevant
- Earthwork Type (Embankment / Cutting / Bund Front / Bund Back / At Grade)
- *In situ* Geology
- Embankment Geology
- Year of Construction
- Earthwork Length (m)
- Number of associated observations
- Presence or otherwise of ground anchors
- Presence or otherwise of rock slopes
- Start OS Easting

- Start OS Northing
- End OS Easting
- End OS Northing

Observations

- Observation ID
- Associated Earthwork Number
- Area/DBFO
- Road
- Class Now
- Location Index Now
- Class 5 Year
- Location Index 5 Year
- HD41 Feature Grade (Maximum of Initial and Subsequent Feature Grade)
- Observation Length (m)
- Start OS Easting
- Start OS Northing
- End OS Easting
- End OS Northing
- Description
- Non-Routine Maintenance Requirements

2. On completion, this information should be passed to the HE Geotechnical Advisor for the scheme and the HAGDMS Support team (to inform the 'snapping' of GAD data to the SRN when the road based mapping has been added to HAGDMS). 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 HAGDMS Support Team.
3. The HE Geotechnical Advisor will pass the information to the relevant Provider GMLE.
4. Continue to Section 5.7.

5.7 Validation and approval of data on HAGDMS

1. For schemes where no mapping is available currently on HAGDMS (swim lane 1), the data will sit in HAGDMS, though not on the map, until the HAGDMS 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 HAGDMS 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 HAGDMS on the entered data.

The checks can be limited to a specific Area and Road, and to Preliminary data. Where earthworks and observations have been snapped to the mapping, and are visible on the HAGDMS mapping screen, they can be selected prior to running QuASaR to limit checks to those earthworks and observations.

Where data has been entered but not snapped to the mapping (swim lane 1), QuASaR can only be run for the entire Area and the road to which the GAD data has been assigned. In this case, any errors flags will have to be checked to ensure that they relate to earthworks that have been entered as part of this data handback exercise.

4. This final approval completes the process for GAD modifications to reflect the as-built situation.

Appendices

A.	Process Diagrams	33
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A. Process Diagrams

Figure 1 Set up and validation of a project in HAGDMS

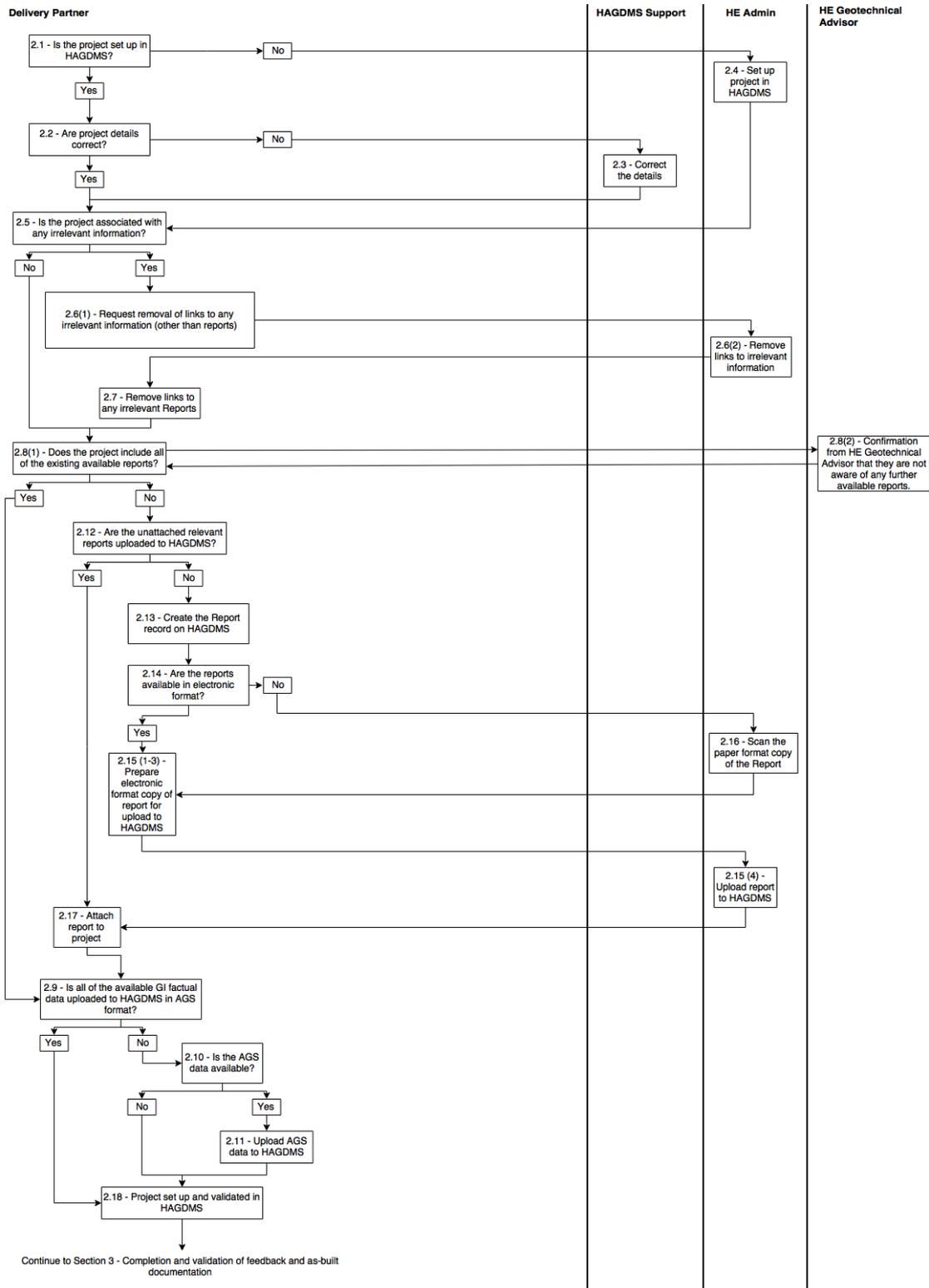


Figure 2 Completion and validation of as-built documentation

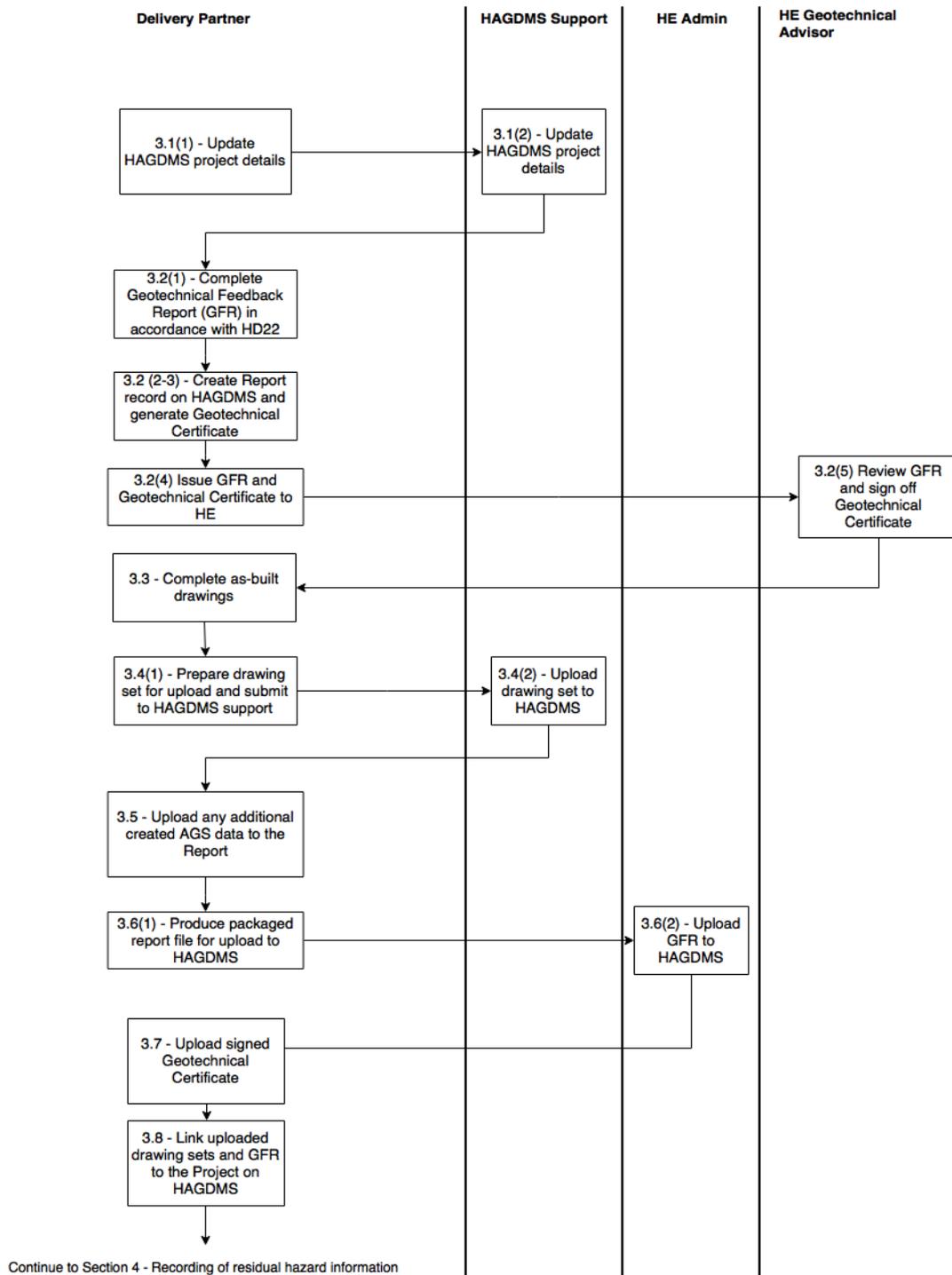


Figure 3 Recording of residual hazard information

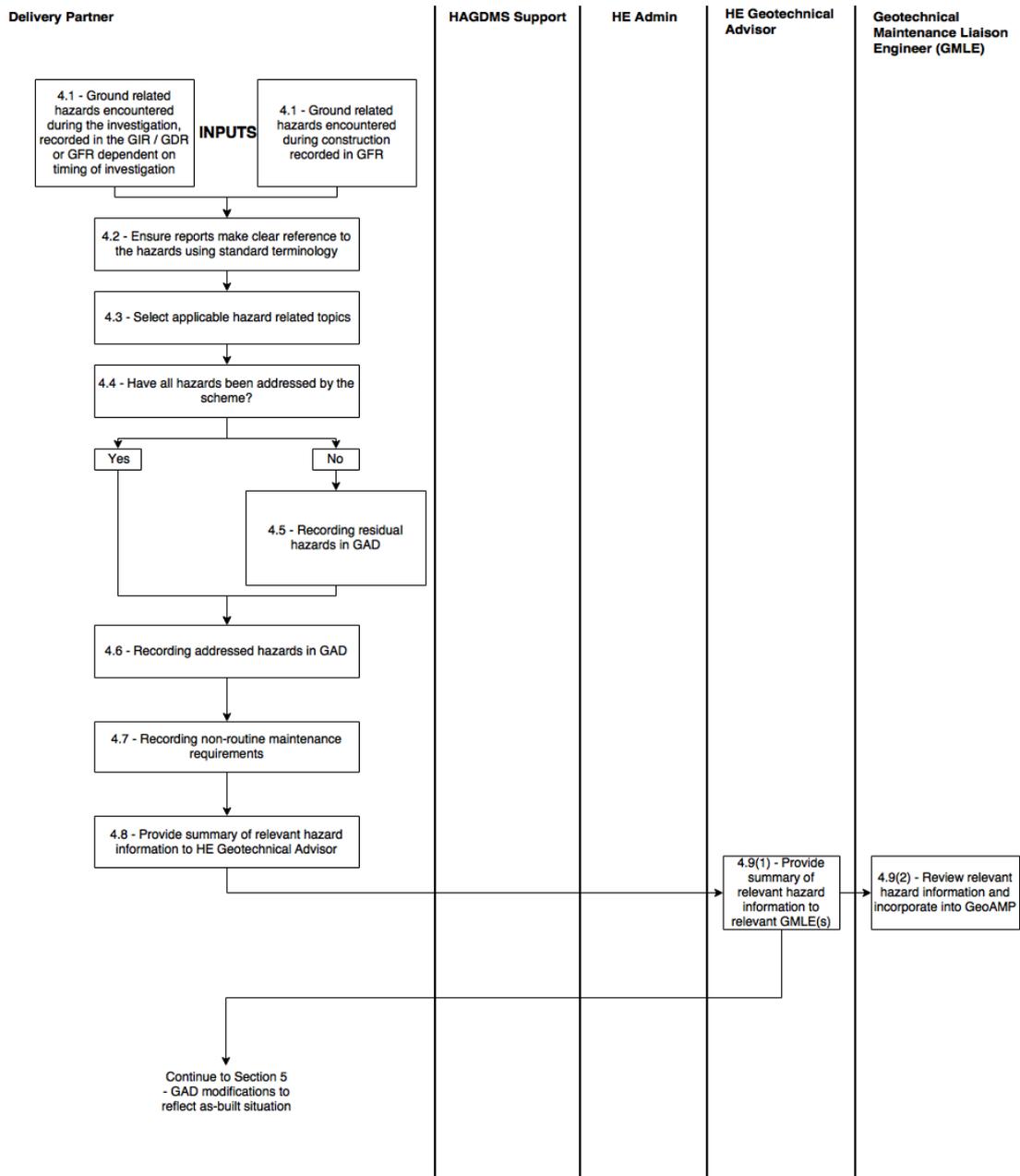


Figure 4 Overview of GAD modifications to reflect as-built situation

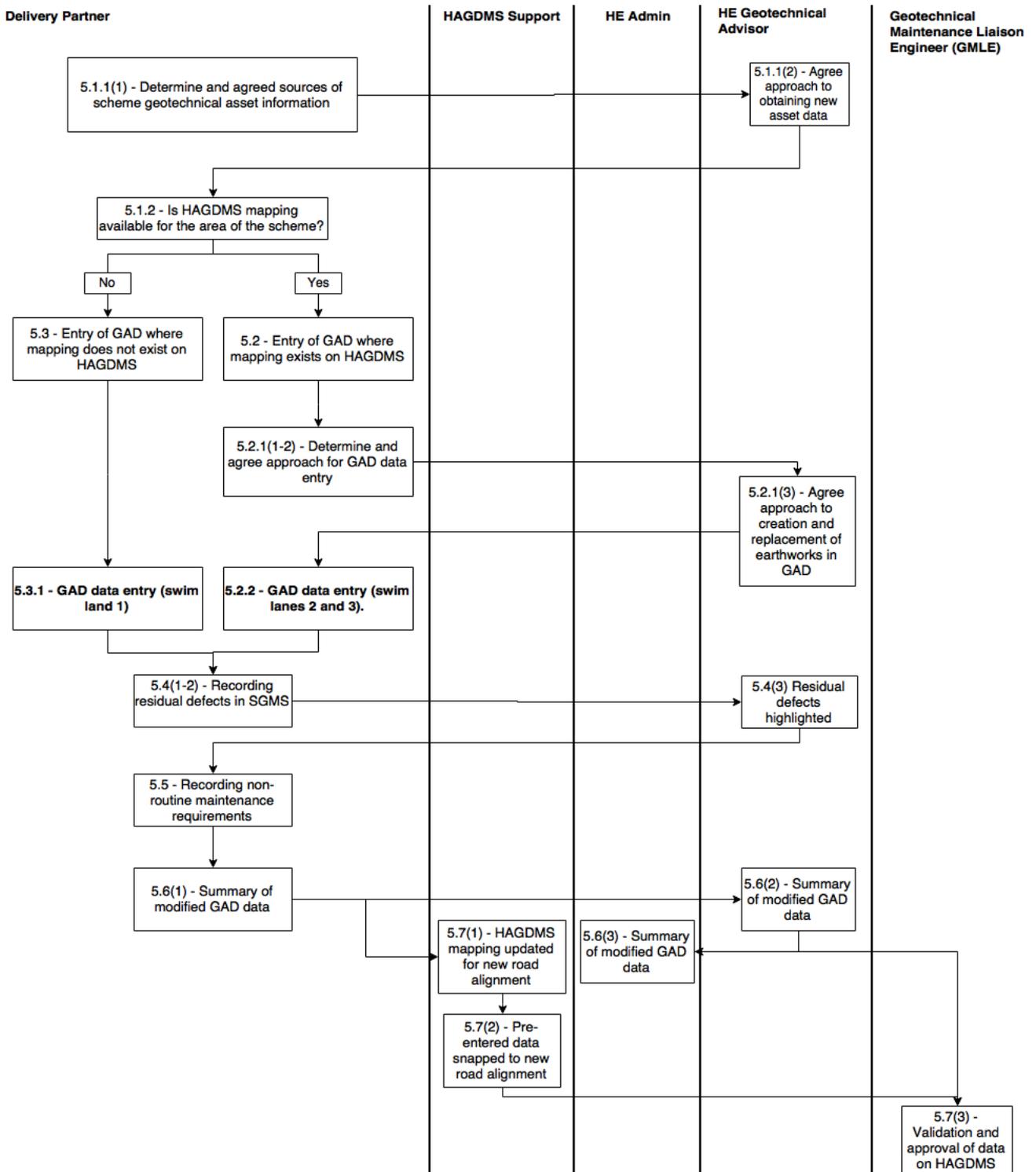
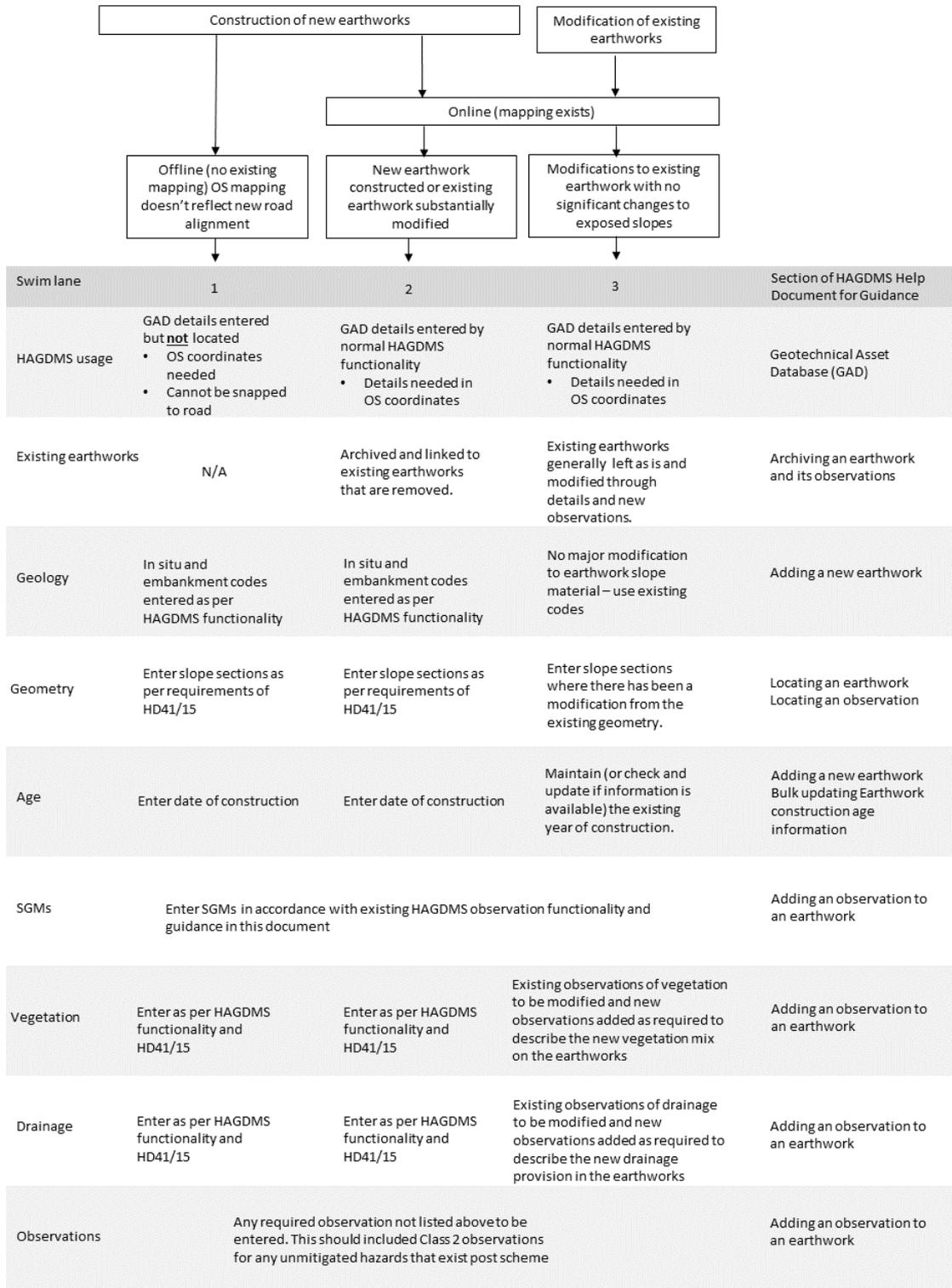


Figure 5 Detail of GAD modifications to reflect as-built situation



B. Special Geotechnical Measure Types

Table 3: Special Geotechnical Measures (SGM) Types and Quad Codes

SGM Category	SGM Sub-Category	SGM Type & Quad Code	HAGDMS Observation tick box to select (in SGM section)	
Drainage	Drainage	Basal Drainage (BSDR)	Other (not supported by drainage observations)	
		Counterfort Drain (CFDR)	Record a drainage observation	
		Crest Drain (CSDR)	Record a drainage observation	
		Cut off Drain (CODR)	Record a drainage observation	
		Filter Drain (FILT)	Record a drainage observation	
		Fin Drain (FIND)	Record a drainage observation	
		Frost Blanket (FRBL)	Other (not supported by drainage observations)	
		Herringbone Drainage (HBDR)	Record a drainage observation	
		Horizontal Drains (HRZD)	Other (not supported by drainage observations)	
		Internal Drainage (INTD)	Other (not supported by drainage observations)	
		Rock Ribs (RIBS)	Other (not supported by drainage observations)	
		Sealed Drainage (SEAL)	Other (not supported by drainage observations)	
		Slope Drain (SLDR)	Record a drainage observation	
		Soakaway (SOAK)	Other (not supported by drainage observations)	
		Syphon Well (SYWL)	Other (not supported by drainage observations)	
Toe Drain (TODR)	Record a drainage observation			
Earthworks	Ground Improvement	Band Drains (BNDR)	Other	
		Concrete Columns (CONL)	Other	
		Dynamic Compaction (DYMC)	Other	
		Grout Injection (GROT)	Other	
		Lime Slurry Injection (LMSL)	Other	
		Sand Wicks / Drains (SDWK)	Other	
		Stone Columns (STCL)	Other	
		Surcharging / Pre-loading (SRCH)	Other	
		Vertical Drains (VERT)	Other	
		Material Modification (Soil Mixing)	Cement Stabilisation (CEMM)	Other
			Fibre Reinforcement (FBRN)	Other
			Lime Piles (LMPL)	Other
			Lime Stabilisation (LMST)	Other
			Lightweight Fill (LGHT)	Other
		Material Replacement	Rock Fill (ROCF)	Rock Fill
Tyre Bales (TYRB)	Other			

SGM Category	SGM Sub-Category	SGM Type & Quad Code	HAGDMS Observation tick box to select (in SGM section)	
Earthworks	Non- Specific Earthworks Intervention	Non-Specific Anchor (NANC)	Other	
		Regrade (REGD)	Regrade	
	Reprofiling	Toe Berm (TOBR)	Other	
		Buttress (BTTR)	Other	
		Concrete Facing (CONF)	Other	
		Dentition (DNNT)	Other	
		Rock Bolts (ROCB)	Rock Bolts	
		Rock Catch Fence (DBFN)	Other	
		Rock Netting / Mesh (SMEH)	Steel Mesh	
		Rock Trap / Catch Ditch (DITC)	Other	
		Rockfall Shelter (ROCS)	Other	
		Scaling (SCAL)	Other	
		Shotcrete (SHOT)	Other	
		Rock Cut Management	Cobbled Facing (COBB)	Other
			Concrete Cladding (CLAD)	Other
			Concrete Rubble Facing (CNRF)	Other
	Erosion Mat (ERSN)		Other	
	Slope Facing		Gabion Facing (GABF)	Gabions
			Masonry Facing (MSNF)	Other
		Rock Armour (ROCA)	Other	
		Rock Mattress (ROCM)	Other	
		Stone Pitching (PITC)	Other	
		Basal Layer (BASE)	Other	
	Special Foundation Measures	Concrete Slab (Non-mining) (RAFT)	Other	
		Geomembrane (GMEM)	GeoTextile	
		Ground Beam (GBEM)	Other	
		Raft (Mining) (MRAF)	Other	
		Shear Key (SRKY)	Other	
		Shear Trench (SRTR)	Other	
		Starter Layer (STLR)	Other	
		Electrokinetic (ELEC)	Other	
		Ground Anchor (GANC)	Other	
Lime Nails (LMNL)		Other		
Strengthened Earthwork		Metallic Reinforcement (MTLK)	Other	
		Natural Material Poles (POLE)	Other	
	Geotextile (GETX)	GeoTextile		
	Geogrid (GEGD)	Geogrid		

SGM Category	SGM Sub-Category	SGM Type & Quad Code	HAGDMS Observation tick box to select (in SGM section)
		Shear Dowel (SRDW)	Other
		Soil Nail Mesh (SNMS)	Steel Mesh
		Soil Nails (SNAL)	Soil Nails
		Anchored Sheet Pile Wall (ASHP)	Sheet Piles
		Anchored Bored Pile Wall (ABPW)	Other
		Anchor Pile (ANPL)	Other
		Concrete Driven Piles (CNPL)	Other
		Contiguous Bored Pile Wall (CBPW)	Other
		Dowel Piles (DOWP)	Other
		Inclined Piles (INCP)	Other
		King Post Wall (KPWL)	Other
	Piles	King Sheet Pile Wall (KSPW)	Sheet Piles
		Non-Specific Bored Pile Wall (NSBP)	Other
		Non-Specific Pile Wall (NSPW)	Other
		Micro Piles (MCRP)	Other
Structures		PVC Pile Wall (PVCS)	Sheet Piles
		Secant Bored Pile Wall (SCPW)	Other
		Sheet Pile Wall (SHPL)	Sheet Piles
		Spaced Bored Pile Wall (SBPW)	Other
		Helical Pile (HELI)	Other
		Block Wall (BLCW)	Block Ret. Wall
		Concrete Sandbag Wall (CNSB)	Other
		Crib Wall (CRIB)	Crib wall
		Gabion Wall (GABN)	Gabions
		Masonry Wall (BKRW)	Block Ret. Wall
	Retaining Walls	Non-Specific Retaining Wall (NSRW)	Other
		Mass Concrete Wall (CNCW)	Concrete Ret. Wall
		Stone Wall (STNW)	Other
		Tied Wall (TDWL)	Other
		Timber Boards (TIMB)	Other

Source: Atkins, 2017

