flint SI (AGS)

flint si (ags) carbon tool

Carbon reduction starts in the ground

The 2050 net zero carbon challenge requires new analytical tools to assess embodied carbon in engineering design. This starts with the first phase of a development, namely the site investigation. flint SI was developed by Dr Emma Hellawell through collaboration with Onyx Geo Consulting Ltd and the AGS. The tool assesses the embodied carbon used in site investigation activities. It currently includes three site investigation techniques, namely cable percussion boreholes, windowless boreholes and trial pit investigations. At present the embodied carbon is evaluated for the following:

- Transport of machinery to site
- Drilling/excavation onsite
- Transport of personnel to site
- Assets of the machinery (based upon site time).

Calculation

The embodied carbon is calculated as total carbon dioxide equivalent (tCO_2e) and includes carbon dioxide and other greenhouse gas emissions. For a process or product, this is typically calculated by multiplying the quantity of a material by a carbon factor for the process or production, i.e.

Embodied carbon (tCO_2e) = Material quantity (t) x carbon factor (tCO_2e/t)

For certain activities, e.g. transport of material, published carbon factors (DEFRA 2026) are used and in this case the value is multiplied by the distance travelled. It is assumed that all transport is a return journey from office to site, using vehicles owned by the business. This allows all visitors to site to be included, for example UXO engineers, ecologists or any other personnel that are in attendance but not directly related to the site investigation activities. It is appreciated that different options may be utilised for transport to the site based upon site location and personnel, however for this calculation the assumptions made are detailed in table 1.

Table 1: Transport assumptions.

Transport	Assumptions
Drilling Rig and personnel	Drilling rig is towed to site on day 1 and back again on final day. All other journeys are from depot to site using a business owned 4x4.
Windowless rig and personnel	Windowless rig is towed to and from site each day using a business owned van.
Excavator and personnel	Excavator is driven to site each day. (For larger journeys this may not be appropriate.)
From office to site for engineers, geologists etc.	Transport is using a business owned, small van, which can be diesel or electric.

For site investigation works there are no published carbon factors for drilling a borehole and therefore this has been estimated based upon the typical diesel use for a drilling rig in soft,

medium and hard soil and the carbon factor for diesel. In this case, site-based experience and guidance from industry has informed the values used in the tool.

Assets are determined based upon the estimates for the mass of the machinery, mass of material, embodied carbon in that material and the working life of the machinery. The tool assumes a 10 year working life of the machinery and 220 annual working days.

The total number of working days is used to evaluate the transport of site personnel from the office to the site. Therefore, this value should be the total multiple of the number of vehicles used and number of site days.

Sources of data

The following references and databases were used within the tool:

DEFRA/ Department for Energy, Security and Net Zero (2026) UK Government GHG Conversion Factors for company reporting. Methodology Paper for Conversion factors. See https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2026

https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting