

Measurement of land for development and planning purposes  
RICS guidance note, 1st edition, Global

All images have been prepared by FAL Architects.

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## RICS professional standards and guidance

### RICS guidance notes

#### Definition and scope

RICS guidance notes set out good practice for RICS members and for firms that are regulated by RICS. An RICS guidance note is a professional or personal standard for the purposes of RICS Rules of Conduct.

Guidance notes constitute areas of professional, behavioural competence and/or good practice. RICS recognises that there may be exceptional circumstances in which it is appropriate for a member to depart from these provisions – in such situations RICS may require the member to justify their decisions and actions.

#### Application of these provisions in legal or disciplinary proceedings

In regulatory or disciplinary proceedings, RICS will take account of relevant guidance notes in deciding whether a member acted professionally, appropriately and with reasonable competence. It is also likely that during any legal proceedings a judge, adjudicator or equivalent will take RICS guidance notes into account.

RICS recognises that there may be legislative requirements or regional, national or international standards that take precedence over an RICS guidance note.

#### Document status defined

The following table shows the categories of RICS professional content and their definitions.

##### Publications status

Type of document	Definition
<i>RICS Rules of Conduct for Members and RICS Rules of Conduct for Firms</i>	These Rules set out the standards of professional conduct and practice expected of members and firms registered for regulation by RICS.
International standard	High-level standard developed in collaboration with other relevant bodies.
RICS professional statement (PS)	Mandatory requirements for RICS members and RICS regulated firms.
RICS guidance note (GN)	A document that provides users with recommendations or an approach for accepted good practice as followed by competent and conscientious practitioners.
RICS code of practice (CoP)	A document developed in collaboration with other professional bodies and stakeholders that will have the status of a professional statement or guidance note.

RICS jurisdiction guide (JG)	This provides relevant local market information associated with an RICS international standard or RICS professional statement. This will include local legislation, associations and professional bodies as well as any other useful information that will help a user understand the local requirements connected with the standard or statement. This is not guidance or best practice material, but rather information to support adoption and implementation of the standard or statement locally.
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## Glossary

Accuracy	In general, when survey accuracies are specified, they refer to vector errors and are defined statistically as root mean square errors (RMSE) or standard deviation. The RMSE or standard deviation for bivariate data is equivalent to 68 per cent of the normal distribution of random errors and is often used to express confidence in measurements. The standardised normal distribution table determines the ratio of RMSE to different confidence or measurement error intervals. A 90 per cent tolerance or confidence in a set of measurements is equal to 1.65 times the RMSE or standard deviation when a representative sample of points is tested. Thus, an RMSE 0.1m indicates that in a representative sample of 100 points, not less than 68 shall be correct to better than 0.1m, and not less than 90 points shall be correct to better than 0.165m. Any errors exceeding three times RMSE (outside of 99.7 per cent of confidence or tolerance in the normal distribution of errors), in this case 0.3m, may be regarded as gross errors or mistakes.
Alternative dispute resolution	A range of options for resolving disputes without going to court. Alternative dispute resolution (ADR) includes mediation adjudication, arbitration, conciliation and ombudsman schemes. The RICS Dispute Resolution Service (DRS) is the largest provider of alternative dispute resolution (ADR) services in the land, property and construction industries.
Cadastre	A record of areas and values of land and landholders.
Covenants	A contract arising by a deed. Covenants can be both permissive and restrictive. In terms of land, covenants tend to be mostly restrictive. A restrictive covenant is a promise by one person with another, for example, by a buyer of land with a seller, not to do certain things with the land, such as to build on it or use it as a shop or factory. It binds the land and not the buyer personally and therefore 'runs with the land'. This means that the covenant continues even when the buyer sells the land on to another person. Restrictive covenants also

	continue to have effect even if they were made many years ago and appear to be obsolete.
Determined boundaries	The <i>Land Registration Act 2002</i> provides for the recording of 'determined boundaries'. The aim is to record a boundary's position to a precision of +/- 10mm. The determined boundary should be mapped relative to surrounding 'hard' detail (anything made of brick, stone or concrete that is expected to endure) to a high level of accuracy that is certified by a chartered land surveyor. The intention is that another chartered land surveyor would be able to relocate the boundary. A determined boundary should be agreed between the neighbouring landowners before it is recorded. The only practical difference between a boundary agreement and a determined boundary is that the determined boundary is recorded on a plan whose accuracy has been certified by a chartered land surveyor.
Development	Development is the undertaking of new building or other operations in, on or under land, including any other changes in the use of that land.
Easement	<p>A right that benefits the land in that it 'eases' the use of the one land and constitutes a restriction on the use of the other 'serving' land. The three necessary parts of an easement are that:</p> <ul style="list-style-type: none"> <li>• it applies to land affected by it (servient tenement)</li> <li>• it is annexed to other land, which has the benefit (dominant tenement) and</li> <li>• it is a right, which in common sense and public policy is capable of forming the subject matter of an easement.</li> </ul> <p>Easements and covenants often run in parallel, but an easement is expressed as a right of the dominant tenement, whereas a covenant is generally expressed as an obligation on the servient tenement.</p>
Gross development value	The market value of a proposed development assessed on the special assumption that the development is complete and sold as at the date of valuation in the market conditions prevailing at that date.
Habitable rooms	Different jurisdictions may define habitable rooms differently. Typically habitable rooms provide the living accommodation of the dwelling. They include living room, dining room, study, home office, conservatory, bedroom etc. They exclude the bathroom, WC, utility room, store room and circulation space. A kitchen is not a habitable room unless it provides space for dining.
Land area	The legal boundary that defines the area of land over which the owner of an interest in land has control.
Land parcel	A collection of more than one legal property ownerships (land areas) that are physically related to one another.

Land Registry	A register of the ownership of land and property.
Net development area	The proportion of the site area upon which new buildings and ancillary space with a realisable financial value can be built, measured on a horizontal plane.
Planning purposes	Used to convey the context within which the land measurement is being carried out. Development of land is regulated in most countries and such regulation is usually conducted through a statutory planning system. Land is allocated for development through such planning systems and the amount of land necessary to accommodate future population needs is based on an understanding of the development capacity of particular areas of land. It is also brought forward thereafter as the location for development.
Plot ratio	The ratio of International Property Measurement Standard 1 (IPMS 1) (GEA) of a building or buildings to the site area.
Precision	In terms of survey measurement, precision relates to the degree to which repeated measurements show the same results.
Site area	The boundary of the site that is subject to an application for permission/permit for development.
Site coverage	The ratio of the area of the building footprint to site area at ground floor level expressed as a percentage of the site area. It is used for assessing openness and interplays with plot ratio in determining acceptable density.
Title plan	A large-scale location plan, usually drawn to a scale of 1:1250 for urban areas or 1:2500 for rural areas and 1:10 000 for mountain and moorland areas, showing the approximate position of the boundaries of the property, edged in red, in relation to the surrounding properties.
Unregistered land	Land that has not been registered with Land Registry. The owner of unregistered land will often have a bundle of deeds, which form a record of previous sales, mortgages and other dealings with the land. However, if the land is mortgaged, the lender normally holds the deeds as security for their loan. There is usually no public record of the information contained in the deeds.

## 1 Introduction

This guidance note (GN) provides advice on the measurement of land for development and planning purposes.

The advice and definitions within this GN reflect that, during the course of preparing a development proposal, particularly for larger projects, there will be a need for various RICS members to measure land and calculate areas for a variety of

purposes. In undertaking such measurements, it is important that the RICS member responsible obtains a clear instruction of the purpose for which the measurement is required and performs their role in a transparent and consistent manner, with regard to both this GN and any appropriate legal, regulatory or other authoritative requirements in the jurisdiction concerned.

### 1.1 Land measurement within national institutional frameworks

It is important to recognise that land measurement for development and planning purposes is carried out in different national contexts. Accordingly, there will be variations in established national land information systems that may impact on the way in which the land area is delineated and title is verified. In most countries, the legal registration of land title is carried out through a cadastral system. These record details of:

- ownership
- tenure
- precise location and demarcation
- dimensions
- area and
- the value of individual parcels of land.

Other forms of land information systems include 'land registries', which primarily record details of land title. The information recorded and protection provided through these systems will vary by jurisdiction.

Most countries will also operate some form of regulation or control of new development. This is usually administered through a planning system that functions with varying degrees of negotiation and prescription. However, in most instances, development proposals will need to be approved by such a planning system before development can commence.

There are elements that are common to most planning systems. It is typical that the development process will start with an initial assessment of the development potential of the land, progressing to an application for planning permission/development permit or similar approval on a defined site area and finally obtaining a specific approval enabling a net development area for a particular scheme to be clearly identified (see chapter 5).

### 1.2 Focus

This GN is focused on the measurement of the surface area of land on a horizontal plane. It should therefore be read alongside *RICS property measurement* (2nd edition), RICS professional statement, which focuses on the measurement of floorspace within buildings. Together they provide a comprehensive approach to the measurement of land and buildings. The GN also supports and complies with the International Land Measurement Standards 2019.

This GN defines, clarifies and expands upon terms commonly used in practice. In doing so, it enables consistent approaches to calculation. This not only enables standardisation but also helps inform assessments of the amount of development that may be accommodated on any given site.

The advice contained within this GN is best practice for RICS members and others making or relying on land measurements while adhering to local jurisdictional legal requirements. The consistent application of this set of conventions is intended to ensure both commonality across fields of surveying (i.e. measurement, valuation, development, etc.) and conformity with objectives of the relevant planning or development regulatory system. As such, it provides a basis for land measurement for land acquisition, planning applications, development viability appraisal and the valuation of development land.

The guidance within this GN is intended to provide an objective approach to the measurement of the surface area of land during the development and planning process. It is intended to be a practical document, with all measurements assumed to be undertaken as accurately as possible in the context of the information available at any given point in the planning/development process together with any associated assumptions. Accordingly, it is envisaged that, in practice, measurements will become more refined as schemes evolve and more precise information becomes available.

This GN incorporates established terms such as plot ratio and site coverage as well as providing definitions for other widely used measurements of land area, site area and net development area. It does not however override any particular jurisdictional requirements where such terms are expressed differently. In terms of the latter measurements of land it is recognised that where sites are constrained or to be developed up to the site boundaries, as is often the case in urban areas, these areas may correlate closely or exactly. Conversely, for sites that are less constrained or to be less densely developed, as may be the case for larger and more 'strategic' sites, there will be clearer distinctions. This reflects the nature and context of the sites being measured.

### 1.3 Scope

The way in which this guidance is applied will be dependent upon the nature of each property sector, in addition to the national and regulatory context in which the measurement is being carried out. RICS acts globally to promote and enforce the highest international standards in the valuation, management and development of land, real estate, construction and infrastructure.

Accordingly, this guidance has been prepared recognising that planning and development regimes differ between nations and regions; some are prescriptive while others are more discretionary in the implementation of policy objectives. This guidance remedies a historic lack of consistency in the way that land is measured for development purposes. In setting out this advice, the intention is that these may then be applied across the surveying, planning, architectural, engineering and other built environment professions. This will allow sites and development proposals to be consistently compared and assessed.

This GN should be read in a cross-disciplinary context. It is not only a document that seeks to provide measures of land area of relevance to those involved at different stages of the development process, but also one which seeks to standardise terminology that may otherwise be applied differently across each allied discipline.

## 1.4 Unit of measurement

The unit of measurement to be adopted must comply with the local jurisdictional legal requirements and local market practice.

## 1.5 Core definitions

This guidance note contains five technical definitions as follows for application in all cases other than those in which there is a mandatory alternative jurisdictional requirement:

- land area (LA)
- site area (SA)
- net development area (NDA)
- site coverage (SC) and
- plot ratio (PR).

For the avoidance of doubt, in order to ensure that information is not misleading when marketing land for sale or letting, RICS members should use the land area definition contained in this GN to describe the legally demised area of land being marketed. This may relate to either a single parcel or a composite of several different land titles. Where the land area of a potential development site comprises land in several different titles this should be made explicit. In such instances the RICS member should make clear in reporting the land area of both the individual landholdings and of the composite.

See chapter 3 for in-depth definitions.

## 1.6 Effective date

This GN is effective three months from publication.

## 2 Key issues with development land measurement

### 2.1 Definitions

Colloquially, most land identified as being suitable for development has tended to be described as 'the site'. This is whether represented through a 'red line' enclosing land in sales particulars or a similar outlining of land area in an owner's land portfolio. This is potentially confusing as in some jurisdictions, for example the UK, the 'site area' may also have other legal or regulatory connotations. It is the area of land outlined in red (or some other colour) identified as the development site in a planning application or application for a development permit.

The legal area of the land intended to be developed may therefore be more or less than the 'site area' required for a planning application. For this reason, the legal land area is described in this guidance as land area (LA) and the land outlined in red for planning application/development regulation purposes is referred to in accordance with legal requirements as the site area (SA).

The third key area of measurement is net development area (NDA). From a regulatory planning perspective NDA may not seem so relevant since planning permission applies in most countries to the entirety of the SA. For this reason, all parts of the site granted planning permission are interdependent. NDA is nevertheless relevant to developers and valuers as it aligns most closely with the saleable/lettable floorspace to be delivered. It is the area of land to which a financial value can be attributed and which directly generates what is described in development appraisal terms as the gross development value (GDV). This is not to understate the importance of any land held with a site, or the extent to which infrastructure and public realm may contribute to the quality of a scheme, but is merely to recognise that in development terms the realisable financial value accrues to the land and buildings within the NDA.

It is recognised that certain sectors of the surveying/planning professions adopt different bases of measurement. For example, site coverage and plot ratio are commonly used by the global industrial and logistics sector as well as in planning systems that rely upon the zoning of land for development. While less widely used in other sectors or markets, they may still provide an indicator as to scale, bulk and intensity of use in other contexts.

Prescriptive planning regimes, particularly those that adopt a zoning approach to the identification of land for development, tend to have greater certainty about what is developable early in the process. In discretionary planning systems, certainty about what is developable tends to be determined much later in the process, following a period of negotiation and consultation. In instances where there is a degree of discretion, RICS members should advise their clients on the need for ongoing review of measurements; particularly those that impact on NDA, recognising the potential impact on land valuation.

In all instances, the consistent measurement of land for development purposes provides a useful tool for benchmarking where the relevant planning authority local authorities may be allocating land or developers may be assessing financial viability with development appraisals and for all parties seeking an accurate estimation of

value. The relevance is to give a measure of the efficiency of site usage or informing an understanding of development potential. All those in the development process or working with land that is to be considered for development purposes rely on the measurement of land to identify development potential and to assess compliance with policies and standards. This includes planners, architects, surveyors, engineers and other related professionals.

The accurate measurement of land is not, in any part, a measurement of development quality. It simply facilitates an accurate understanding of a development, proposed or otherwise, in relation to the area of land it occupies. A number of other indicators or measures related to development/planning density ratios are or may be derived from these land measurements. These also rely in part on measures already defined in *RICS property measurement* (2nd edition), RICS professional statement (most commonly GEA, GIA or NIA as appropriate).

## 2.2 Land and property boundaries

Uncertainties, disputes and mistakes in relation to boundaries and plans are common in the context of property development.

Most countries operate national systems of land registration. These typically record general boundaries that show the extent of the land holding in question including registered burdens. When a property is registered, this is generally accompanied by a plan. While these provide a useful indication of the extent of a title it should be noted that they are not always definitive and not all burdens may be shown in such registers.

A number of assumptions about the location of the boundary may apply and these will need to be conveyed to the developers or their lawyers. Likewise, common assumptions about boundaries may have no legal basis.

Some land and property may have clear boundary features on site. A boundary feature is any existing feature that separates one property from a neighbouring property, such as a fence, wall, ditch or hedge. There are no universal laws about who owns these, or which side of the boundary feature land owners are responsible for. In some cases, the width of a boundary marking, hedge or ditch may be significant, but the documentation is silent about whose land the marking, hedge or ditch occupies. Verification of boundaries will need to be conducted in accordance with local legal jurisdictional requirements.

In the case of development land, the exact location of the boundary line may be critical to the ability to carry out a development either for example through the need to satisfy accessibility and visibility standards on completion of the development or to provide access for heavy machinery during the course of construction. Likewise determining such matters as the boundaries of rights of way or the wayleave protection zones for underground services may not be readily apparent from documentary evidence.

The limitations of reliance on documentary evidence alone without site inspection or a topographical survey should be stressed. While it is not always possible to access

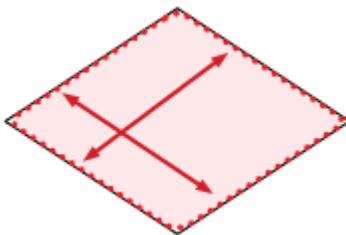
a development site at early stages of feasibility work, any calculations at this stage should make clear that they are based on desktop analysis only if this is the case. Any assumptions made by the surveyor at any stage of the measurement process should be clearly and explicitly expressed. A topographical survey plan will show the physical features of the land in detail and the boundaries of the site as they are on the ground. It is silent on legal title. If there is any doubt about the validity or conclusiveness of legal documentary evidence available it may be advisable to request legal clarification, particularly where there may be a material impact on the measurement. In certain circumstances it may be prudent to apply for a 'determined boundary agreement' – *Boundaries: procedures for boundary identification, demarcation and dispute resolution* (3rd Edition) RICS guidance note (applicable only in England and Wales) provides best practice advice on this.

### 3 Application of key measurement approaches

This section sets out in-depth definitions for the measurement of land. For the avoidance of doubt, while expressed differently, all measurements of land are those of surface area on a horizontal plane.

#### 3.1 Land area (LA) – in accordance with legal documentation and laws of the land

##### 3.1.1 Purpose



**Figure 1: Shows land area, as calculated within an ownership boundary**

##### Land area:

- defines the area of land over which the owner of an interest in land has control, subject to any other legal encumbrances (i.e. mortgage, easement, property tax lien)
- satisfies statutory obligations to consumers for property description
- in land transactions, is the area of land being acquired/disposed of and relied upon to assess the value of land
- in local planning terms, is typically a legal parcel of land being considered for the delivery of certain objectives and
- is used to define the land take for compulsory acquisition.

##### 3.1.2 Description and definition

The land area relates to the legal boundary. This is typically shown by the red line delineating the property on the title documents. Land area should be measured to this legal boundary in accordance with jurisdictional requirements and having regard to the legal documentation.

In circumstances where there may only be title deeds that do not delineate the land by reference to a map the surveyor should clearly reference the documentary evidence relied upon to establish the boundary delineation. Legal advice may be required in some instances, such as where the boundary is unclear.

### 3.1.3 Basis, method of measurement and level of accuracy

The acceptable basis, method of measurement and level of accuracy required for the measurement relates to the purpose for which the measurement is being used, for example:

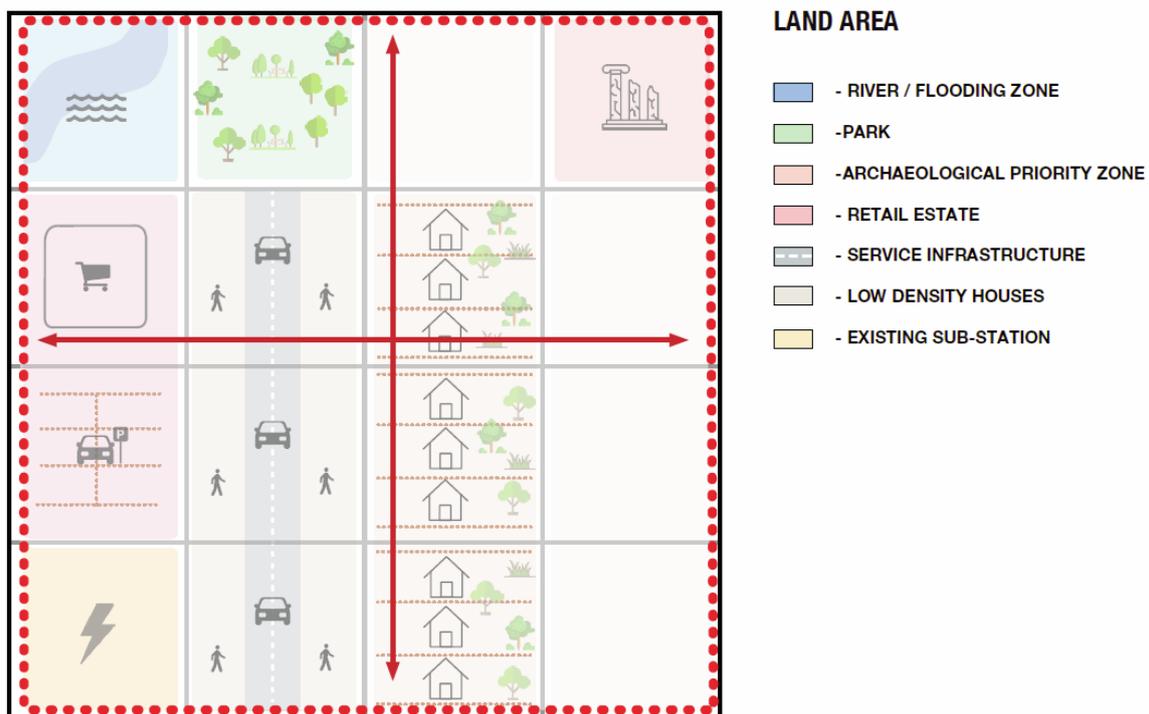
- a. paper (or electronic) based
- b. GIS based or
- c. measured survey.

The surveyor taking the measurement should report the basis on which the measurement was carried out, advise on the appropriateness of such basis and accuracy of measurement for the purpose for which it is or is likely to be used.

### 3.1.4 Inspection

The RICS member or registered firm should advise on whether a land registration inspection has been carried out. They should also advise on whether a site inspection has been carried out and the level of inspection conducted.

Where both inspections have been conducted any potential inconsistencies observed should be reported.



**Figure 2: Shows land area, as including all within the legal boundary**

### 3.1.5 Potential legal burdens impacting on the functional site area within the legal boundary

RICS members will need to be aware that within the delineated legal site boundary there may also be legal burdens on the title that will have a limiting effect on the

functional area and volume of space available for development. These burdens may include:

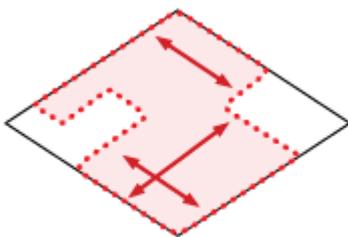
- a. wayleaves
- b. easements
- c. rights of way
- d. rights to light and
- e. mineral rights.

Burdens affecting land are typically revealed through legal searches but may also be observable or suspected from a site inspection. Other burdens may only be revealed much later and the RICS member should make this possibility clear.

RICS members should be aware of the risk of offering advice where they have not carried out a site inspection or have not had a report on title available and should caveat their advice accordingly.

### 3.2 Site area (SA) for planning purposes

#### 3.2.1 Purpose



**Figure 4: Shows the calculation of the site area, being the land under consideration for planning and development purposes**

Site area:

- describes the site that is subject to an application for permission/permit
- includes the main land under consideration for an application for permission/permit and forms the planning unit and
- defines the area of land within the site boundary that is the basis for calculation of site coverage, density and other metrics for assessing compliance with planning objectives and standards.

#### 3.2.2 Description and definition

The SA for planning application/permit purposes is defined by the red boundary line submitted on the planning application drawings.

The boundary for the SA is entirely at the discretion of the applicant for planning permission or a development permit. However, the SA should be measured to the planning application boundary and delineated by the use of a red line.

#### 3.2.3 Basis and method of measurement

The acceptable basis, method of measurement and level of accuracy relate to the purpose for which the measurement is being used, for example:

- a. paper (or electronic) based
- b. GIS based or

c. measured survey.

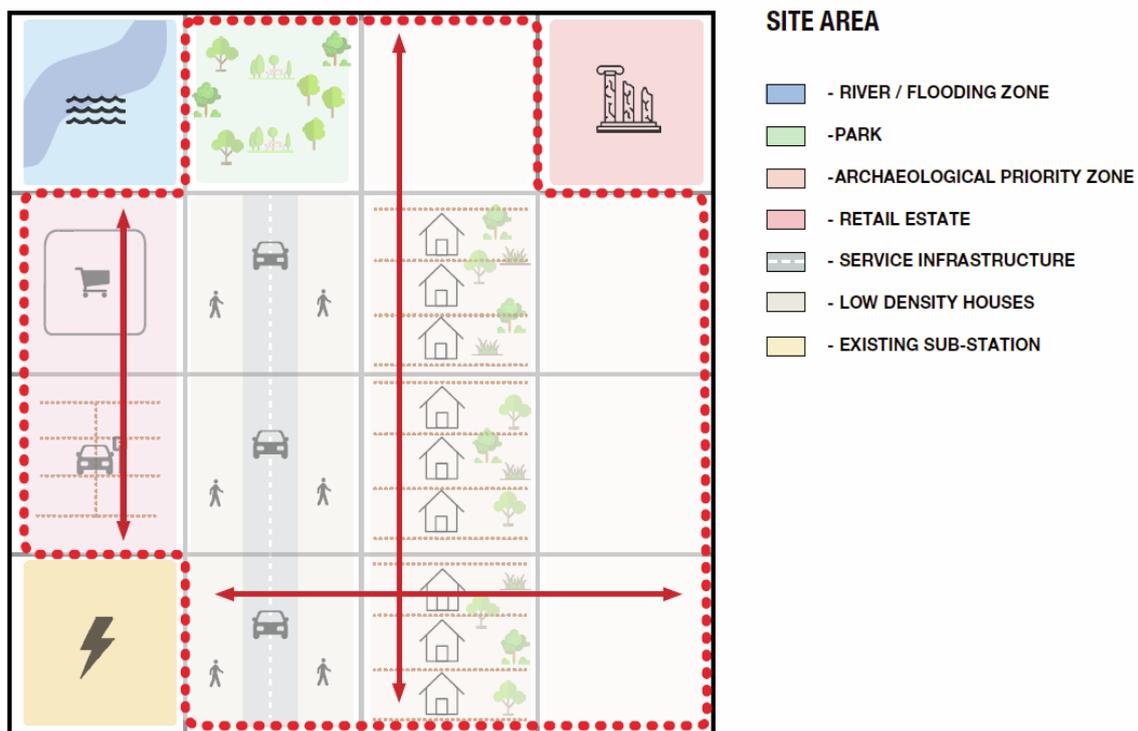
### 3.2.4 Reporting measurement information

The RICS member should report the basis on which the measurement was carried out, and advise on the appropriateness of such basis and accuracy of measurement for the purpose for which it is or is likely to be used.

They should report residential density in relation to the SA, as this is the area upon which 'development' in the broadest sense will occur. This reflects the fact that proposals can only be considered acceptable in their wider context (i.e. open space provision, access, etc.).

### 3.2.5 Inspection

The RICS member should advise on whether a site inspection has been carried out or advised and the level of inspection conducted. They should advise on whether a land registration inspection has been carried out and whether any inconsistencies have been observed on site.



**Figure 5: Shows the site area, which can include or exclude whatever is considered appropriate for the purposes of a planning permit/application proposal**

## 3.3 Net development area (NDA)

### 3.3.1 Purpose

Net development area:

- is that part of the development site to which financial value is directly attributable. This will normally be those elements that are capable of being sold or let and
- will influence the amount of floorspace that can be accommodated on any site and may also impact the density, height and massing of a proposed scheme.

### 3.3.2 Description and definition

NDA is the proportion of the SA upon which new buildings and ancillary space capable of realising financial value can be built.

At the outset of the development this area can usually only be estimated. As project planning and design evolve, particularly on large greenfield or regeneration sites, NDA becomes more certain.

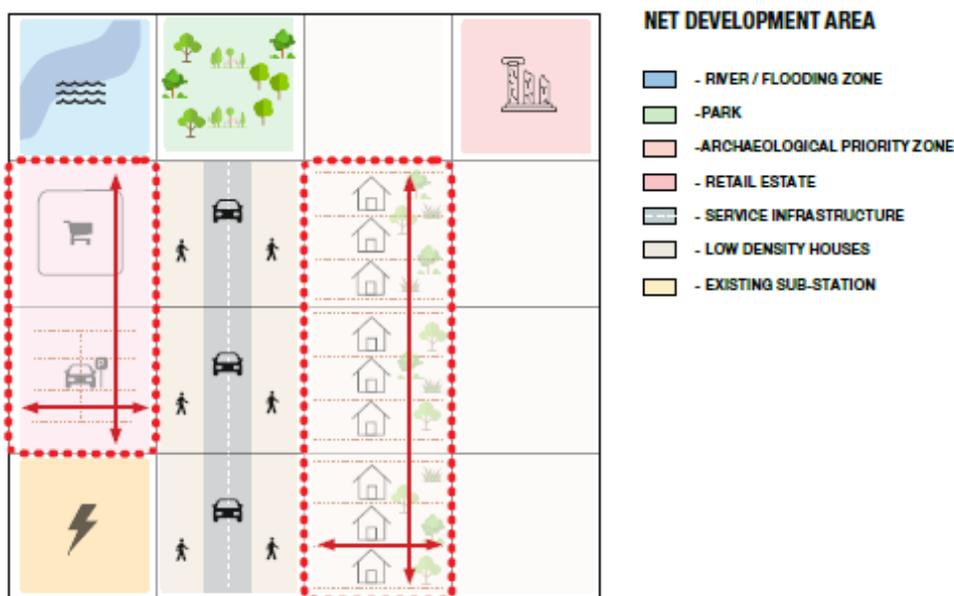
The extent to which NDA correlates to other measurements will vary. On dense urban sites where there may be 100 per cent coverage NDA will coincide with SA for planning purposes and LA in accordance with the legal boundary.

In determining NDA the stage at which this measurement is being undertaken and the assumptions underlying the delineation of NDA should be stated alongside the measurement.

The RICS member should be aware of the extent to which planning policies and other standards may impact upon the NDA of a given site. This could include, for example:

- density requirements
- sustainable urban drainage systems (SUDS)
- functional flood plains and
- title restrictions.

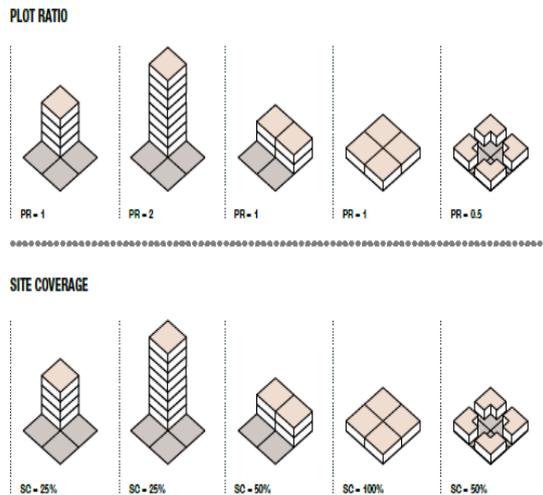
Further clarification is provided in chapter 4.



**Figure 6: Shows the net development area, as defined by those elements to which calculable financial value can directly be attributed**

### 3.4 Plot ratio and site coverage

#### 3.4.1 Purpose



**Figure 7: Shows the calculation of plot ratio and site coverage**

Plot ratio is:

- used for measuring, assessing and controlling density. It is a measure of intensity of use and
- mainly used in commercial developments and high density mixed used developments including residential.

#### 3.4.2 Definition

A number of metrics and standards are used in the planning process globally to assess compliance with policy objectives. These relate to development density, site coverage, massing, openness, daylighting and sunlighting indicators among others. The main globally recognised planning measures are defined below together with their method of application:

- **Plot ratio:** plot ratio is the ratio of IPMS 1 (GEA) of a building or buildings to the SA.
- **Floor Area Ratio (FAR):** FAR is a similar measure to plot ratio for measuring, assessing and controlling density. It is the ratio of the IPMS 1 (GEA) of a building or buildings to the SA.
- **Site coverage:** Site coverage is the ratio of the area of the building footprint to SA at ground floor level expressed as a percentage of the SA. It is used for assessing openness and interplays with plot ratio in determining acceptable density.

The implementation of these development methods and standards has a significant impact in determining the NDA of the site. Details of these metrics and their application is provided in chapter 4.

## 4 Refinement of key measurement approaches

This chapter sets out the technical definitions alongside confirmation of those elements that are to be included and excluded as applicable.

### 4.1 Land area (LA)

LA is the total area of the site within the site title boundaries, measured on a horizontal plane.

Applications for LA include:

- measurement for planning applications and approvals
- measurement for the allocation and/or zoning of land for development and
- measurement for the financial appraisal and valuation of land.

### 4.2 Site area (SA)

SA is the area of a site in accordance with a planning application for which a specific scheme is proposed or determined, measured on a horizontal plane.

#### 4.2.1 Inclusions and exclusions

The principle of SA is to account for all elements of land that in some manner comprise part of the development, whether existing or proposed.

Applications for SA include:

- measurement for planning applications and approvals
- measurement for the allocation and/or zoning of land for development
- measurement for the financial appraisal and valuation of land and
- calculations of area for the purposes of assessing residential density globally.

### 4.3 Net development area (NDA)

NDA is the proportion of the SA upon which new buildings and ancillary space with a realisable financial value can be built, measured on a horizontal plane.

#### 4.3.1 Inclusions and exclusions

This includes:

- private residential gardens and ground floor amenity space
- private residential parking at ground floor level
- private commercial yard, storage and parking at ground floor and
- ancillary buildings and structures.

This excludes:

- public realm and open space (parks, verges, SUDS, etc.)
- undemised hardstanding (roads, pavements, etc.) and
- undemised terraces, steps and patios.

Whether to include or exclude the following will depend on where they are located on the site:

- infrastructure (roads, railways, etc.)
- utilities (sewers, pylons, etc.) may be essential to include if applicable and
- legal entitlements (wayleaves, easements, etc.) may be essential to include if applicable.

Applications for NDA include:

- measurement for planning applications and approvals
- measurement for the allocation and/or zoning of land for development and
- measurement for the financial appraisal and valuation of land.

#### 4.4 Site coverage (SC)

SC is the ratio of the area of building footprint(s) measured in accordance with IPMS 1 (GEA) to the SA at ground floor level.

##### 4.4.1 Inclusions and exclusions

This includes:

- lift rooms, plant rooms, fuel stores, tank rooms that are housed in a covered structure of a permanent nature
- outbuildings that share at least one wall with the main building
- loading bays
- garages, greenhouses, garden and fuel stores
- conservatories
- ancillary buildings and structures
- structural, raked or stepped floors (to be treated as a level floor measured horizontally)
- covered walkways and
- enclosed terraces and patios.

This excludes:

- overhanging elements including eaves, cornices and other roofline projections
- hardstanding including driveways, parking, roads, pavements, etc.
- unenclosed terraces, steps and patios
- open vehicle parking areas and
- gardens, landscaped areas, unenclosed terraces and patios.

Applications for SC includes:

- measurement for planning applications and approvals
- measurement for the allocation and/or zoning of land for development and
- measurement for the financial appraisal and valuation of land.

#### 4.5 Plot ratio (PR)

PR is the ratio of the IPMS 1 measurement (GEA) of a building(s) at each floor level to the SA.

##### 4.5.1 Inclusions and exclusions

This includes:

- lift rooms, plant rooms, fuel stores, tank rooms that are housed in a covered structure of a permanent nature
- outbuildings that share at least one wall with the main building
- loading bays
- garages, greenhouses, garden and fuel stores
- conservatories
- ancillary buildings and structures

- internal structural, raked or stepped floors (to be treated as a level floor measured horizontally)
- internal balconies and mezzanine floors
- covered walkways and
- enclosed terraces and patios.

This excludes:

- overhanging elements including eaves, cornices and other roofline projections
- hardstanding including driveways, parking, roads, pavements, etc.
- unenclosed terraces, steps and patios
- open vehicle parking areas
- external structural, raked or stepped floors (to be treated as a level floor measured horizontally) and
- gardens, landscaped areas, unenclosed terraces and patios.

Applications for PR include:

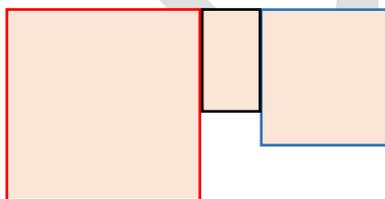
- measurement for planning applications and approvals
- measurement for the allocation and/or zoning of land for development and
- measurement for the financial appraisal and valuation of land.

## 5 Measurement ratios and other factors

This chapter sets out the approach to calculating and expressing each measurement of land. It also addresses in more detail the different ways in which planning standards and policies impact on NDA.

It should be stressed that while each measurement can be made throughout the development/planning process, subject to reasonable and clearly stated assumptions, this also implies that different measurements of land may be of more or less relevance to different stakeholders. For example, the LA will have particular significance in legal terms, the SA in planning terms and the NDA in valuation and viability terms. The relative importance of each measurement suggests that, in so far as is possible, it would be desirable for each to be available and up-to-date throughout the process.

### 5.1 The use of a 'blue line' – land owned additional to site area



**Figure 8: Shows the use of a 'blue line' to indicate other land within the control of the owner and in a different location but not within the land area, site area or net development area**

#### 5.1.1 Purpose

The blue line identifies land in the ownership of the applicant for a permission/permit other than the planning application site.

### 5.1.2 Description and definition

In many circumstances the LA will coincide directly with the SA, being that for which development is being considered. The SA will typically be identified as part of an application by use of a red line.

In some instances it will be useful to demonstrate how the SA relates to the LA for example to clarify any land that is located outside of the SA but within the LA. For this purpose and in some jurisdictions a local planning authority or equivalent body may require the applicant to identify the land that they control and do not control in proximity to the planning application site.

Land within the ownership or control of the applicant in reasonable proximity to the development site is typically delineated by a blue line.

Both red and blue lines can be shown together or used independently.

### 5.1.3 Basis and method of measurement

The acceptable basis, method of measurement and level of accuracy relate to the purpose for which the measurement is being used, for example:

- a. paper (or electronic) based
- b. electronic
- c. GIS based or
- d. measured survey.

### 5.1.4 Reporting measurement Information

The RICS member should report the basis on which the measurement was carried out, and advise on the appropriateness of such basis and accuracy of measurement for the purpose for which it is or is likely to be used.

### 5.1.5 Inspection

The RICS member should advise on whether a site inspection has been carried out or advised, and the level of inspection conducted. They should also advise on whether an inspection of the land title records has been carried out and whether any inconsistencies have been observed on site.

## 5.2 Residential density

In a rapidly urbanising world, residential density is becoming an increasingly important measure of the development potential of a site, particularly where large new residential developments are proposed.

In determining residential density, the area of land to which the measure of density applies will typically relate to the SA, as this is the area upon which development in the broadest sense will occur. Thus, a development can be clearly confirmed as accommodating a set number of units per acre or hectare.

This is a measure of density that includes all aspects of a neighbourhood, including the housing, roads, open spaces schools and their grounds and other uses. It is measured across the entire SA.

The calculation of residential density based on SA does not necessarily provide for a clear assessment of either the land parcel's specific constraints or the resulting compactness of development proposed. In these circumstances, calculation of residential density based on the NDA can also be used as a supplemental measurement to assess how concentrated a proposed development may be in the context of any particular site. Where the standard calculation is supplemented by one using NDA for additional context, this should be made clear and both measurements should consistently be reported alongside each other for clarity.

#### 5.2.1 Calculation of residential density

There are a number of different ways of calculating and expressing residential density with variations between jurisdictions as to the favoured measure or measures. Examples include:

- **Dwellings per hectare/acre:** refers to the number of dwelling units on a site but ignores their size.
- **Habitable rooms per hectare/acre:** refers to the number of habitable rooms within a scheme and gives an indication of approximately how many people would live within a scheme.
- **Bedspaces per hectare/acre:** refers to size of dwelling unit based on its bedspace capacity and gives an indication of approximately how many people would live within a scheme.

#### 5.3 Open space

Open space requirements will vary between dense central urban areas (e.g. Hong Kong) and lower density urban extensions (e.g. US). In large new residential developments, publicly accessible open space is one of the largest components of land to be planned for, reducing the amount of land area available for building. How this amount is to be determined and where it is to be located is dependent on local site conditions, the development vision for the scheme, whether the open space provision is being delivered in the context of a sustainable urban drainage system and whether the open space is for passive or active recreational purposes. As part of the planning for the future maintenance of public open space, planning authorities may enter into maintenance contracts with third parties and a separate measurement of open space areas based on 'as constructed' measurements may be necessary for these purposes.

The RICS member responsible for measurement should obtain a clear instruction of the purpose for which the measurement is required and request any appropriate legal and regulatory documentation in support of the instruction.

#### 5.4 Sustainable urban drainage systems (SUDS)

SUDS are increasingly encouraged in large-scale developments. Although not consistently mandated by local planning authorities and water companies, where the intention is to service the development using SUDS there will be implications for space allocation for the SUDS function itself. There will also be a need to consider related or overlapping functions that may be capable of being accommodated in shared space.

Additionally, there may be off-site implications that will need to be addressed. All of these may impact on the area of land the applicant will be required to have legal control over, the site area subject of the planning application and any additional land

in the control of the applicant and ultimately the area of land regarded as the net development area.

## 6 The application of land measurement for development planning purposes

This chapter discusses the general approach to implementing this advice and some of the issues commonly encountered when calculating land areas for development purposes.

### 6.1 The development/planning process

There are arguably only two fixed points in the process of development and planning: start and completion. The period and steps between these two points will vary according to jurisdictional requirements. However, in all instances the steps to be covered in between these two points are likely to involve an on-going process of scheme evolution.

Broadly speaking there are three stages of work in the development and planning process:

- a. site assessment
- b. planning/permit application and
- c. final planning permission/permit.

This applies equally whether in a discretionary or a prescriptive system.

As the measurements within this advice relate to the development process, which is iterative, it should be assumed that some may change over time, not least as more information becomes available. A scheme prepared by an architect and transport consultant to test planning principles or inform initial discussions may need to be substantially revised at a later date as further, more detailed work is undertaken; for example, if a utilities survey identifies a sewer that cannot be diverted or archaeological remains are found that must be left in situ.

Surveyors, planners, architects, engineers and others engaged in the development process should all acknowledge that until a proposal is submitted and permitted, SA and NDA are informed only by the information that is available at that point. Until the scheme is constructed, they cannot be confirmed with absolute certainty. This has an impact upon the way that measurements are used throughout the development cycle. It is the responsibility of the surveyor to ensure that the measurements being used are the most accurate and reflective of what is known or may reasonably be assumed at any given time.

In the event that a scheme is not permitted by a local planning authority but subject to further recourse (for example, either an appeal or judicial review) the most relevant measurements will normally be those that are the most up-to-date. In either instance, the way in which such measurements are considered should be akin to

those in the planning application stage as an implementable permission will not exist until a decision has been reached to approve the proposal.

## Development and planning process

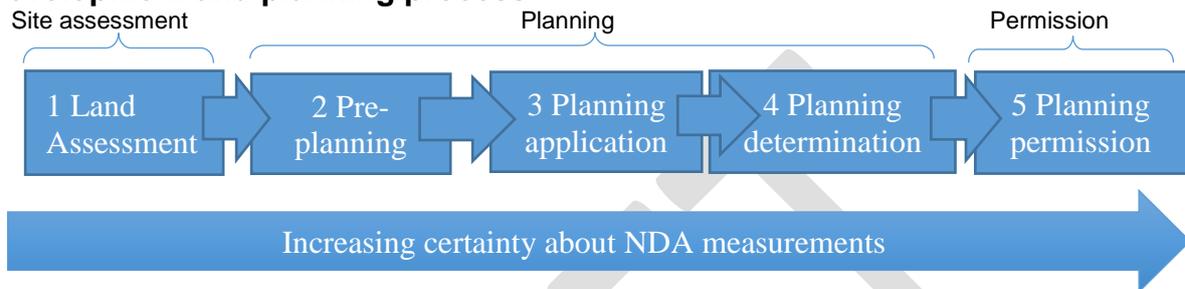


Figure 9: Key measurement stages in development/planning process

### 6.1.1 Site assessment

At the stage of site assessment, it is not uncommon that relatively little information may be known about a property. An acquiring party may only have available the information in a data-room or sales pack. This could be limited to legal documents and topographical survey information.

Preparation of a development proposal in this context is reliant upon a significant number of assumptions. At this stage, measurements of site coverage, plot ratio and site area are useful indications of what may be possible.

For industrial development, site coverage is often key and therefore sufficient. Plot ratio is equally helpful in such instances, as a reflection of what might occur within a development (i.e. mezzanine floors). For residential development, a target density is often applied to understand what may be accommodated on site. Site coverage and plot ratio are helpful, but site area is particularly important.

### 6.1.2 Planning

It is during the planning process that the opportunities and constraints of any site are increasingly defined, particularly in discretionary systems where there is a degree of negotiation required. The extent and nature of these become more apparent as progress is made through the development process, reflecting the greater amount of information that becomes available as further site and scheme assessment work is undertaken.

It is during this process that it becomes easier to distinguish the LA from the SA. This is because it is during the planning stage that the detailed approach to a site's development is being fully established. For example, it is at this point that the full extent of the functional flood plain can often be assessed and acceptable responses established. It may be that the development of some water-compatible uses is

possible where other development is not, with the incorporation of these into an emerging scheme extending the SA. It might be that areas of landscape importance can be incorporated into the design of what occurs around but not upon them. In all respects, this is where the boundary of the site that will form part of the scheme, irrespective of whether it constitutes new building or merely facilitates it, is assessed. It is also the point at which the specific application of planning policy and its implications are negotiated and considered.

In urban areas there is often greater potential for existing infrastructure to impact upon the way in which a building may be constructed and the location in which it may be positioned. It may be, for example, that there is an underground railway line which prevents the depth of foundations required for a certain form of development or planning restrictions relating to key views, historic monuments or existing buildings. It is more likely that urban locations will be previously developed 'brownfield' properties and could be affected by the historic use of the land (i.e. utilities connections, contamination, etc.) in addition to surrounding developments. As such, while the measurement of the LA, SA and NDA may be closer to one another than on larger 'strategic' sites, it is important to refine such measurements to ensure that a site's specific circumstances can be fully considered and assessed.

The expectation that calculations of residential density are to be reliant upon the SA is because planning policy typically requires the provision of a range of residential amenities to make a proposal acceptable in planning terms. Policy requirements will often exist in residential proposals that directly impact the amount of development which can be supported, both in terms of target development densities and also requirements for the infrastructure needed to support this such as open space and child play space. It is only by basing assumptions about density upon SA that they can be properly assessed for planning compliance purposes. It is for the same reason that calculations of residential density measured based on SA, do not indicate the scale, bulk or form of buildings proposed.

As simple calculations do not provide any indication as to the quality of design and construction that will be achieved, a greater degree of professional rigour and judgement is required. As a scheme becomes more advanced, it may therefore be useful to have regard to NDA in order to contextualise any proposal. The NDA is important to the design and acceptability of any proposal because it also has a direct impact on the visual appearance of the site. For example, if the NDA is small, but a high target density or floorspace must be achieved, the amount of development to be accommodated within the NDA is also necessarily large with implications for building heights and massing.

#### 6.1.3 Permission

Once permission has been granted, it is possible to accurately calculate all measurements of land as applicable to a specific site at a specific point in time. Where permission exists, NDA is not only useful to the local planning authority, but also to the valuer and those marketing the development. While it is quite possible for one site to have several possible NDAs, the NDA of a permitted scheme indicates the way in which the site's various constraints have been resolved in the context of this particular scheme, though it may not automatically represent the optimal or 'highest and best' use.

## 6.2 Time

For the avoidance of doubt, any measurement is only accurate at a particular point in time in light of the circumstances which apply then. A measurement can only reflect the very specific nature of circumstances as they exist. Should the basis for measurement change, the measurement should change accordingly. It is incumbent upon the surveyor to ensure that the measurements being used reflect the most accurate information available to them at any point and that, where assumptions are required, these are reasonable and appropriate.

Those undertaking a development appraisal to assess possible schemes may make assumptions about the measurements they use when determining either profit or site value. This may occur when undertaking sensitivity testing for a proposed scheme or seeking to understand the implications of development options that would affect the SA or NDA.

If measurements made in accordance with this guidance note are used as the basis for an *RICS Valuation – Global Standards 2017*-compliant valuation, it will be necessary to make clear any assumptions being made regarding these site measurements.

## 7 'As constructed' land measurements

Layout plans that are copies of the original planning permission drawings may or may not be an accurate representation of the development as constructed on the ground. Where alterations may have taken place in the siting of buildings as construction progresses this may give rise to significant inconsistency where such plans have been relied upon for conveyancing purposes.

During the course of construction situations may arise that require slight relocation or repositioning of buildings on the site. In most cases this will not be material to the planning consent and no rectification of the planning documents will have been necessary. In other cases the change in position on the ground may be sufficiently material to warrant rectification and revised drawings will usually need to be submitted to the planning authority.

Potential difficulties may arise where properties bought off-plan rely on title documents that include the original planning consent layout. This may legally refer to a building sited in a slightly different location to the one subsequently built. Where the change is slight the differences may never be identified and will not give rise to practical or legal difficulties. In other cases many years may elapse before a property owner recognises the variation, which may then give rise to a boundary dispute.

It is advisable that 'as constructed' drawings be produced at the end of the construction process accurately recording the position of buildings on the site as constructed. Any variation should be brought to the attention of the conveyancer to ensure the most accurate documentation is provided to end purchasers.

'As constructed' drawings and surveys should follow the requirements of the relevant jurisdiction. In the UK, for example, planning consent plans are admissible in court during dispute procedures and may be the unwitting cause of serious dispute proceedings. As constructed plans that follow local jurisdictional requirements and/or RICS best practice guidance may remove this potential liability and risk for future owners/tenants, etc. The 'determined' boundary specification will completely remove all potential future disputes and is strongly recommended for individual parcels.

In jurisdictions that operate a form of 'cadastre' (fixed or otherwise) more stringent demarcation requirements of individual parcels may be applicable and final submission of 'cadastral' plans to relevant authorities may need to be actioned by a locally/nationally 'licensed cadastral/land surveyor'. It is important that RICS members understand the cadastral requirement of the jurisdiction in which they operate.

## Appendix A: Topographic survey detail accuracy banding table

Band	2 sigma (X,Y)	Accuracy hard detail (Z)	Example survey types/uses	Approximate legacy plot scale output required to achieve accuracy band	Minimum size of feature shown true to scale (not symbolised)
C	+/- 10mm	+/- 5mm	Engineering surveying and setting out, high accuracy measured building surveying, heritage recording.	1:20	10mm
D	+/- 20mm	+/- 10mm	Engineering surveying and setting out, measured building surveys and floorplans, high accuracy topographic surveys.	1:50	20mm
E	+/- 50mm	+/- 10mm	Scanned surveys, measured building surveys, topographic surveys, net area surveys, valuation surveys, area registration.	1:100	50mm
F	+/- 100mm	+/- 50 mm	Low accuracy measured building surveys, topographic surveys, high accuracy utility tracing, tree modelling.	1:200	100mm
G	+/- 200mm	+/- 50mm	Massing studies from survey, topographic surveys, aerial imagery, LIDAR surveys, low accuracy measured building surveys.	1:500	200mm
H	+/- 500mm	+/- 125mm	Low accuracy topographic surveys, infrastructure surveys, aerial imagery, LIDAR surveys, satellite imagery, urban cadastre surveys and parcel demarcation.	1:1000	500mm

## Appendix B: Ordnance Survey mapping accuracies of large-scale topographic mapping data

### Relative accuracy

Relative accuracy is a measure of the positional consistency of a data point in relation to other local points of detail. Relative accuracy compares the scaled distance between features measured from the map data with distances measured between the same features on the ground. The following table represents the relative accuracy applicable to the scale of capture.

#### Relative accuracy

Scale	Relative error	95% confidence limit	99% confidence limit	Maximum measured distance
1:1250 (urban)	<±0.5m	<±0.9m	<±1.1m	60.0m
1:2500 resurvey or reformed (urban and rural)	<±1.0m	<±1.9m	<±2.5m	100.0m
1:2500 overhaul (urban and rural)	<±1.8m	<±3.6m	<±4.7m	200.0m
1:10 000 (mountain and moorland)	<±4.0m	<±7.7m	<±10.1m	500.0m

To put this in more practical terms, if, at a scale of 1:1250 the distances between well defined points of detail 60.0m apart were measured on the ground, there would be an expectation that 95 per cent would be represented on the Ordnance Survey map by scaled distances of between 59.1m and 60.9m. Similarly, at 1:2500 resurvey the measured distances between points of detail 100.0m apart there would be an expectation that 95 per cent would be represented on the Ordnance Survey map by scaled distances of between 98.1m and 101.9m.

### Absolute accuracy

Absolute accuracy is the measure which indicates how closely the coordinates of a point in Ordnance Survey map data agree with the 'true' National Grid coordinates of the same point on the ground. As the true position can never be known exactly, the statistic is quoted relative to the best known position determined by precise survey methods. Ordnance Survey publishes the following expected absolute accuracy values for well-defined points within each category of mapping contained in the National Topographic Database.

#### Absolute accuracy

Scale	RMSE*	95% confidence level	99% confidence level
1:1250 (urban)	<±0.5m	<±0.8m	<±0.9m
1:2500 (rural) (resurvey or reformed)	<±1.1m	<±1.9m	<±2.4m
1:2500 (rural)	<±2.8m	<±4.7m	<±5.8m
1:10 000 (mountain and moorland)	<±4.1m	<±7.1m	<±8.8m

\*RMSE (root mean squared error) is the square root of the mean of the sum of the squares of the errors between the observations.

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