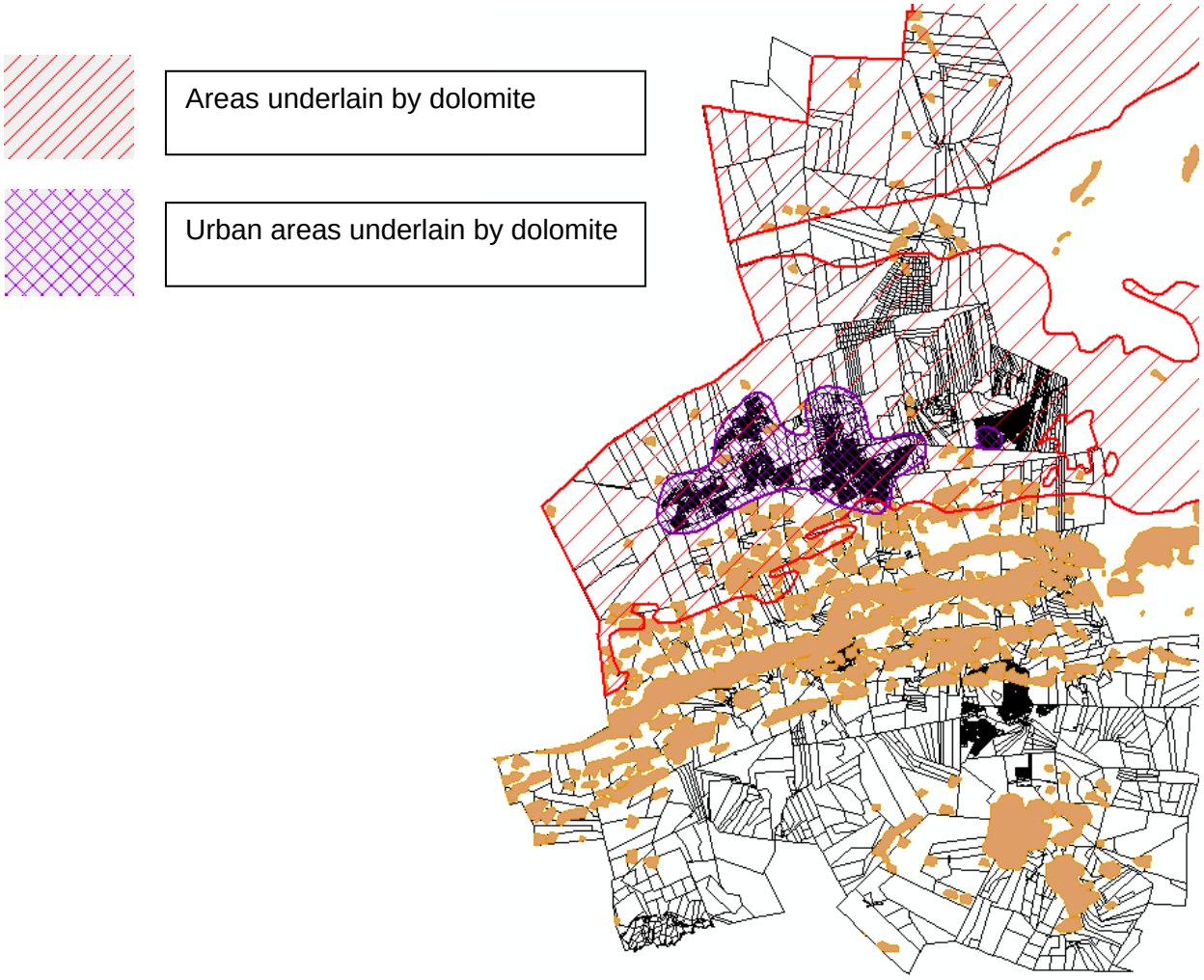
MERAFONG CITY MUNICIPAL SPATIAL DEVELOPMENT FRAMEWORK 2016-2021

ANNEXURE D

DOLOMITE MANAGEMENT

Merafong is affected by the occurrence of dolomite within the Municipal Area. Past experience in the region has highlighted the dolomitic limitations affecting the municipal area, especially with regard to township development. The resettlement of Khutsong to safer geological land has received major attention and is adopted as a Presidential Project. The risks of dolomite can be managed to such an extent that normal life and economic activities can continue. Many urban areas in all 9 provinces of South Africa are underlain by dolomite such as Centurion, Benoni, Germiston, Port Elizabeth and Saldanha Bay. If dolomite is managed properly its effects can be reduced by more than 90%.

As indicated in Figure 1, only the northern urban areas are affected by dolomite.



Geological classification zones have been identified by examining the available data for urban areas concerning geology, geo-hydrology, geophysics, borehole data, sinkhole and doline data, dewatering, structural damage and risk characterisation. Many local authorities have large concentrations of privately owned residential properties located on land that is highly susceptible to sinkhole formation. Many of these authorities have opted to manage the risk and

aim to maintain a tolerable hazard rating (acceptable development risk) through comprehensive Dolomite Risk Management Systems. The state has itself adopted this approach on its assets located on highly susceptible dolomite land. Of great significance is recent, comprehensive research undertaken relating to the National Department of Public Works' Dolomite Risk Management Strategy. The findings of this research have ultimately underpinned the requirements set out in SANS 1936 (2012). Following four years of aggressive implementation of dolomite risk management to largely highly susceptible areas, sinkhole formation has been reduced by in excess of ninety per cent. Merafong is taking the first steps towards a comprehensive risk management strategy. The latest standard for Dolomite Risk Management is called SANS 1936 of 2012.

SANS 1936 (2012) IN RELATION TO DEVELOPMENT & SUBMISSION OF BUILDING PLANS:

With regard to development on dolomitic land, SANS 1936(2012) makes provision for the following sections:

- Part 1: General Principals and Requirements;
- Part 2: Geotechnical Investigation and determination;
- Part 3: Design and construction;
- Part 4: Risk Management;

SANS 1936(2012) was compiled as an extension of the National Building Regulations, with the object to set requirements for development on dolomitic land. The linkage between SANS 1936(2012) and the National Building Regulations seen as a pyramid and one cannot split one level from another level.There are 8 primary Dolomite Hazard Zones, of which not all may occur in Merafong or in urban areas. The following table depicts these classes with their inherent risks without mitigating measures.

Inherent Hazard Class (IHC)	Small sinkhole (<2m)	Medium sinkhole (2-5m)	Large sinkhole (5-15m)	Very large sinkhole (>15m)	Subsidence Formation
1	Low	Low	Low	Low	Low
2	Medium	Low	Low	Low	Medium
3	Medium	Medium	Low	Low	Medium
4	Medium	Medium	Medium	Low	Medium
5	High	Medium	Low	Low	High
6	High	High	Medium	Low	High
7	High	High	High	Medium	High
8	High	High	High	High	High

New residential developments ***should not*** be considered in Dolomite Hazard Zones 3, 4 and 5.

SANS 1936, Part 1 Land uses:

Table 1 — Dolomite area designations

Dolomite area designation	Description
D1	No precautionary measures are required.
D2	General precautionary measures, in accordance with the requirements of SANS 1936-3, that are intended to prevent the concentrated ingress of water into the ground, are required.
D3	Precautionary measures in addition to those pertaining to the prevention of concentrated ingress of water into the ground, in accordance with the relevant requirements of SANS 1936-3, are required.
D4	Additional site-specific precautionary measures are required.

Land usage		Inherent hazard class determined in accordance with the requirements of SANS 1936-2							
Designation	Description	1	2	3	4	5	6	7	8
		Dolomite area designation and footprint investigation requirement							
Commercial and miscellaneous non-residential usage									
C1	Places of detention, police stations, and institutional homes for the handicapped or aged	D3 + FPI						D4	
C2	Hospitals (including clinics), hostels, hotels	D3 + FPI						D4	
C3	Commercial developments ≤ 3 storeys, including railway stations, shops, wholesale stores, offices, places of worship, theatrical, indoor sports or public assembly venues, other institutional land uses such as universities, schools, colleges, libraries, exhibition halls and museums, light (dry) industrial developments, dry manufacturing, commercial uses such as warehousing, packaging, and electrical substations, filling stations	D2 + FPI	D3 + FPI					D4	
C4	Commercial developments > 3 storeys, including railway stations, shops, wholesale stores, offices, places of worship, theatrical, indoor sports or public assembly venues, other institutional land uses such as universities, schools, colleges, libraries, exhibition halls and museums, light (dry) industrial developments, dry manufacturing, commercial uses such as warehousing, packaging, and electrical substations	D2 + FPI	D3 +FPI	D4					
C5	Fuel depots, processing plants or any other areas for the storage of liquids, waste sites.	D2 + DLI	D3 + DLI				D4		
C6	Outdoor storage facilities, stock yards, container depots	D2 + DLI	D3 + DLI					D4	
C7	Parking garages	D2	D3 + FPI					D4	
C8	Parking areas	D2	D3					D4	
DLI = Design level investigation in accordance with the requirements of SANS 1936-2, as deemed appropriate by the competent person. FPI = Design level investigation specifically below the footprint of the structure.									
NOTE 1 D1, D2, D3 and D4 have the meanings assigned in table 1. NOTE 2 Residential coverage ratio = footprint area/site area.									

Land usage		Inherent hazard class determined in accordance with the requirements of SANS 1936-2							
Designation	Description	1	2	3	4	5	6	7	8
		Dolomite area designation and footprint investigation requirement							
High rise dwelling units									
RH1	> 10 storeys	D4							
RH2	> 3 storeys but ≤ 10 storeys with a population of ≤ 1 500 people per hectare	D2 + FPI	D4						
RH3	> 3 storeys but ≤ 10 storeys with a residential coverage ratio of ≤ 0,4, and a population of ≤ 800 people per hectare	D2 + FPI	D3 + FPI				D4		
Low rise dwelling units									
RL1	≤ 3 storeys with 80 to 120 units per hectare and a population not exceeding 600 people per hectare	D2 + FPI		D4					
RL2	≤ 3 storeys with up to 80 units per hectare and a population not exceeding 400 people per hectare	D2 + FPI		D3 + FPI			D4		
Dwelling houses									
RN1	Up to 60 dwelling houses per hectare with stands larger than 150 m^2	D2	D3	D4					
RN2	Up to 25 dwelling houses per hectare with stands no smaller than 300 m^2	D2	D3			D4			
RN3	Up to 10 dwelling houses per hectare with 1 000 to 4 000 m^2 stands	D2	D3			D3 + FPI	D4		
Other									
AO	Agriculture that does not require irrigation in any form or the storage of water, parkland and public open spaces that are not irrigated and grazing pastures	See SANS 1936-4							
DLI = Design level investigation in accordance with the requirements of SANS 1936-2, as deemed appropriate by the competent person. FPI = Design level investigation specifically below the footprint of the structure.									
NOTE 1 D1, D2, D3 and D4 have the meanings assigned in table 1. NOTE 2 Residential coverage ratio = footprint area/site area.									
A1	Agriculture that requires intensive irrigation	See SANS 1936-4							
A2	Agriculture that requires irrigation, including botanical gardens, sports fields, driving ranges, golf courses, parkland and public open spaces	See SANS 1936-4							
DLI = Design level investigation in accordance with the requirements of SANS 1936-2, as deemed appropriate by the competent person. FPI = Design level investigation specifically below the footprint of the structure.									
NOTE 1 D1, D2, D3 and D4 have the meanings assigned in table 1. NOTE 2 Residential coverage ratio = footprint area/site area.									

INFILL DEVELOPMENT:

Additional requirements for **infill development on residential stands (Second dwellings of subdivisions)** – Annex A Section 3 (SANS 1936-2:2012)

"*In addition to the applicable requirements of 4.1 to 4.5 (inclusive), the competent person shall, in the investigation of infill development on residential stands, including subdivision or second dwelling rights within proclaimed townships in dolomite areas,*

a) *source available information…*

b) *Certify that the proposed subdivision / second dwelling application complies with SANS 1936-1;*

c) *determine the appropriate dolomite area designation and potential nominal loss of support due to sinkhole or subsidence formation below a foundation;*

d) *inspect the open works to verify the stability zone; and*

e) *determine the monitoring area designations in accordance with SANS 1936-4."*

- Section 4.1.4(SANS 1936-2:2012)
  - "*An application for land use rights, made to any relevant authority, shall include a sufficient level of information to provide confidence in the presented determinations(s).*"

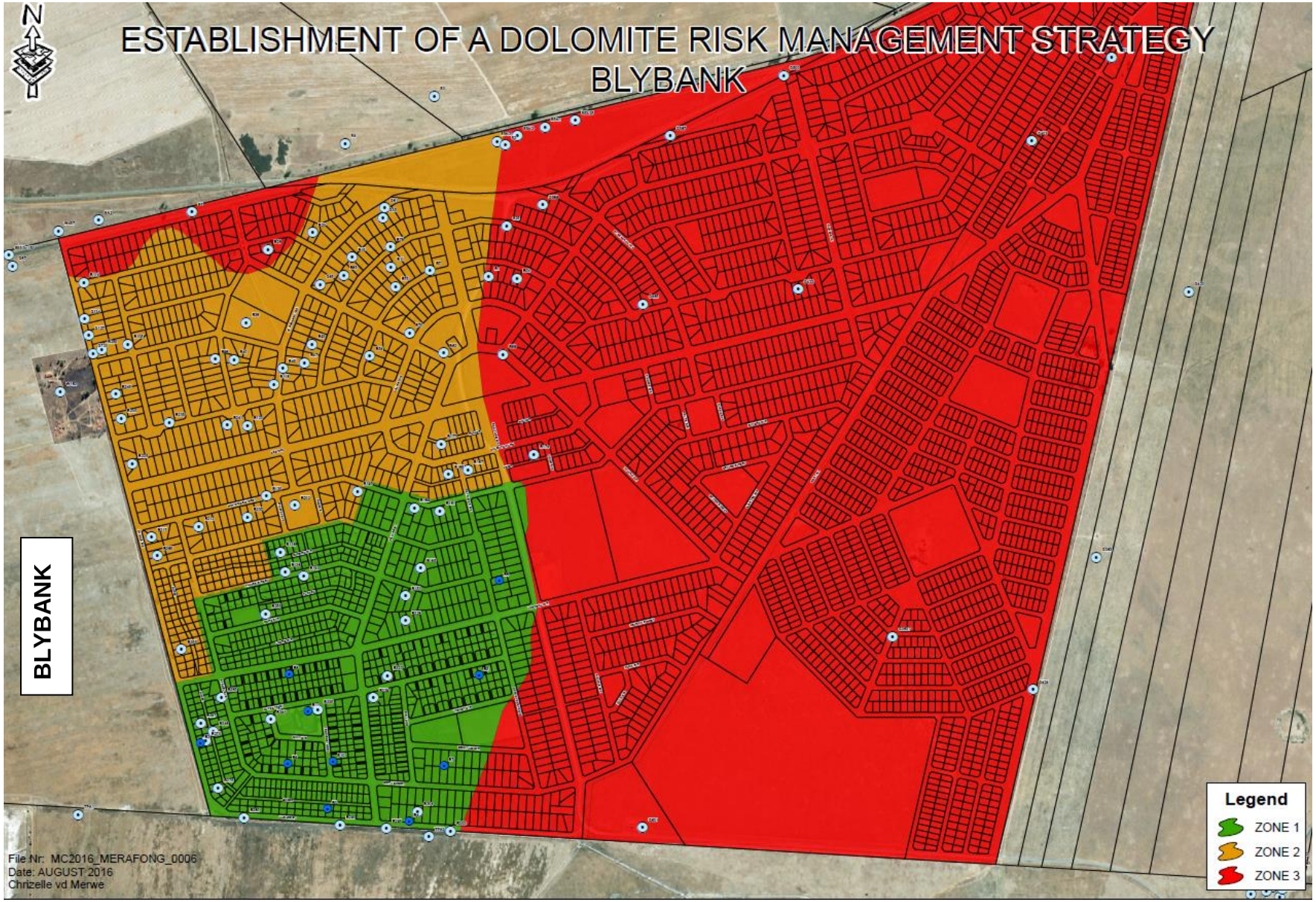
The Council for Geoscience proposed the following "set of rules" in order to assist residents in low risk areas:

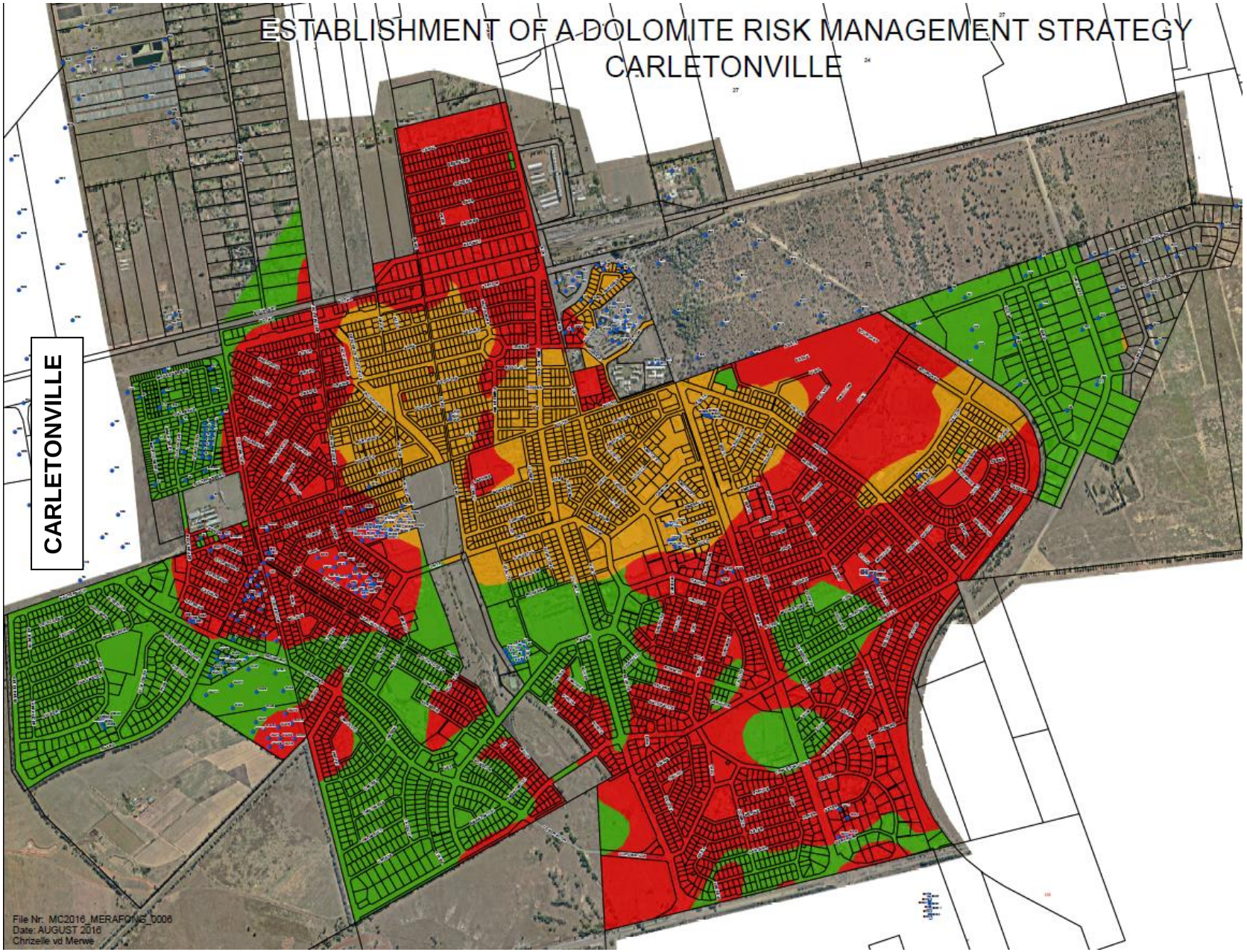
For the purpose of development all urban areas in the north of Merafong have been divided into 3 zones. No drilling is needed for additions on property within Geological Zones 1 and 2, subject to:

- Zone 1 - Council can approve additions with wet services or without wet services up to 50m²;

- Zone 2 - Council can approve addition without wet services up to 50m²;

- Development should comply with the requirements of SANS 1936;
- Audit of wet services, any shortcomings to be rectified in line with the requirements of SANS 1936;
- Foundation design to span a minimum of 5 m loss of support;
- General precautionary measures on the stand to comply with SANS 1936. i.e. aprons, storm water management;
- Additions may not be larger in size than the original building;
- This set of rules is only applicable on first time additions since implementation of SANS 1936 (2012) – All second time additions are subjected to Site Specific Investigation.


N
ESTABLISHMENT OF A DOLOMITE RISK MANAGEMENT STRATEGY
BLYBANK
BLYBANK
Legend
ZONE 1
ZONE 2
ZONE 3
File Nr: MC2016_MERAFONG_0006
Date: AUGUST 2016
Chrizelle vd Merwe


ESTABLISHMENT OF A DOLOMITE RISK MANAGEMENT STRATEGY
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CARLETONVILLE
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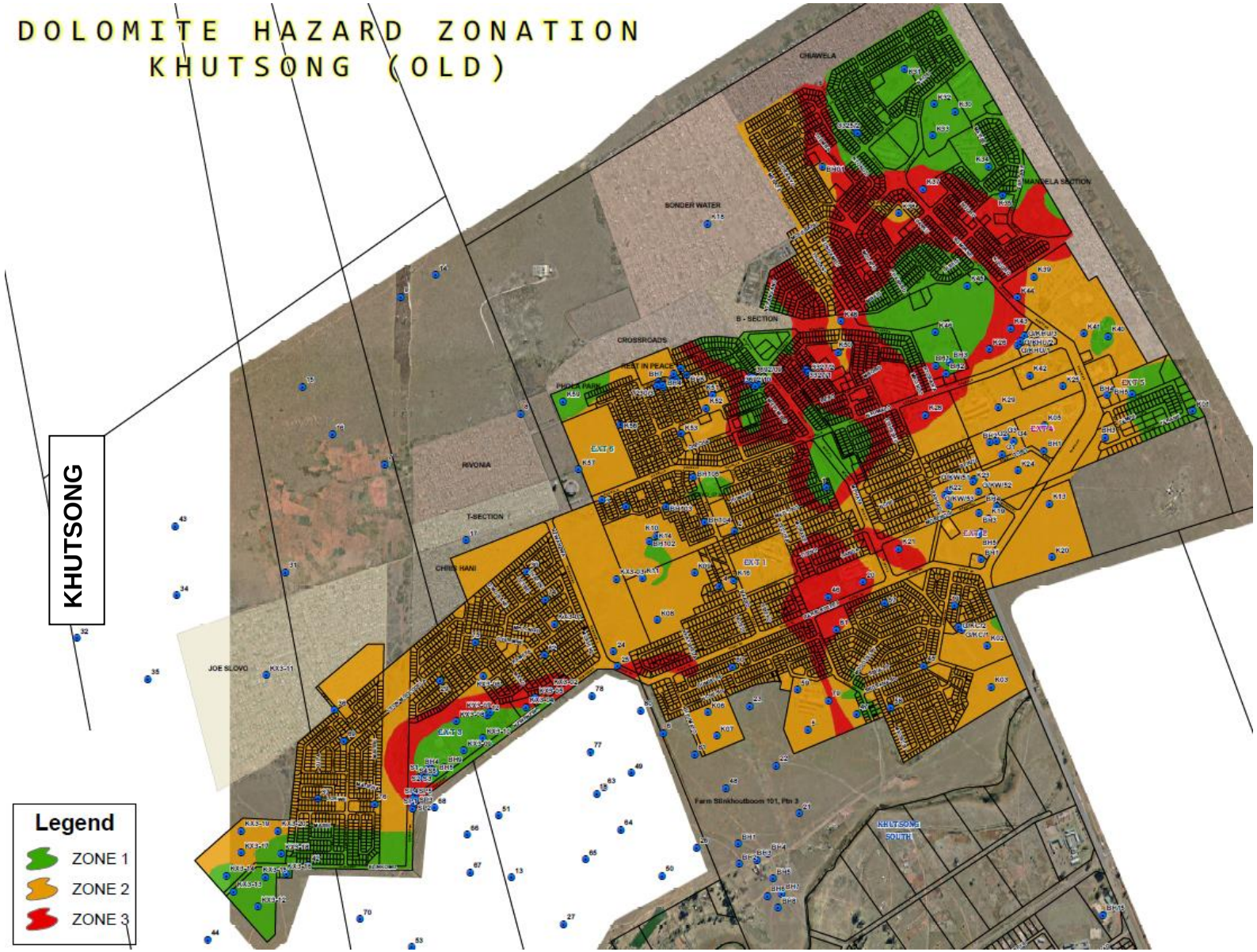
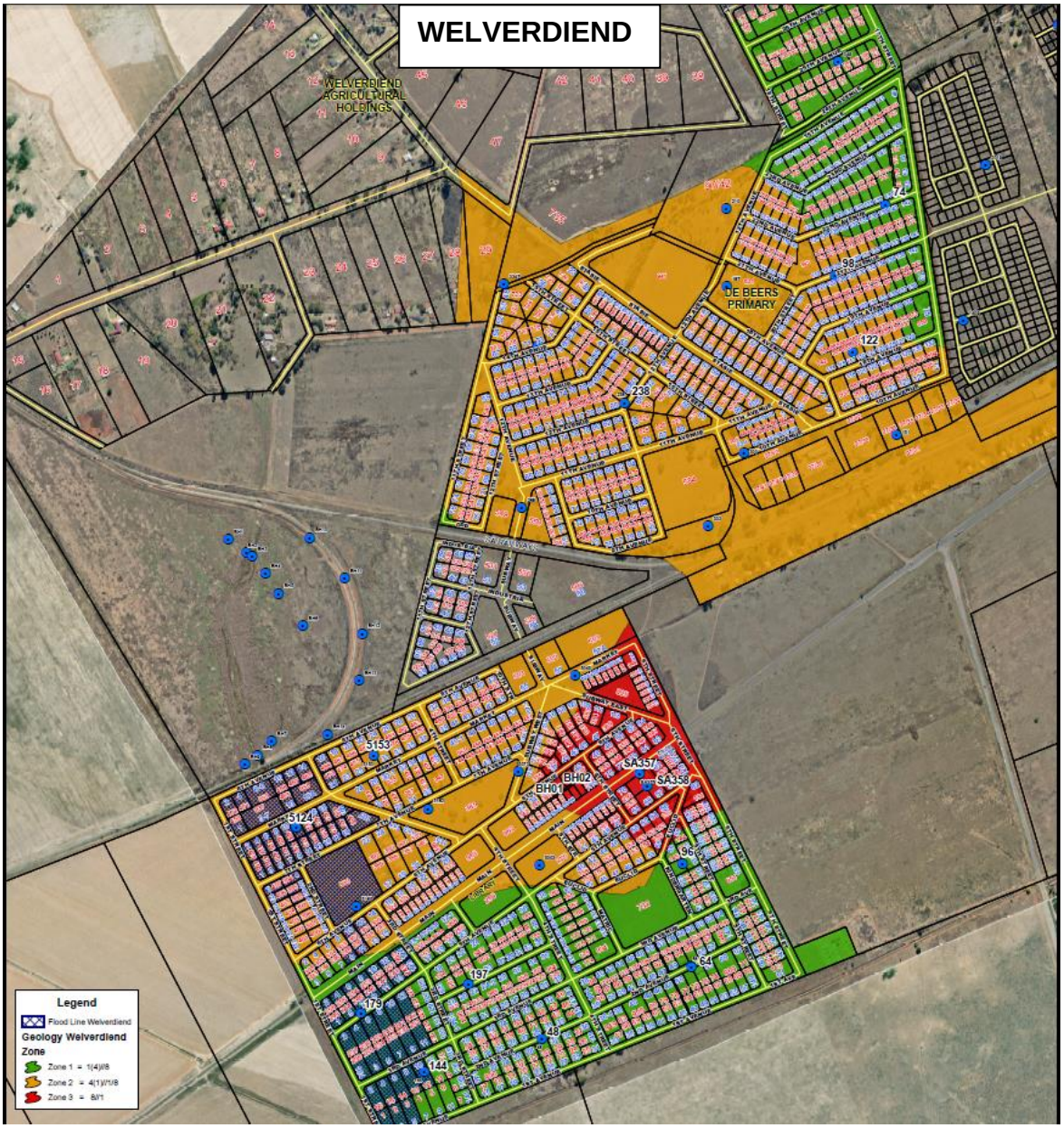
DOLOMITE HAZARD ZONATION
KHUTSONG (OLD)





The above is subject to the following:

Design of Structures (Provisional)

The philosophy to be applied to the design of foundations in the event of D3 is that a sinkhole having a nominal diameter (typically no less than 5m) occurring anywhere beneath or adjacent to the building will not envelop the building or result in toppling or sliding failure of the building

(or portion of the building) into such a sinkhole or collapse of the building into such a sinkhole. It should be noted that the provisional assumed design size (in this case 5 m) is based on the typical size of sinkhole or subsidence for the particular Hazard Class area (i.e. central to the bell curve). It is not implied that sinkholes or subsidences smaller or larger than the assumed size cannot occur.

The final design considerations are to be determined by a competent person, subsequent to detailed Design Stage dolomite stability investigations, and in accordance with SANS 1936 (2012).

Precautionary Measures (SANS1936-3, 2012)

The minimum standards applicable to any design work, services, future upgrading, repair or maintenance work as contained in **SANS 1936, Part 3 (2012): Design and construction of buildings, structures and infrastructure**" must be complied with as a point of departure, as this standard now forms part of the National Building Regulations.

All existing wet services should be inspected and tested and upgraded in line with current industry standards, where required.

New wet services should be designed to minimize the potential for leaks etc, and comply with SANS 1936 Part 3, and the Department of Public Works Consultants Manual, where applicable.