



**rural development  
& land reform**

Department:  
Rural Development and Land Reform  
REPUBLIC OF SOUTH AFRICA

**Policy Framework  
for  
Geodetic Surveying, Aerial Imagery and Mapping**

**Chief Directorate: National Geo-spatial Information**

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## 1. Context

The Chief Directorate: National Geo-spatial Information (NGI) is a component in the Department of Rural Development and Land Reform. NGI was previously known as the Chief Directorate: Surveys and Mapping (CDSM). This name change was made by the Department to remove the confusion that existed between CDSM and the cadastral survey component of the Department, namely the Chief Surveyor-General and the provincial-based Surveyors-General.

Prior to being called CDSM, it was named the Trigonometrical Survey of South Africa, or Trig Survey. Trig Survey was formed in 1920.

In terms of Section 3A(1) of the Land Survey Act, 1997 (Act No. 8 of 1997) the responsible Minister may give direction to the Chief Director in executing his/her duties. This policy is an expression of such Ministerial direction.

## 2. Scope

2.1 The Chief Directorate: National Geo-spatial Information (NGI) is responsible for the following programmes or key activities:

- a) National spatial referencing system (national geodetic survey);
- b) National earth imagery (primarily aerial imagery);
- c) National mapping, including topographic surveying, digital elevation model, land cover mapping, and land use mapping (national mapping).

2.2 This policy framework covers these three programmes or key activities of NGI as well as the related key activities, in particular the dissemination of geo-spatial information products, safe-guarding of relevant geomatics records and rendering of relevant services.

2.3 NGI is the source of many of the fundamental geo-spatial information for the South Africa Spatial Data Infrastructure (SASDI). The policies related to the SASDI are also applicable to NGI but are not discussed in detail here.

## 3. Legislative Framework

3.1 The primary legislation are:

Land Survey Act 1997 (Act No. 8 of 1997)

Spatial Data Infrastructure Act, 2003 (Act No. 54 of 2003)

3.2 The secondary legislation are:

South African Geographical Names Council Act, 1998 (Act No. 118 of 1998)

National Archives and Records Service of South Africa Act, 1996 (Act No. 43 of 1996)

Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)

Intergovernmental Relations Framework Act, 2005 (Act No.13 of 2005)

Legislation relevant to the public service.

### 3.3 *Land Survey Act*

3.3.1 Section 2A creates the position of Chief Director: Surveys and Mapping (referred to as the Chief Director). The responsible Minister appoints the Chief Director, who must be a person registered as a Professional Geomatics Practitioner in terms of the Geomatics Profession Act. In terms of Section 2A(2) "the Chief Director shall, subject to the directions of the Minister, exercise the powers and perform the duties conferred upon or assigned to the Chief Director by this Act or any other law". The Department's organisational structure amended the name to Chief Director: National Geo-spatial Information (CDNGI). As such the CDNGI is also the Chief Directorate.

3.3.2 Section 3A(1) provides the duties of the Chief Director to be:

"The Chief Director shall be in charge of such geodetic and topographical surveying and geospatial information services in the Republic as the Minister may direct and, subject to this Act, shall-

- (a) promote and control all matters connected with those surveys and services;
- (b) conduct such geodetic, topographical and other relevant survey operations as may be required;
- (c) acquire such aerial photography or other remotely sensed imagery as may be required;
- (d) establish and maintain a national control survey system;
- (e) prepare, compile and amend such maps and other cartographic representations of geospatial information as may be required; and
- (f) take charge of and preserve the records of all geodetic and topographical surveys, maps and aerial photography or other remotely sensed imagery."

3.3.3 Section 3A(2) provides for the Chief Director to delegate any specified act or task, which could be performed by the Chief Director, to any person employed in the office of the Chief Director.

3.3.4 Section 8 provides for the responsible Director-General (Head of Department) to prescribe the fees to be charged by the Office of the Chief Director.

3.3.5 Section 42 provides for Town Survey Marks (TSMs) to be erected to enable the positions of the corner points of all pieces of land therein to be accurately determined. Such TSMs may be erected either by the Chief

- 3.3.5 Section 42 provides for Town Survey Marks (TSMs) to be erected to enable the positions of the corner points of all pieces of land therein to be accurately determined. Such TSMs may be erected either by the Chief Director or by a local authority, after approval of the positions by the Chief Director and at its own cost. The erection and survey of the TSMs are deemed to be part of the national control survey system. The relevant Surveyor-General and local authority must be notified by the Chief Director and a notice published in the Government Gazette once the TSMs have been erected and positions made available. The relevant local authority is responsible for the maintenance of the TSMs, but the Chief Director may maintain the TSMs should the local authority fail to do so. This will be done at the cost of the local authority.
- 3.3.6 Section 43 provides for the protection of trigonometrical beacons, including the prohibition of erecting any fence-post or other object or any excavation next to a trigonometrical beacon. If need be the Minister can require a servitude to be established for the purpose of protecting the use of the trigonometrical beacon.
- 3.3.7 Section 47 empowers the Chief Director, or any authorised person, to enter upon any land to perform any authorised work and erect reference marks, bench marks, trig beacon or temporary mark for such purposes, within reasonable grounds.
- 3.4 *Spatial Data Infrastructure Act*
- 3.4.1 The main objectives of the Spatial Data Infrastructure Act (SDI Act) are to promote the sharing of geo-spatial information and eliminate duplication among organs of State.
- 3.4.2 The SDI Act and the regulations and policies framed there-under provide specific responsibilities and obligations on data custodians. The Chief Director of National Geo-spatial Information (CDNGI) must comply with such responsibilities and obligations for those datasets for which it has appointed as being the data custodian for.
- 3.4.3 As a data custodian NGI may be represented on the membership of the Committee for Spatial Information, should the responsible Minister so appoint a representative from NGI.
- 3.5 *South African Geographical Names Council Act*
- 3.5.1 Section 3(1)(b)(ii) provides for the relevant Minister to appoint one member as nominated by the Chief Directorate: Surveys and Mapping.
- 3.5.2 In terms of Section 10 the relevant Minister approves geographical names. Such approved names must be published in the Government Gazette.

3.5.3 NGI may submit geographical names to the SA Geographical Names Council for approval.

#### **4. Key Principles**

- 4.1 The developmental state is responsible for the collection, maintenance and dissemination of fundamental geo-spatial information (national geodetic, aerial imagery and mapping programme) as a national strategic asset.
- 4.2 Geo-spatial information is used extensively in the development planning, implementation and monitoring processes, as well as in most other public decisions. It is essential for evidence-based planning and decision-making.
- 4.3 All role players in the development processes must have access to and have the ability to use the geo-spatial information. An open access to data policy is required to achieve this effectively. This requires users to be empowered and not marginalized in the access to and usability of geo-spatial information.
- 4.4 Geo-spatial information has a significant multiplier effect in the economy, which must be acknowledged by the national government. Geo-spatial information provides value-add to the fiscus beyond its immediate realization.
- 4.5 Access to geo-spatial information must not be hindered through the charging of fees that are beyond the means of all role players in the development process (principle of affordability).
- 4.6 Geo-spatial information must be relevant for the application. That is, the geo-spatial information must be 'fit for purpose' (in terms of accuracy, currency, content, and completeness) that meets the needs of the users. This requires a strong user focus and well defined used needs.
- 4.7 Geo-spatial information must be available, be timeously received by the user, and in the appropriate structure/format. Appropriate technology is required to support this requirement.
- 4.8 A programmatic approach to the collection and maintenance of geo-spatial information must be followed to ensure availability of the geo-spatial information over the long term. This is also important for monitoring purposes and longitudinal studies.
- 4.9 Sound geo-spatial information management practices are required.
- 4.10 Geo-spatial information is best represented on a map.
- 4.11 A unique spatial referencing system provides for the basis for unambiguous and accurate positioning and integration of geo-spatial information.

## **5. National Spatial Referencing System**

- 5.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for controlling the official geodetic surveying in the Republic of South Africa.
- 5.2 The CDNGI will determine the manner and accuracy requirement of any geodetic survey within the territory of the Republic of South Africa for the purpose of determining geodetic parameters and positioning.
- 5.3 The CDNGI is responsible for determining the unique spatial referencing system for the Republic of South Africa. No other person or organization may determine a spatial referencing system to be used in South Africa for any official purpose. Determining the unique spatial referencing system includes the reference ellipsoid and its parameters, the official horizontal datum, the official vertical datum and the official coordinate system(s). In determining the unique spatial referencing system the CDNGI must:
- a) Ensure connection to the Global Geodetic Reference Frame (International Terrestrial Reference Frame);
  - b) Ensure connection with the African Geodetic Reference Frame;
  - c) Take note of internationally accepted geodetic systems;
  - d) Take note of internationally accepted projection and coordinate systems;
  - e) Comply with units of measure as established by the Measurement Units and Measurement Standards Act, 2006 (Act 18 of 2006).
- 5.4 The CDNGI is responsible for determining a national geoid over the territory of the Republic of South Africa. The resolution and accuracy of this geoid will be determined by the CDNGI. In determining the resolution and accuracy of the geoid the CDNGI must take into account user requirements for geoidal information and international norms. The CDNGI may include data from different sources, including marine gravity measurements, and technologies for the purpose of computing the national geoid.
- 5.5 The national control survey system is the expression of the unique spatial referencing system. The national control survey system consists of both the horizontal and the vertical networks. The horizontal network provides for the horizontal positioning (x,y) with reference to the horizontal datum, and the vertical network for elevation or height (ht) with reference to the vertical datum.
- 5.6 The horizontal network consists of a network of reference stations in both a passive (or static) network and an active network.
- 5.7 The passive network is the original and traditional network of reference stations established over many years. These reference stations have been established through geodetic chains, primary, secondary and tertiary triangulation networks and down to fourth order points. The reference stations making up the geodetic

chains, primary, secondary and tertiary networks are the trigonometrical beacons. The fourth order points are town survey marks.

- 5.8 The network of trigonometrical (trig) beacons is well established and no further densification of such reference stations will take place. The only time a new trig beacon will be built is to replace an existing trig beacon that has been destroyed, and such trig beacon is considered as being an essential trig beacon within the network. It is the sole discretion of the CDNGI as to whether or not a new trig beacon should be built. In making such decision the CDNGI must consider the usability of existing trig beacons in the area in providing a surveying and positioning service.
- 5.9 The CDNGI will determine which trig beacons will be maintained on an on-going basis. The needs of users must be taken into account, as well as the continuation of a sound national control survey system, when determining which trig beacons will be maintained.
- 5.10 A network of town survey marks (TSMs) will be established within urban areas to provide a denser network of reference stations. The CDNGI will decide where a network or scheme of TSMs will be established. This decision will be based on the user needs, in particular a request from the local authority. Where the request emanates from a local authority then that local authority will be expected to build the TSMs at their own cost. The lack of such request from a local authority does not prevent the CDNGI from establishing TSMs in any urban area. In all cases the CDNGI will determine the location for each TSM. The CDNGI will be responsible for determining the position of the TSMs. The CDNGI must notify the local authority and the relevant Surveyor-General of the TSM scheme in accordance with Section 42 of the Land Survey Act.
- 5.11 The local authority is responsible for the maintenance of the TSMs in accordance with the Land Survey Act. Should a local authority fail in its responsibility to adequately maintain the TSMs within its area of jurisdiction then the CDNGI may undertake such maintenance work and then recover such cost from the local authority. The provisions of the Inter-Governmental Relations Act should be followed in all cases, providing for good working relations.
- 5.12 The active network is based on modern global geodetic observing systems, in particular a network of continuously operating reference stations (CORS) using the global navigation satellite system (GNSS). This network is called TrigNet.
- 5.13 TrigNet consists of reference stations located across South Africa to provide a positioning service in both post-processed and real-time positioning. The location of the TrigNet stations will be determined by the CDNGI. In determining the location of the station consideration must be given to a sound

- national control survey system, the effectiveness of the current positioning service for post-process and real-time services and user needs.
- 5.14 The CDNGI will determine the time interval over given epochs of GNSS signal reception, processing and dissemination. In determining this, consideration must be given to national user needs and participation in the global geodetic observing system and similar international programmes.
  - 5.15 TrigNet data can be used for applications other than positioning, including space weather science, and meteorology (precipitation).
  - 5.16 A TrigNet station has the same status as a trig beacon in terms of its protection and contribution to the national control survey system.
  - 5.17 The vertical network consists of a number of fundamental bench marks, bench marks and heights on trig beacons and TSMs. The bench marks make up the leveling routes that cut across the country. The national geoid complements the network of bench marks, trig beacons and TSMs to complete the vertical network.
  - 5.18 Fundamental bench marks are located near to primary tide gauges, used for the determination of sea level, and at strategic locations across the country. Fundamental bench marks must be built onto bedrock so as to provide stability in the vertical direction and avoid surface movements.
  - 5.19 The CDNGI will work collaboratively with organizations in the recording of sea level, including the Hydrographer of the SA Navy for tide gauges at key locations, and the safe guarding of this information.
  - 5.20 The position of bench marks must be known so as to enable users to use such bench marks.
  - 5.21 The heighting of trig beacons may be at an accuracy that is less than that of bench marks, while the TSMs will have the same heighting accuracy as bench marks.
  - 5.22 Bench marks must be maintained by the CDNGI.
  - 5.23 If in the opinion of the CDNGI the published position and/or height/elevation of trig beacons, TSMs or bench marks is not representative of actual position and/or height/elevation caused by ground surface movement or other causes, then the CDNGI may undertake the resurvey and determination of such position and/or height/elevation.
  - 5.24 The CDNGI will determine the size, shape and materials to be used in the construction of all reference stations. The usability and permanence of the reference station must be considered in such determination.
  - 5.25 Should the CDNGI be requested by any person or organization to remove a reference station, the CDNGI may approve such request after taking into consideration:

- a) The importance of the reference station from a users' perspective;
- b) The density of reference stations in the vicinity;
- c) The impact that the removal of that reference station will have on the integrity of the national control survey system.

In all cases where a request is made to remove a reference station the cost of such will be for the account of the requester.

## **6. National Aerial Imagery and Other Remotely Sensed Imagery**

- 6.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for the acquisition of aerial imagery in the Republic of South Africa.
- 6.2 The CDNGI will determine the coverage of aerial imagery for each imaging season or year as well as the rate of refreshing the imagery for any particular area. The user needs as expressed by organs of State must be considered when determining the coverage and frequency for aerial imagery.
- 6.3 The CDNGI will determine the spatial resolution, radiometric resolution and spectral resolution of the aerial imagery, as well as the relevant ancillary data required. In making these determinations the needs of users must be considered as well the national topographic surveying programme and national mapping programme.
- 6.4 The CDNGI may also acquire satellite remote sensing imagery for its own purposes or for use by other organs of State. In such cases the CDNGI must collaborate with the South African National Space Agency.
- 6.5 The CDNGI may act as a central repository for aerial imagery acquired by another organ of State. Such imagery may be disseminated for public use under the same conditions as NGI may have on its own imagery.
- 6.6 The CDNGI will determine which aerial imagery acquired in a year will be ortho-rectified to produce ortho-imagery, as well as the spatial resolution, radiometric resolution and spectral resolution of the ortho-image. In making these determinations the needs of users must be considered as well the national topographic surveying programme and national mapping programme.
- 6.7 The ortho-image will be geo-referenced to the national control survey system. The CDNGI will determine the method to achieve such. In doing so the CDNGI will consider appropriate methods, including direct geo-location and aerial triangulation or combinations of the two. Where required, photogrammetric ground control points will be established.
- 6.8 The CDNGI will determine the accuracy standards for the acquisition of aerial imagery and the production of ortho-images. This includes the calibration of imaging sensors and ancillary equipment.

## **7. National Topographic Surveying**

- 7.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for controlling the official topographic surveying in the Republic of South Africa.
- 7.2 The topographic surveying has the primary purpose of updating the topographic information in the integrated Topographic Information System (iTIS). The topographic information must be updated on a regular basis to ensure the completeness and relevance of the topographic information for various applications.
- 7.3 The topographic surveying may include both field surveys and photogrammetric surveys. All such surveys will be geo-referenced to the national control survey system. The field surveys may include direct observations for topographic surveying, image (photo) annotation or field appraisals and inspections.
- 7.4 The CDNGI will determine the manner of collecting and the sources of topographic information. This can include incorporating more detailed topographic information sourced from other organizations. It can also include volunteer geographic information (VGI) and community mapping sources.
- 7.5 The CDNGI will determine the various features, physical and human-made, and the relevant descriptive attributes of each, that will be collected as topographic information. Such determination will be based on user needs and the requirements for the national mapping programme.
- 7.6 The CDNGI will determine the accuracy standards for topographic information. Such determination will be based on user needs and the requirements for the national mapping programme.

## **8. Integrated Topographic Information System**

- 8.1 The Chief Director of National Geo-spatial Information (CDNGI) must establish a national database for the topographic information and related information, called the integrated Topographic Information System (iTIS).
- 8.2 The data model of the iTIS will be object or feature orientated, representing the topographic information as close to the real world situation as possible. The data model will contain topological structures to provide the spatial relationships between features. All features will be described by a unique identifier to provide unambiguous representation across the country.
- 8.3 The CDNGI will determine the content of iTIS. In doing so consideration must be given to the user needs and the national mapping programme.
- 8.4 Versioning of the content of iTIS must be used to enable changes over time to be tracked.

8.5 Notwithstanding the above paragraphs the CDNGI must ensure that the iTIS is compliant with the requirements of the SDI Act.

## **9. National Digital Elevation Model**

9.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible to establish a national digital elevation model (NDEM) over the territory of the Republic of South Africa, and adjacent areas where deemed necessary. The NDEM is a digital representation of the topography.

9.2 The CDNGI will determine the sources of data, the format of elevation representation, spatial resolution and elevation accuracy of the NDEM. The user requirements and the needs for ortho-rectifying aerial imagery must be considered in such determinations.

9.3 The NDEM will be based on the official vertical datum.

## **10. National Land Cover Mapping**

10.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for undertaking land cover mapping in the Republic of South Africa.

10.2 The land cover information is highly correlated with the topographic information and land use mapping. As such, these three datasets must be treated together.

10.3 The land cover mapping will be undertaken with comprehensive base mapping at regular intervals, with changes to the land cover reported at sub-intervals in between the base mapping. The CDNGI will determine the interval between the comprehensive base mapping, as well as the frequency of the change reporting in between. In making such determination the CDNGI must consider the needs of users.

10.4 The CDNGI will determine the classification schema for land cover mapping. Such classification must consider national standards, user needs as well as contributing to regional and global land cover studies. The classification schema must also provide for a breakdown to more detailed classes, should there be a need for more detailed land cover mapping in specific locations.

10.5 The CDNGI will determine the spatial resolution and minimum mapping unit for the land cover mapping. Such determination must take into account the needs of users.

10.6 Any organ of State undertaking detailed land cover mapping must submit such mapping to the CDNGI, who may incorporate such information into the national dataset.

- 10.7 The CDNGI must use robust methodologies to undertake the land cover classification. This will provide for reliable classification over time, enabling monitoring and longitudinal studies to be undertaken.
- 10.8 The CDNGI will determine accuracy standards for national land cover mapping, taking into consideration the user needs.

## **11. National Land Use Mapping**

- 11.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for undertaking land use mapping in the Republic of South Africa.
- 11.2 The land use information is highly correlated with the topographic information and land cover mapping. As such these three datasets must be treated together. Land use mapping is distinguished from land use regulation or management.
- 11.3 The land use mapping will be undertaken with comprehensive base mapping at regular intervals, with changes to the land use reported at sub-intervals in between the base mapping. The CDNGI will determine the interval between the comprehensive base mapping, as well as the frequency of the change reporting in between. In making such determination the CDNGI must consider the needs of users.
- 11.4 The CDNGI will determine the classification schema for land use mapping. Such classification must consider national standards and user needs, in particular land use management. The classification schema must also provide for a breakdown to more detailed classes should there be a need for more detailed land use mapping in specific locations.
- 11.5 The CDNGI will determine the spatial resolution and minimum mapping unit for the land use mapping. Such determination must take into account the needs of users.
- 11.6 Any organ of State undertaking detailed land use mapping must submit such mapping to the CDNGI, who may incorporate such information into the national dataset.
- 11.7 The CDNGI must use robust methodologies to undertake the land use classification. This will provide for reliable classification over time, enabling monitoring and longitudinal studies to be undertaken.
- 11.8 The CDNGI will determine accuracy standards for national land use mapping, taking into consideration the user needs.

## **12. National Mapping**

- 12.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for the production of topographic and related mapping in the Republic of South Africa.
- 12.2 The CDNGI will determine what type of map will be included as a national map series. In making this determination the needs of users must be considered as well as the inherent need to provide national coverage of official mapping. The requirement to meet any regional or international obligation must also be taken into account. Maps of the national map series are the official, authoritative maps of the country.
- 12.3 The following maps are currently included in the national map series:
- a) 1:10 000 orthophoto map;
  - b) 1:50 000 topographic map;
  - c) 1:250 000 topo-cadastral map;
  - d) 1:500 000 topo-admin map.
- 12.4 The CDNGI will determine the design and content of each of the map series. Such determination must take into account sound cartographic design principles, usability and user needs.
- 12.5 The main source of information for the map is the integrated Topographic Information System (iTIS). In addition to this source, ancillary geo-spatial information, obtained from external sources, will be added to the map, as required.
- 12.6 The maps must be revised regularly to ensure that the map is a good representation of the real world. A new edition of the map will be produced as required. The CDNGI will determine when a new edition of a map must be produced. In doing so consideration must be given to the usability of the map and the extent of changes that have taken place since the current edition of the map.
- 12.7 The maps will be produced as both hard copy and as digital maps. The printing of the maps is the responsibility of the CDNGI.
- 12.8 All maps will have State copyright.

## **13. Dissemination of Products**

- 13.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for the dissemination of all the products of the CDNGI.
- 13.2 The CDNGI will determine the nature, content and format of all the products. In making such determination consideration must be given to user needs, usability of the products and the applicable standards.

- 13.3 The CDNGI will differentiate between the standard products and other products. The standard products will be those that are generally available from the CDNGI and are the products emanating from the core functions of the CDNGI. Other products to be made available will be determined by the CDNGI. Such products will usually be user-demand driven and be produced on demand.
- 13.4 Products may be disseminated in hard copy or digital form or both, as appropriate.
- 13.5 The CDNGI must ensure that products can be obtained from outlets that are geographically distributed to provide convenient access by all users. Products that can be disseminated through web-based services should also be disseminated through this means. For this purpose the CDNGI will operate a geoportal. The geoportal will also provide for data and product discovery.
- 13.6 The CDNGI must actively promote awareness of all products through appropriate means.
- 13.7 The Director-General of the Department of Rural Development and Land Reform is responsible in terms of the Land Survey Act for setting the fees to be charged for the products of the office of the CDNGI. In setting such fees the provisions of the Promotion of Access to Information Act and that of the SDI Act must be complied with. The principle of affordability must apply.

#### **14. Preservation of Geomatics Records**

- 14.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for the safe guarding and preservation of all the geomatics records of the office of the CDNGI.
- 14.2 The CDNGI will determine which geomatics records must be safe guarded and preserved.
- 14.3 The NGI Policy on Archiving details the requirements for safe guarding and preserving of geomatics records of the CDNGI, which must comply with the provisions of the National Archives and Records Service of South Africa Act and the SDI Act.

#### **15. Provision of Geo-spatial Information Services**

- 15.1 The Chief Director of National Geo-spatial Information (CDNGI) is responsible for the provision of geo-spatial information services.
- 15.2 The CDNGI will determine the geo-spatial information services that will be provided. These services may be provided on an on-going basis or for a specific project or user (client) request. The provision of geo-spatial information services will be dependent upon the alignment with the functions

of the CDNGI, available resources and expertise, and the nature of a request and the requestor.

- 15.3 Any geo-spatial information service outside of the territory of the Republic of South Africa must require the prior approval of the responsible Minister.
- 15.4 The current generally available geo-information services are:
- a) Geodetic surveys;
  - b) Cartographic services – including production of aeronautical charts on behalf of Civil Aviation Authority, and maps for exams for Department of Basic Education;
  - c) Professional advisory services in geomatics;
  - d) National Geo-spatial Information Library;
  - e) Research in geomatics in accordance with the Research Agenda of NGI;
  - f) Production of wall maps;
  - g) Technical training in geomatics;
  - h) Geo-spatial information analysis;
  - i) Calibration bases for distance measuring instruments.
- 15.5 The rendering of geo-spatial information services may be charged for. Such charges will be in accordance with the fees of office as set by the Director-General.

## **16. Geographical Names**

- 16.1 The Chief Director of National Geo-spatial Information (CDNGI) is required to comply with the provisions of the SA Geographical Names Council Act. In particular, only those geographical names that have been approved by the responsible Minister for geographical names and published in the Government Gazette, are official names to be depicted on any product or service of the CDNGI.
- 16.2 The CDNGI has a representation on the SA Geographic Names Council (SAGNC).
- 16.3 Geographical names may be collected by the CDNGI in the course of his/her work. Such names must be processed in accordance with the requirements of the SAGNC.
- 16.4 Notwithstanding the requirement to only use official geographical names there may be a need to depict names in popular use that are not yet approved. Such names will be used only to provide enhancement of naming of geographic features, in particular for settlements. Should such name be used, the depiction thereof must ensure that the user is clear that the name is not an

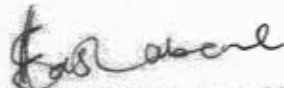
official name. Should there be any doubt or dispute over the name then the name must not be used.

### **17. Quality Management System**

- 17.1 The Chief Director of National Geo-spatial Information (CDNGI) will use a quality management system (QMS) in support of the processes and products and services of the CDNGI.
- 17.2 The QMS will be based on the total quality management (TQM) principles and aligned to the ISO and/or SA National (SANS) standards.
- 17.3 The CDNGI will comply with relevant SANS.
- 17.4 The CDNGI will establish standards for own use, as appropriate. Such standards could be used as *de facto* national standards.

### **18. APPROVAL**

The Policy Framework for Geodetic Surveying, Aerial Imagery and Mapping is hereby approved.



**MS MAITE NKOANA-MASHABANE, MP**  
**MINISTER: RURAL DEVELOPMENT AND LAND REFORM**  
DATE: 15/06/2018

## GLOSSARY OF TERMS

1:10 000 orthophoto map	A map at the scale of 1:10 000 which has a photographic image with contours, grid lines, names and other information added. This map combines all the advantages of conventional line maps and aerial photography. Unlike a conventional aerial photograph, accurate measurements can be made on the orthophoto map. It does require some skill to understand the information contained in the image.
1:50 000 topographic map	A map at the scale of 1:50 000 showing topographical detail. The 1:50 000 topographical maps are the largest scale of maps providing full coverage of South Africa. They accurately depict the location of natural and man-made features by means of symbols and colour, and elevation by means of spot-heights and contours (20m interval). Additional information added are place names, boundaries, magnetic data, etc. These maps contain essential information for planning and decision making but also have many other uses.
1:250 000 topo- cadastral map	A map at the scale of 1:250 000 showing topographical detail with the addition of geographical names, original farm boundaries and numbers, boundaries of magisterial districts, and provincial and international boundaries. Elevation, depicted by means of contours at 100m intervals (50m on sheets prior to 2000), is further enhanced by hypsometric tints, i.e. shades of brown becoming progressively darker as elevation increases. This map series is a firm favourite for regional planning and administrative purposes.
1:500 000 topo- admin map	A map at the scale of 1:500 000. The 1:500 000 topo-admin maps depict similar information as the 1:250 000 maps but with less detail, and without the cadastral information. Provinces and Magisterial districts are shown. A total of 36 sheets cover the whole of South Africa.
active network (TrigNet)	A network of continuously operating reference stations (CORS) that receive signals from satellites, such as GPS. TrigNet is South Africa's network of CORS. It streams Global Navigation Satellite Systems (GNSS) data to a Control Centre where it is processed and made available to users for accurate positioning and navigation.
aerial imagery programme	The systematic approach to acquiring aerial imagery over large areas in a consistent manner. The programme provides for the refresh of aerial imagery over the areas at set epochs, including for recording the changes over time. This provides an invaluable record for various applications such as land resource planning, agriculture and environmental management. The archive of aerial imagery provides assistance in legal matters where historical land use of a particular piece of land is required.

	must be determined. Aerial imagery programmes and priorities are determined in co-operation with other state departments, local governments and state owned entities.
aerial photography	The action of taking photographs (imagery) of the ground from an airborne platform such as aircraft, helicopter, or unmanned aerial vehicle (UAV). The camera usually points downwards (vertical photographs) but can also be pointed at an angle (oblique photographs), depending on the application intended. Also called aerial imagery.
aerial triangulation	Aerial triangulation is a mathematical process of optimally piecing together a block of overlapping aerial images such that you can make a map. The objective is to determine the position and orientation of each image in a mapping frame. Once you have these, you can measure the positions of every object in the image block. This data is used by other applications for digital terrain model creation, contour generation, orthophoto map production and topographic map compilation.
African Geodetic Reference Frame	A project designed to unify the many geodetic reference frames of Africa using data from a network of permanent Global Navigation Satellite Systems (GNSS) stations as primary data source for the implementation of a uniform geodetic reference frame. This will provide consistent positioning and navigation across the African continent.
ancillary data	Data which is not derived primarily from aerial imagery by the national mapping organisation, but from other sources. This data is used to supplement data used to make a map.
bench mark	A small permanent mark known height above mean sea level (ht). It is used as a reference to obtain the heights of other points.
calibration of imaging sensors and ancillary equipment.	The procedure to assess and quantify the internal characteristics of a particular camera system against the manufacturer's specifications. It includes a factory calibration to assess and compensate for geometric, radiometric and spectral characteristics. It extends to an in-situ boresight calibration to assess and compensate for the geodetic offset characteristics.
cartographic design principles	Guidelines to promote good map design and stimulate better cartography.

classification schema	A classification schema categorises real world phenomenon into various classes in order to address specific data/information and query needs, e.g. road spatial data/information will be categorised into a Transportation class while elevation data/information will be categorised into a Hypsography class. Collectively these classes will form a classification schema.
Committee for Spatial Information (CSI)	A Committee established in terms of Sec. 5 of the Spatial Data Infrastructure Act, No. 54 of 2003, whose function is to advise the Minister, the Director-General or an organ of state dealing with spatial information on any matter regarding the capture, management, maintenance, integration, distribution and use of spatial information
community mapping	A process where community members (voluntarily) make a map of their local area, primarily for their own purposes. This can be used as a means for the community to give expression to a community need.
continuously operating reference stations (CORS)	A permanent reference (base) station of known position, with equipment to receive signals from navigation satellites, such as GPS, arranged in a network of stations. These stations send the data, usually in real time, to a control centre, which processes all the received data to provide correction data for positioning. Accuracy in positioning and navigation is increased in a CORS network, because using more than one station helps to remove errors and uncertainties from the satellite data.
data custodian	The organisation responsible for, or with administrative control over, granting access to specified documents or digital data, while protecting the records and data as defined by the organization's information access and security policies and practices.
dataset	Information comprising a uniform collection of data, usually held in electronic form.
digital elevation model	A three dimensional representation of the terrain surface in digital form, that excludes vegetation, buildings and other human-made features.
earth imagery	Images of the Earth collected by sensors in air- or satellite-borne platforms.
epoch	A specific interval in time.
field survey	The process of undertaking in-situ observations and measurements, usually with the use of specialised equipment, such as GPS receiver, Total Station, to perform a field survey.

geodetic chain	A number of survey stations arranged in a pattern of triangles to form a chain of points over long distances. Precise observations are taken from these stations to the other stations, from which the accurate positions of the stations can be calculated.
geodetic parameter	Parameters pertaining to geodesy e.g. gravity anomalies, cartesian coordinate systems, ellipsoid dimension etc.
geodetic positioning	The determination of precise locations of one or more points on earth in a predefined reference coordinate system.
geodetic survey	A survey of a large area of land in which corrections are made to account for the shape of the earth.
geographical name	Names of geographical phenomena. These include names of places, called place names. The spelling of geographical names are standardised by approval from the Minister of Arts and Culture, on the recommendation of the South African Geographical Names Council (SAGNC).
geoid	An imaginary surface of equal gravitational potential of the Earth, which coincides with mean sea level. Water will not flow on this surface and plumb lines point perpendicular to the geoid.
geo-location	The process or technique of identifying the geographical location. This is widely used in navigation systems.
geomatics record	Any record containing information relevant to geomatics e.g. aerial image, field survey records, co-ordinates of reference beacons.
geoportal	A type of internet web portal used to find and access geo-spatial information, and associated geo-spatial services via the internet.
geo-referenced	To associate something with locations on the Earth's surface.
geo-spatial information	Information describing the location and description of features or phenomena beneath, on or above the Earth's surface.
geo-spatial information service	A service-based approach to linking a wide range of data and analyses with location/geographic feature awareness.
global navigation satellite system (GNSS)	Generic term for Earth-orbiting satellite navigation systems that provide autonomous geo-spatial positioning with global coverage e.g. GPS.
horizontal network	A network of reference points providing positions in the horizontal plane – given in (x,y) co-ordinates.

integrated Topographic Information System (iTIS).	The iTIS is an enterprise-wide information system managing the geo-spatial and related information of the Chief Directorate: National Geospatial Information (NGI) – the official national mapping organisation of South Africa, in an integrated structure.
International Terrestrial Reference Frame	International Terrestrial Reference Frame (ITRF) is a reference frame for the Earth providing for internationally agreed upon coordinates. It is determined from measurements made at geodetic reference stations. It is the realisation of the International Terrestrial Reference System for international use. Terrestrial reference frames are also established and implemented regionally.
ISO	ISO (International Organization for Standardization) is an independent, non-governmental membership organization and the world's largest developer of voluntary international standards.
land cover mapping	Mapping pertaining to the coverage of the land. Land cover is commonly defined as the vegetation (natural or planted) or human-made constructions (buildings, etc.) which occur on the Earth's surface. Water, bare rock, sand and similar surfaces also count as land cover.
land use mapping	Mapping pertaining to how humans use the land, such as residential, commercial, and agriculture.
map	A graphical representation of an area or country at a scale symbolising natural and/or human phenomena. A map is the main means to portray geo-spatial information. There are various types of maps depending on the purpose of the map e.g. topographic map, land use map, population distribution map. The symbols and colours are used to enhance the portrayal of the information at that scale (reduction).
mapping programme	The systematic approach to producing and revising maps in a consistent manner. The annual mapping programme is established annually in order to maintain maps in a national map series. The various national map series are categorised by scale and have national coverage. The annual mapping programme addresses the revision cycle of maps within each series.
minimum mapping unit	Minimum mapping unit (MMU) in terms of geo-spatial information will define the minimum size and dimensions of features that will be mapped/captured. It defines the density and amount of detail that will be captured for the database. For example, an area of high density buildings can be represented by a single building within a 65m radius. In terms of creating a cartographic map, MMU will define the degree of generalisation that occurs in mapping real world features. For example a land cover type will only be shown if it covers an area of the MMU or bigger..

modern global geodetic observing system	A system of modern specialised measuring and observing equipment or instruments used for determining geodetic parameters, including the shape and rotation of the Earth, global geodetic reference frame, and Earth's gravity. Each instrument contributing to one or more of these parameters. It is best then to have these different instruments in close proximity to each other, co-location, as a geodetic station. The stations are located at strategic locations around the globe to form a global network. The Global Geodetic Observing System (GGOS) has been established in order to integrate the three fundamental areas of geodesy, so as to monitor geodetic parameters and their temporal variations, in a global reference frame. These instruments include VLBI, SLR, DORIS, GNSS and absolute and relative gravimeters.
national control survey system	A system to provide for the unique, accurate positioning and heighting across the whole country. It consists of the national control survey networks and horizontal and vertical datums. The control survey networks consist of monumented reference points, including trigonometric beacons, town survey marks, TrigNet stations and benchmarks, of known position and elevation.
national digital elevation model (NDEM)	A digital elevation model (DEM) covering the whole country at a specified point interval.
national geodetic programme	The systematic approach to providing the national control survey system. This includes the establishment and maintenance of the various reference stations of the national control survey networks, and the undertaking and processing of geodetic observations.
national geoid	The geoid adopted for the country.
national spatial referencing system	The adopted spatial reference system across the whole country, providing the means to define the national coordinate system. All geo-spatial entities are described according to the adopted national spatial reference system. The national control survey system provides the base for the national spatial referencing system.
official coordinate system	Coordinate system adopted for the country. This is based on the national spatial referencing system.
official horizontal datum	Horizontal datum adopted by the country.
official vertical datum	Vertical datum adopted by the country.

ortho-imagery	Imagery that has been ortho-rectified. True distances and directions can be measured on an ortho-image.
ortho-rectified	The process of removing the effects of image perspective, camera tilt and terrain variation effects for the purpose of creating a planimetrically correct image that is geo-located.
passive (or static) network	Network of reference points in the national control survey system that can be observed from or to, as opposed to an active network. Consists of trigonometrical beacons, town survey marks and benchmarks.
photogrammetric ground control point	Point of known position that is visible in the aerial photograph, used to establish the position and orientation of the photograph.
photogrammetric survey	A method of undertaking measurements on photographs, using photogrammetry.
post-processed positioning	A method of determining positions by first recording the observations and thereafter processing these. Computing positions after the fact has a number of advantages, one being that post-processed satellite orbits and clock corrections are available, which means greater position precision is possible.
primary tide gauge	Tide gauges which are used to define the vertical datum. The sea level information is recorded over a long period of time, usually 19 years, to determine the mean sea level at that point.
primary triangulation network	A network of reference points, generally between 50 and 80km apart, forming a pattern of triangles of the first-order in the national control survey network.
projection and coordinate system	Projection: A method of representing the earth's surface on a flat piece of paper or a plane. A coordinate system defines the location of a point on a planar or spherical surface.
radiometric resolution	The number of digital levels used to express reflectance (energy) data collected by the imaging sensor. Sometimes referred to as number of grey levels.
real-time positioning	A method of determining positions in real time, i.e. as the signals are received.
reference ellipsoid	A mathematically defined surface of the Earth, that approximates the geoid, that is adopted for the national spatial reference system.

reference mark	A point used for the verification and recovery of stations in the event of damage to the original marks.
reference station	A permanent monumented point with a known position within the national control survey network/system.
remotely sensed imagery	Imagery acquired from a sensor at a distance from the object - aerial or satellite imagery.
Research Agenda of NGI	A plan which identifies issues or topics requiring the undertaking of research and development to improve/advance the knowledge base and/or operations of the Chief Directorate: National Geospatial Information (NGI).
secondary triangulation network	Similar to primary triangulation network but of the second-order within the primary triangulation, with the reference points generally spaced at 20 – 30 km apart.
servitude	A registered right that a person has over the immovable property of another.
spatial referencing system	A coordinate-based system, based on a reference ellipsoid, used to locate geo-spatial (geographic) entities in a consistent manner. The coordinate system may be either three-dimensional or two-dimensional. In the latter case a map projection is used for the planar system.
spatial resolution	The distance between distinguishable patterns or objects in an image that can be separated from each other, or the level of detail discernible. It provides the smallest size detail. Spatial resolution is linked to spatial accuracy.
spectral resolution	The sensitivity of a sensor to respond to a specific frequency range (mostly for satellite and airborne sensors). The frequency ranges covered often include not only visible light but also non-visible light and electromagnetic radiation. Objects on the ground can be identified by the different wavelengths reflected (interpreted as different colours) but the sensor used must be able to detect these wavelengths in order to image these features.
temporary mark	A point of fixed location that is used as a reference for a short-duration project.
tertiary triangulation network	Similar to secondary triangulation network but at the third-order within the secondary triangulation network, with the reference points generally spaced at 4 – 8 km apart.

topographic surveying	The observing and measuring of natural and human-made features on the surface of the earth and the topography.
topography	The shape, configuration, relief, roughness or three-dimensional characteristics of the earth's surface.
topological structure	In terms of spatial entities that define real world phenomenon in the form of vector data, topological structure defines the spatial relationship between spatial entities. Such relationships include adjacency, connectivity, containment etc. Effecting a change on one of the entities in a relationship will guarantee the continuation of the relationship.
total quality management (TQM)	A comprehensive and structured approach to organizational management seeking to continuously improving the quality of products and services through ongoing refinements, with emphasis on the processes, in response to continuous feedback.
Town Survey Mark (TSM)	A monumented reference point forming part of the national control survey network, situated within urban areas. They provided a denser network of reference points. The monument generally consists of a brass peg embedded in the centre of a concrete block, which is placed below the tarred road surface and protected by a heavy iron cover.
TrigNet	A network of continuously operating GNSS base stations covering South Africa, all managed and controlled by a single control centre situated in the offices of the Chief Directorate: National Geospatial Information (NGI)
trigonometrical beacon	A monumented reference point forming part of the national control survey network, located in elevated positions, such as mountain tops and elevated structures. The monument generally consists of a white concrete pillar with a detachable black vane or signal placed at its centre. They are commonly referred to as trig beacons.
TSM scheme	A network of Town Survey Marks located in a defined area, such as a city or town, which has been officially established through publication in the Government Gazette.
vertical network	A network of reference points providing heights or elevation above mean sea level.
volunteer geographic information (VGI)	Geo-spatial information that has been collected and contributed for free by volunteers, who are usually non-professionals in the field.