



Geodetic Physical Infrastructure Strategy

National Geodetic Office

September 2012

Introduction

The Geodetic Physical Infrastructure Strategy will provide direction for the management of geodetic physical infrastructure by the National Geodetic Office (NGO) over the next 5 years, ensuring that geodetic resources are spent in the areas where they will provide the maximum economic benefit for New Zealand.

The implementation of this strategy will produce a more targeted approach to the maintenance of New Zealand's geodetic physical infrastructure that better meets the needs of its customers. This will identify marks, beacons and protection structures that require regular maintenance and identify those that will not require ongoing maintenance.

Background

Over the past decade we have seen (through Landonline) a noticeable decrease in the use of beaconed marks around the country. This is correlated with an increase of GNSS surveys being performed, particularly in rural areas. In 2011, the NGO conducted a geodetic physical infrastructure questionnaire that revealed approximately 70% of respondents would prefer resources be invested in more 'Order 5' marks instead of maintaining more trig beacons, and the questionnaire also revealed that over 60% of respondents expect an increase in their GNSS usage over the next 5 years.

From these results and observations it is predicted that we will continue to see decrease in the use of beacons throughout the country. However it is recognised that specific beacons will remain important to customers and that protection structures will still be required to ensure the longevity of important marks.

The Geodetic Physical Infrastructure strategy links to the following Regulatory Geodetic Objectives:

A2(b) Geodetic marks are protected and maintained to prevent physical deterioration and minimise loss or safety hazards

A2(c) Information about geodetic marks accurately records its physical condition

The following strategic aims complete the Geodetic Physical Infrastructure Strategy.

Strategic Aims

1. *Ensure key marks, beacons and protection structures are regularly maintained*
2. *Monitor the usefulness of non-key marks, beacons and protection structures in response to evolving technologies and customer requirements and ensure they are maintained appropriately*
3. *Actively engage with customers to assist maintenance planning and encourage the supply of updated physical infrastructure information*

Strategic Aim 1

1. ***Ensure key marks, beacons and protection structures are regularly maintained***

LINZ understands that many beacons are still important to the survey community and it is important that non-beaconed marks used for datum monitoring and deformation are sufficiently protected. The implementation of Strategic Aim 1 will ensure that these important marks and beacons are well-maintained.

(a) *Develop and implement a regular maintenance schedule for marks, beacons and protection structures:*

- *which are important to the realisation of New Zealand's national geodetic system*

EXPLANATION

These marks include, but are not restricted to, the following:

- Geodetic Datum Reference Marks (GDRMs)
- Vertical Datum Reference Marks (VDRMs)
- National Deformation Monitoring Network (NDMN) marks
- Regional Deformation Monitoring Network (RDMN) marks, excluding those where access is impractical or managed by other agencies or institutions:

- *which are, or will be, regularly accessed by customers*

EXPLANATION

These marks will usually have at least one of the following characteristics:

- *High usage in cadastral surveys; or*
- *High usage in non-cadastral surveys, as advised by customers; or*
- *Planned usage for major land developments or*

infrastructure projects within the next ten years, as advised by customers:

- *where the beacon is essential for the mark to meet its designated purpose:*

EXAMPLE

- Basic Geospatial Network (BGN) marks, where the mark or associated structure needs to be visible in aerial imagery

- (b) *Consider environmental factors when determining how regularly key marks, beacons and protection structures shall be maintained:*

EXPLANATION

Maintenance must be sufficiently frequent to ensure:

- *structures remain safe and easily usable in normal environmental conditions*
- *structures look visually appealing and well-maintained, where the site receives high public use*
- *structures remain safe and easily usable where ongoing adverse environmental conditions exist at the site, such as salt air*

- (c) *For all key marks ensure mark data is regularly updated and readily accessible to customers*
- (d) *For all key marks, engage with interested parties to ensure:*
- *their views are considered*
 - *they are comfortable with any changes made to the site, and*
 - *they are aware of the importance of protecting the mark*

EXPLANATION

Interested parties include:

- *Landowners*
- *Land occupiers/managers*
- *Local Iwi*
- *Local Authorities*

Strategic Aim 2

2. Monitor the usefulness of non-key marks, beacons and protection structures in response to evolving technologies and customer requirements and ensure they are maintained appropriately

The NGO currently selects marks for maintenance through a combination of Landonline usage statistics and recommendations from the survey community and the general public. Unfortunately, about 11 % of beacons selected for maintenance have not had any usage recorded in Landonline in the succeeding three years. Strategic Aim 2 will address those beacons that need urgent maintenance but are no longer used regularly.

- (a) *For non-key marks, remove beacons where they pose a health and safety risk or are no longer in a usable state*
- (b) *For non-key, non-beaconed marks, leave sufficient protection to ensure the longevity of the mark*
- (c) *For non-key, non-beaconed marks, ensure that the mark can be located easily*
- (d) *Investigate and implement options for protecting a formerly beaconed mark to ensure that it is safe for people, stock and agricultural machinery*

EXPLANATION

Many marks protrude above ground level, posing a hazard once the beacon is removed. Options to mitigate this could include:

- cut the mark down to or below ground level or
- raise the surrounding area up around the mark
- install a post and rail enclosure

- (e) *For non-beaconed marks, ensure that the height is preserved for marks with Order 1-5 ellipsoid heights and Order 1V-3V orthometric heights*
- (f) *Identify marks, beacons and protection structures that are inaccessible, dangerous to access or otherwise unsuitable for physical maintenance*

EXPLANATION

These mark will be explicitly removed from future maintenance programmes or urgent works unless reported to LINZ as having a health and safety issue

- (g) *Investigate and implement a beacon structure that will meet the requirements of the Basic Geospatial Network*
- (h) *For all non-key marks ensure mark data is updated and readily accessible to customers*
- (i) *For all non-key marks, engage with interested parties to ensure:*
 - *their views are considered*
 - *they are comfortable with any changes made to the site, and*
 - *they are aware of the importance of protecting the mark*

EXPLANATION

Interested parties include:

- *Landowners*
- *Land occupiers/managers*
- *Local Iwi*
- *Local Authorities*

Strategic Aim 3

3. Actively engage with customers to assist maintenance planning and encourage the supply of updated physical infrastructure information

The NGO is aware that the survey community has a wealth of knowledge relating to the state of our marks, beacons and protection structures. The current mechanisms for reporting changes to mark information are cumbersome. Through Strategic Aim 3 LINZ will investigate the value of implementing tools for customers to submit updates to mark metadata and provide feedback into the maintenance programme.

- (a) *Regularly publish details of key marks and their maintenance levels in a form easily accessible to customers*
- (b) *Investigate and implement options for the geodetic database so customers can easily update physical infrastructure details*
- (c) *Regularly consult customers to ensure the list of key marks remains relevant*
- (d) *Investigate, and where appropriate utilise, technology to encourage and simplify customer updates and recommendations*

EXAMPLE

- *Investigate the benefits of developing an application for internet enabled 'smart' devices*