

# A Client's Guide To Site Investigation

## Introduction

## Why Carry Out a Site Investigation?

## What Comprises a Site Investigation?

The objective of this brief guide is to inform promoters of civil engineering and building projects of the importance of adequate site investigation for the successful completion of their project. It indicates what a site investigation is likely to comprise, the important role of the promoter, and the risk to the project of undertaking an inappropriate or inadequate site investigation.



The design of a structure which is economical and safe to construct, is durable and has low maintenance costs, depends upon an adequate understanding of the nature of the ground. This understanding comes from an appreciation of the distribution of the materials in the ground, and their properties and behaviour under various influences and constraints during the construction and lifetime of the structure. An adequate and properly structured site investigation is therefore an essential part of any civil engineering or building project.

The Institution of Civil Engineers has published a guide *Without Site Investigation Ground is a Hazard* (Ref 1, Vol 1) which is primarily for clients and their non-geotechnical advisors. The guide's purpose is to raise awareness of ground problems and highlight the consequences of inadequate site investigation. The executive summary states:

Inadequate site investigation arises from the lack of awareness of the hazards associated with the ground, inadequate focus of finance, insufficient time and a lack of geotechnical (or geoenvironmental) expertise.

It is concluded that a site investigation should be undertaken for every site, since without a properly procured, supervised and interpreted site investigation, hazards which lie in the ground beneath the site cannot be known.

It should be noted that the terms site investigation and ground investigation have frequently been misused. A *site investigation* is the overall process of discovery of information, appraisal of data, assessment and reporting. A *ground investigation* is the more restrictive phase of specialist intrusive investigation on a site with the associated monitoring, testing and reporting.



The approach adopted for a particular site investigation, its extent and the techniques used will all depend upon the site-specific circumstances, and the experience and judgement of those involved. There is no single way to carry out an investigation, and inevitably different advisors will adopt different approaches for any particular project. However, it is usual for the site investigation to be a phased exercise:-

Phase 1 — Information gathering from available records such as maps and published documents, from studying aerial photographs, from site inspection, from utility company records and from interviews and contacts. An hypothesis about the site is developed, eg about the past and present land use, geology and the surface and groundwater environment.

Phase 2—A limited intrusive ground investigation to gain an initial appraisal of the site and its suitability for the proposed development. This may comprise boreholes, trial pits, penetration tests, laboratory tests and geophysical methods. A factual report is usually prepared by the ground investigation contractor, and typically the advisor would prepare a report setting out the conclusions and hypotheses, including the identification of problem areas that require additional investigation and consideration. The information obtained is used to design Phase 3.

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Phase 3 — The main or detailed intrusive ground investigation, which may itself be staged. This phase of the site investigation will seek to address or clarify particular technical requirements or problem areas and to provide adequate information for design and construction. Usually a factual report on the ground investigation is prepared, and the advisor would prepare an interpretative report, providing information on the soil properties, and giving design and construction guidance. If the advisor is also the designer then his report may be incorporated into the design report.

Phase 4 — Collection of information, and its appraisal, should continue during the construction works, to confirm or otherwise the assumed ground model.

These four phases might run consecutively, or could have long periods between them. Several different organisations might be involved. Phases 2 and 3 are often combined for smaller projects. Throughout the site investigation the information obtained must be continuously assessed by the advisor. Changes to the proposed investigation, or even the design and construction works themselves, might be needed in the light of unexpected findings.

## The Client's Role and Responsibilities



An effective site investigation depends on a clear specification of the project details by the promoter/client throughout the duration of the project. As the project progresses from feasibility study, through outline and then detailed design, and as the knowledge of the site improves, the project specification should be refined to accommodate the conditions found and the site constraints. It is now common practice to make available to all parties, including any contractors and subcontractors for the proposed

development, the results of all phases of the site investigation, including interpretation.

The promoter has statutory duties under the Construction (Design and Management) Regulations 1994. Details are given in the Health and Safety Executive's Information Sheet No 39 (available at [www.hse.gov.uk](http://www.hse.gov.uk)) and on an AGS Information Sheet, Ref 2.

The promoter is also responsible for the appointment of his own advisors. From the foregoing it is clear that the risk and uncertainty associated with the ground can be minimised by the appointment of an experienced and adequately resourced Geotechnical and/or Geoenvironmental Advisor (Ref 1, Vol 2, App 1) at an early stage in the project. The Advisor should be able to assist the promoter in the adoption of good practice, plan and supervise a site investigation taking into account the constraints of the project, and appraise the information obtained from each phase of the investigation. Even with unrestricted access and unlimited time and funds there will always remain some uncertainty and risk. However, what is certain is that insufficient, inadequate or inappropriate site investigation will greatly increase the uncertainty and the risks of incurring significant cost and or time overruns. In the worst case the unsuitability of the ground for the proposed development might only become evident after construction has started.

## References

1. ICE (1993) Site Investigation in Construction. Volume 1: Without Site Investigation Ground is a Hazard. Volume 2: Planning, Procurement and Quality Management. Site Investigation Steering Group. Thomas Telford, London.
2. AGS (2003) Client Obligations in Ground Investigation Contracts. AGS Information Sheet. AGS, Beckenham, Kent.