

IN THE MATTER of the Resource Management Act 1991 and Local Government (Auckland Transitional Provisions) Act 2010

AND

IN THE MATTER of Topic 016 Rural Urban Boundary North/West

AND

IN THE MATTER of submission 5259 and further submission 2773 by Hugh Green Limited

**STATEMENT OF EVIDENCE OF NIGEL FITCH
ON BEHALF OF HUGH GREEN LIMITED
(GEOTECHNICAL – WEITI STATION)**

13 NOVEMBER 2015

1 QUALIFICATIONS AND EXPERIENCE

1.1 My full name is Nigel Robyn Fitch. I hold current registrations in the following bodies:

- i) Chartered Professional Engineer (Civil and Geotechnical).
- ii) International Professional Engineer.
- iii) ACENZ Engineer.

1.2 I also hold memberships of the following New Zealand professional bodies:

- i) The Institution of Professional Engineers New Zealand.
- ii) The New Zealand Geotechnical Society.
- iii) The New Zealand Society for Earthquake Engineering

1.3 My academic qualifications are as follows:

- i) Master of Civil Engineering, Civil (1996).
- ii) Bachelor of Engineering, Civil (1979).
- iii) New Zealand Certificate in Engineering, Civil (1976).

- 1.4 I am the Technical Director of Geotechnical Engineering at Riley Consultants Ltd (**RILEY**), a consulting engineering firm specialising in Engineering Geology and Geotechnical, Civil, and Water resource Engineering. I have worked in the civil engineering services field based in the Auckland area since 1972. My initial work experience was as a Soils Technician, and since 1978 I have worked as a Civil Engineer providing consulting engineering services.
- 1.5 I have specialised in the engineering interpretation of geotechnical, geological, hydrological, and physical conditions, to provide appropriate solutions to difficult engineering problems. Over the past 36 years (since graduating BE) I have worked on the design and construction of hundreds of commercial and residential developments around the Auckland area including remedial measures involving slope stability, settlement, and associated problems.

2 SCOPE

- 2.1 I am providing geotechnical evidence in relation to the submission made for the South-Western and South-Eastern Basins of Weiti Station within the Dairy Flat Stream catchment to be included within the Rural Urban Boundary (**RUB**). The proposed extension is as shown in Appendix 1 of the Statement of Evidence prepared by Ms Emma Bayley of CivilPlan Consultants Ltd on behalf of Hugh Green Ltd.
- 2.2 The evidence includes geotechnical comment for the balance of the Weiti Station property to the north as to its suitability for residential development.
- 2.3 I have conducted a geotechnical appraisal of Weiti Station, Silverdale, based on published geological reports, maps, and two separate site visits, as outlined in the RILEY Geotechnical Constraints Assessment, Weiti Station, Stillwater, RILEY Ref: 02162/2-A, dated 13 November 2015. Reference has also been made to the Tonkin and Taylor (**T&T**) report Geotechnical Desk Study, North and North-West Auckland Rural Urban Boundary Project, dated August 2013, in particular, the classification development constraints.

- 2.4 A review was also undertaken of the Statement of Evidence from Mr Robert Hillier of T&T, prepared on behalf of Auckland Council, dated 14 October 2015, in particular Section 9.44 outlining the assessment of the development of the area that includes the site.

3 CODE OF CONDUCT

- 3.1 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person.

4 GEOTECHNICAL CONTEXT

- 4.1 The site is currently a large block of farmland used for pastoral farming. For the purposes of my geotechnical assessment the site has been divided into six areas, as shown on the appended drawing (RILEY Ref: 150725-FIG 1), that are described in detail in the RILEY geotechnical assessment report, with relevant sections summarised below. The boundaries of these areas are based on topographic features that also form significant surface water divides. The currently proposed extension to the RUB encompasses the two southern basins. These southern basins are denoted as the “South-West Basin” and “South-East Basin”. The balance of the site to the north includes the “Okura Basin” on the eastern side of the existing access road and proposed Penlink road that is to connect to the Whangaparaoa peninsula. The “North-West Basin”, “North Valley”, and “North-East Basin” to the west of the proposed Penlink.

Southern Basins

- 4.2 The southern basins are bound to the west by East Coast Road and to the east and south by elevated ground that forms a watershed, with the site draining to the west.

- 4.3 The South-West Basin on the western side of the proposed Penlink is characterised by broad valleys, and generally gentle 8° slopes steepening to between 12° and 18° towards its northern boundary. This basin has three broad valleys, with terracettes on steeper slopes, typically small and appears to have been exacerbated by the passage of livestock rather than shallow slumping. Terracettes become more defined on steeper 12° to 18° slopes. The ridges show no obvious recent large scale instability. There is a noted shallow soil movement on steeper slopes in the southern and northern portions of the basin. An older slump feature was noted in the north-eastern corner of the basin. The lower-lying areas and the invert of gully appeared to be wet, with reeds indicating a potentially high groundwater table.
- 4.4 The South-East Basin is characterised by low angle rolling slopes that are typically 8°, with steeper 15° slopes to the east. The lower-lying central area is relatively flat to gently sloping. This basin has broad slopes, with the lower-lying area appearing wet, with reeds indicating a high groundwater table. There is evidence of potential slope instability on the steeper slopes of the two gullies to the east, with apparent broken and hummocky ground.
- 4.5 Based on published geology, the southern basins are predominantly underlain by materials of Northland Allochthon that are overlain by Tauranga Group alluvium in the lower-lying portions of the site. There are also noted localised areas of the eastern ridge and south elevated areas underlain by East Coast Bays Formation.
- 4.6 The topographic relief profile area of the southern basins is low to moderate. The lower-lying areas associated with alluvial soils are generally low relief.

Remaining Valley and Basins

- 4.7 As with the southern basins, the balance of the property is inferred to be predominantly underlain by materials of the Northland Allochthon, with alluvium in lower-lying areas.

- 4.8 This Okura Basin lies to the east of the existing main access road. This basin has a large slump running up to the edge of the road and, with hummocky areas, exhibits some instability. The basin drains to the east into the Okura River.
- 4.9 The north-west Basin slopes down to one of the two main tributaries of Duck Creek located on the property. At the southern portion of the valley system the slopes are generally moderate 12° to 15° slopes with board gently sloping 6° to 9° areas between valleys. Further north the land steepens to 12° to 14°, with reed and surface ponding indicative of high groundwater levels. There is evidence of active slope instability in areas of steeper slopes especially adjacent to the tributary and in areas of inferred high groundwater.
- 4.10 The North-Valley is the main valley on the site draining into the other main tributaries to Duck Creek. The southern slopes at the head of the valley are typically steep 18° to 21° slopes. The gently to moderately 2° to 8° sloping basin is flanked by two generally moderately steep 10° to 16° sloping ridges along the west and east margins.
- 4.11 The North-East Basin area drains out toward Duck Creek forming a separate small catchment crossing the northern boundary. The basin is open and of relatively gentle gradient. Slopes are typically 8° with steeper slopes of 12° in the south-west portion of the basin. A localised steep 24° slope is located near a pond in the west.

5 GEOTECHNICAL CONSIDERATIONS FOR WIETI STATION

- 5.1 My opinion is based on a walkover appraisal in September 2002 and September 2015, together with an assessment of topographic features and inferred subsoil conditions.
- 5.2 My assessment of the site's **Development Constraints** and **Development Premium** for the purposes of this evidence has adopted the classification system outlined in Section 5.5 of the T&T report, as indicated on the appended drawing (RILEY Ref: 150735-FIG 1)

5.3 The T&T Statement of Evidence states:

The lower-lying areas associated with alluvial soils have **medium development premium** potential due to the compressibility and liquefaction susceptibility characteristics of these soils.

This assessment, as defined in the T&T report, is considered appropriate for the lower-lying areas within southern basins.

- 5.4 The South-West Basin has slopes generally ranging between 5° and 12°. The northern ridge has slopes of typically 8° to 12°. Based on a visual assessment these slopes would have an indicative **medium** slope instability potential and a **medium development premium**. The eastern slope of the South-East Basin are typically 12° to 18°, with minor localised areas of 18° to 27°, and based on a visual assessment, these slopes would typically have an indicative medium to high slope instability potential. Based on this, and observations, the eastern steeper slopes are inferred to have a medium to high development premium.
- 5.5 The Okura Basin is seen to have a **high development premium** due to the inferred underlying Northland Allochthon material, steep slopes and evidence of previous slope instability.
- 5.6 The Main Valley, North-West Basin, and North-East have noted **high development premium** within areas inferred to be underlain by Northland Allochthon material with steeper slopes, and where there is noted evidence of previous instability, notably the southern portion of the North Valley that has evidence of previous deep-seated slope instability.
- 5.7 The gentler slopes within the North-West Basin and North-East Basin have a lower slope stability potential, assessed to have a **medium development premium** potential. The exception is the northern portion of the North-East Basin where evidence high groundwater and shallow instability of slopes of approximately 10° to 12° was noted. Due to the likely drainage requirements to improve the stability of these slopes they are seen as having a **high development premium**.

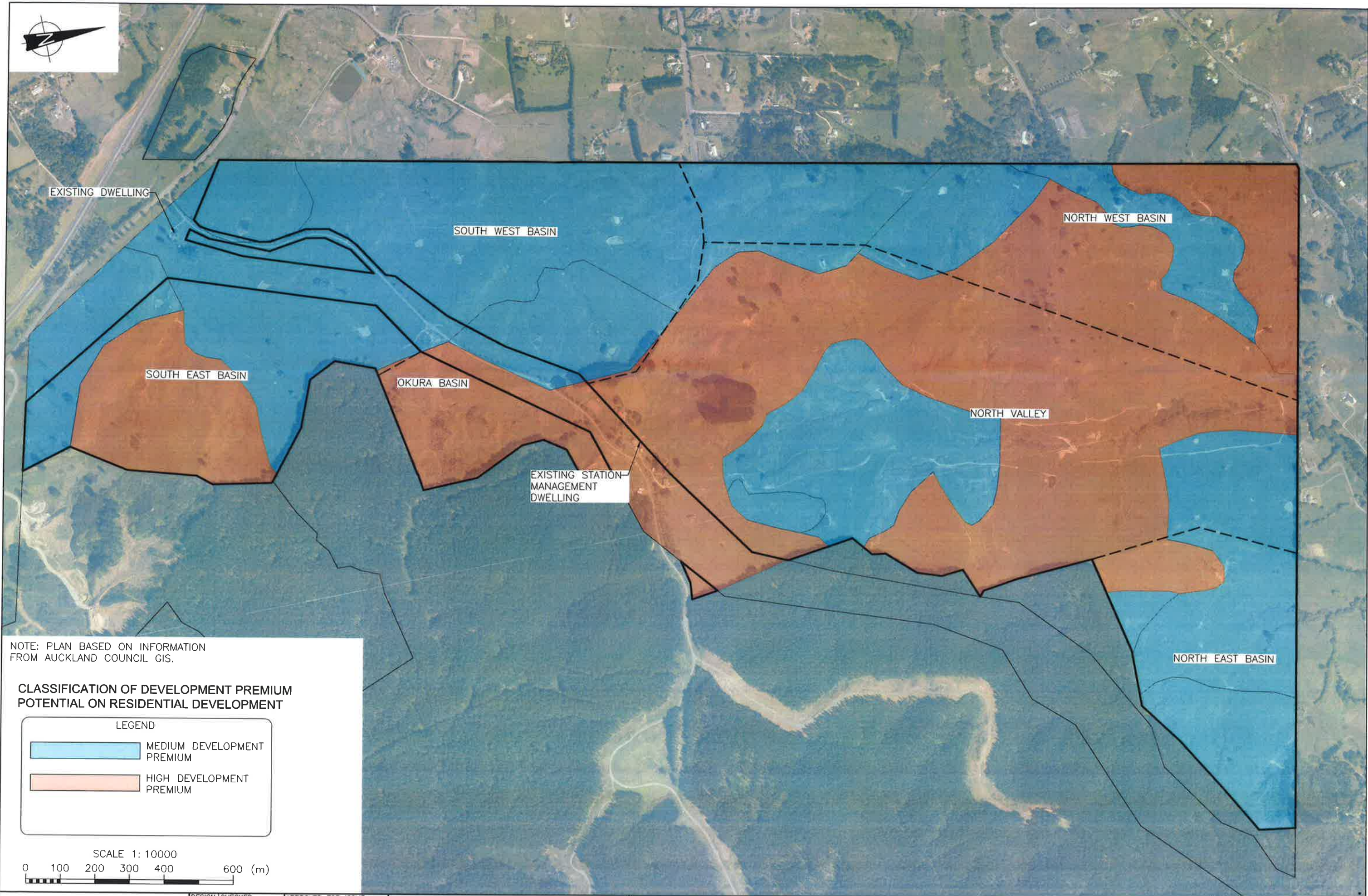
- 5.8 As with the southern basins the lower-lying gently sloping areas are inferred to be underlain by Tauranga Group Alluvium. Areas of **low to medium development premium** potential have been identified to the north of the South-West Basin and within the lower-lying areas in the central North Valley, North-West Basin, and North-East Basins on the property.
- 5.9 Based on the above assessments of geotechnical development constraints and assigned development premium potential, I am of the opinion that the southern basins are similar to areas within the RUB to the south and should therefore be considered suitable for inclusion for future urban development.
- 5.10 These sites are likely to typically require minimal geotechnical input, and remedial works with respect to stability, building foundation, and future development requirements. These are areas typically with slopes of less than 12° in well drained areas of the site and less than 8° where potential higher groundwater levels have been identified. Due to the variability of alluvial and colluvial soils in low-lying areas, there is a potential for lower strength or potentially compressible soils to be present.
- 5.11 Dependent on specific proposals, earthworks required could be minimal along with remedial or stability improvement measures. Areas of flat to gently rolling land may only require minor slope regrading and drainage works to form the desired finished landform. These works are unlikely to require significant engineering design and or construction control to address the potential for slope instability. Some areas with of shallow potential instability, higher potential groundwater, or greater potential variability of soil founding conditions may require slight increased geotechnical inputs.

- 5.12 Although the northern valley and basins contain areas that may be more difficult to develop, with a higher development premium potential, and may require greater inputs to develop, these are not considered insurmountable for the majority of the sites. Areas identified as having a **high development premium** are areas that have been identified as having a high potential for instability. These are typically slopes within the property underlain by Undifferentiated Northland Allochthon and colluvium material on slopes of steeper than 18°, slopes of 8° to 18° with likely high groundwater levels, or slopes showing signs of current active instability. Instability observed on the property includes, slide slump, gully erosion, and tomo features.
- 5.13 These areas do not necessarily have to be precluded from future development, although they may require more extensive remedial works. This may include installation of drainage to maintain acceptable groundwater levels and earthworks/re-profiling to achieve stable slope angles that are suitable for residential development.
- 5.14 Land which falls within the high geotechnical constraints category is most effectively and economically made available for development by using a bulk earthworks approach to provide stable landforms over wide areas.

6 SUMMARY

- 6.1 I have undertaken a geotechnical assessment of the development potential for the Weiti Station property including an assessment of geotechnical hazards and development constraints.
- 6.2 The areas of the site have been assigned a **Development Premium** potential utilising the classification system outlined in the T&T reports for the area.

- 6.3 The majority of the land with medium development premium is likely to be suitable for future urban development, assuming appropriate engineering control and design is undertaken. However, some areas are likely to be more easily developed than other areas. Some areas of high development premium may be more difficult to develop due to multiple constraints, and may need a larger scale and more intensive approach to develop economically, as has been done in a number of other areas within the Auckland region.
- 6.4 It is my opinion that the development of the South-West Basin and South-East Basin are similar in geotechnical constraints to adjacent areas to the west included within the RUB.
- 6.5 It is my opinion that although the remainder of the site may encounter more construction and engineering design efforts and costs, these are not insurmountable. They would however require a greater degree of planning and geotechnical engineering input to develop.

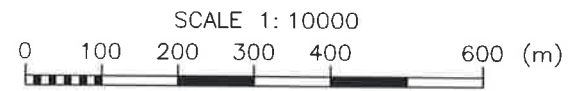


NOTE: PLAN BASED ON INFORMATION FROM AUCKLAND COUNCIL GIS.

CLASSIFICATION OF DEVELOPMENT PREMIUM POTENTIAL ON RESIDENTIAL DEVELOPMENT

LEGEND

	MEDIUM DEVELOPMENT PREMIUM
	HIGH DEVELOPMENT PREMIUM



DESIGN SRO		CHECKED	APPROVED FOR ISSUE:	DATE: 13/11/15
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REV	DESCRIPTION			



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TITLE		CADFILE	
HUGH GREEN GROUP WEITI STATION, STILLWATER DEVELOPMENT PREMIUM ON RESIDENTIAL DEVELOPMENT		150720-FIG1	
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