WESTERN CAPE UNIT

DEVELOPMENT POSSIBILITIES ON DOLOMITIC GROUND

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Council for Geoscience
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1912 - 2012

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ENGINEERING GEOSCIENCE UNIT

HOW SAFE IS YOUR HOUSE – THE DOLOMITE HAZARD

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Council for Geoscience Centennial Celebration and Conference
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Dolomitic land

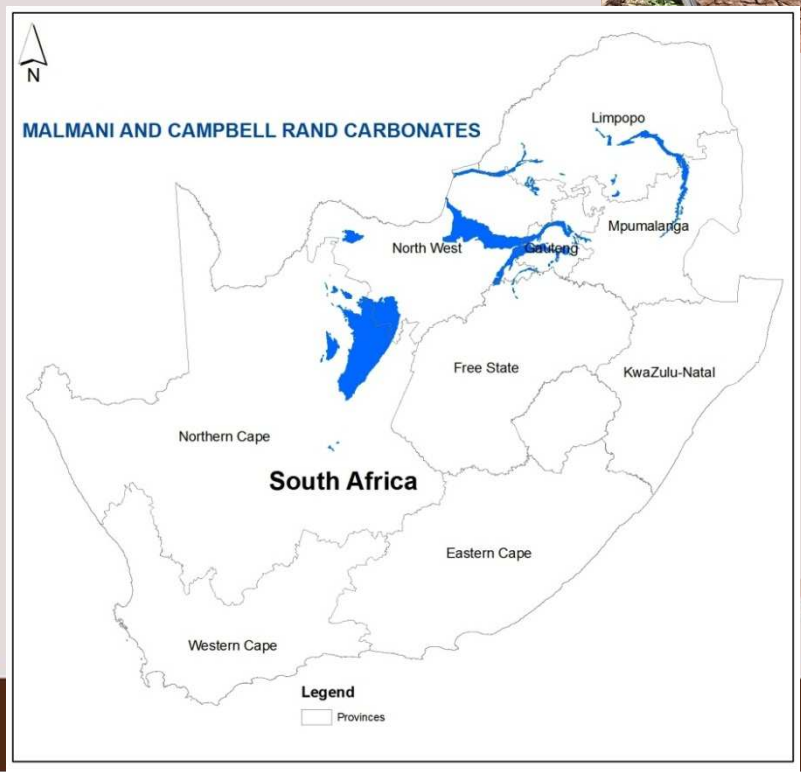
- Advice to local authorities on appropriate and safe development on dolomitic land.
- Certain areas of SA are prone to sudden, catastrophic collapse which may lead to death, injury or structural damage.
- Features → Sinkholes → occur in areas underlain by dolomite rock.

House and family of 5 swallowed by a sinkhole in 1962.

Damage to structure, 2010.

Dolomitic land

- Dolomite rock → system of discontinuities (fractures, joints and faults) → preferential solution passages.
- relatively impervious and insoluble in pure water → rainwater (charged with carbon dioxide) → flows along these discontinuity passages → slowly acts to dissolve this rock type.
- Distribution → Transvaal Basin and Griqualand West Basin → 2600 Ma.
- Covers 5 of the 9 provinces



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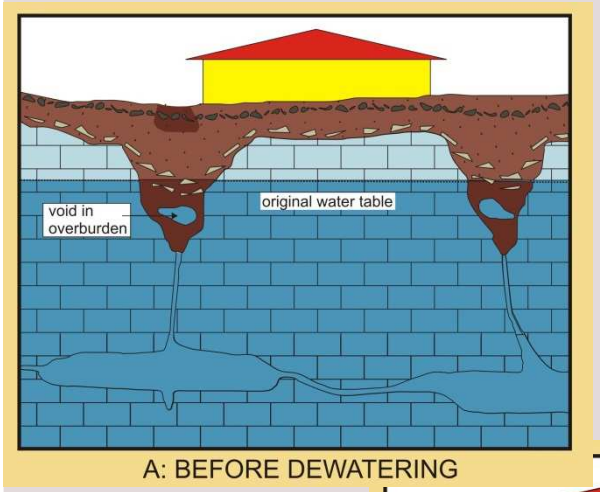
Sinkhole formation

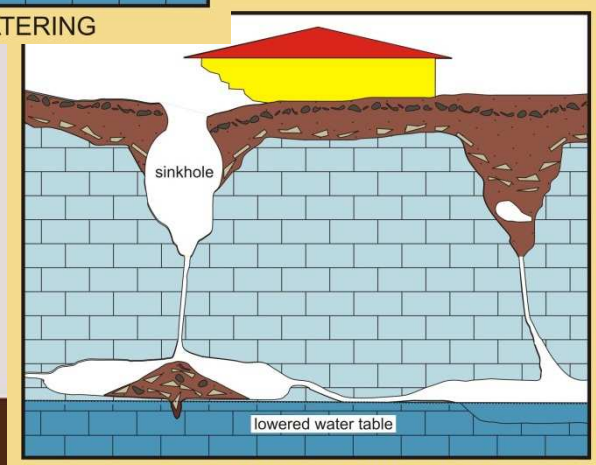
- Sinkholes → collapse of an arch or dome which spans an air filled void → triggered by ingress water (leaking services or ponding water) or lowering of the groundwater table.
- Generally circular, up to 10's of meters in diameter, steep sided and deep.
- Can occur with little warning → cracks in walls or settlement in the ground are often the early warning signs.

Triggering Mechanisms

- Leaking water bearing services
- Poor surface water management
- Artificial lowering of the groundwater table



A: BEFORE DEWATERING



C: AFTER DEWATERING

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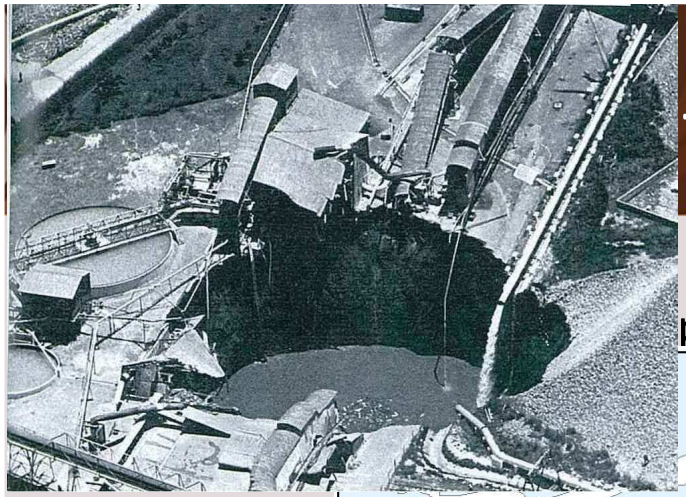

province →most
populated area on

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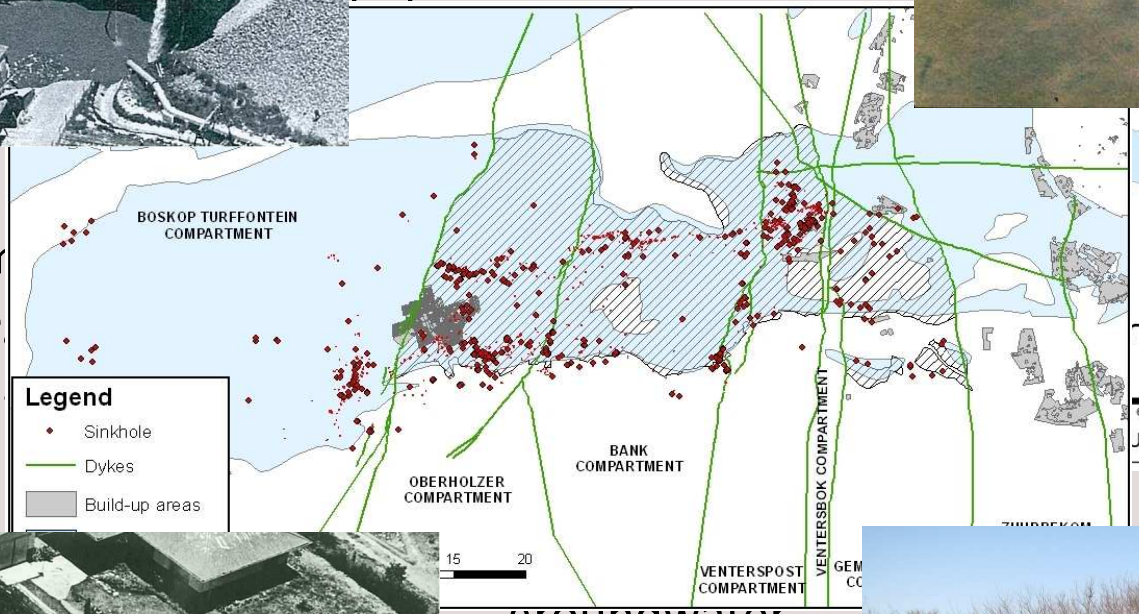

groundwater
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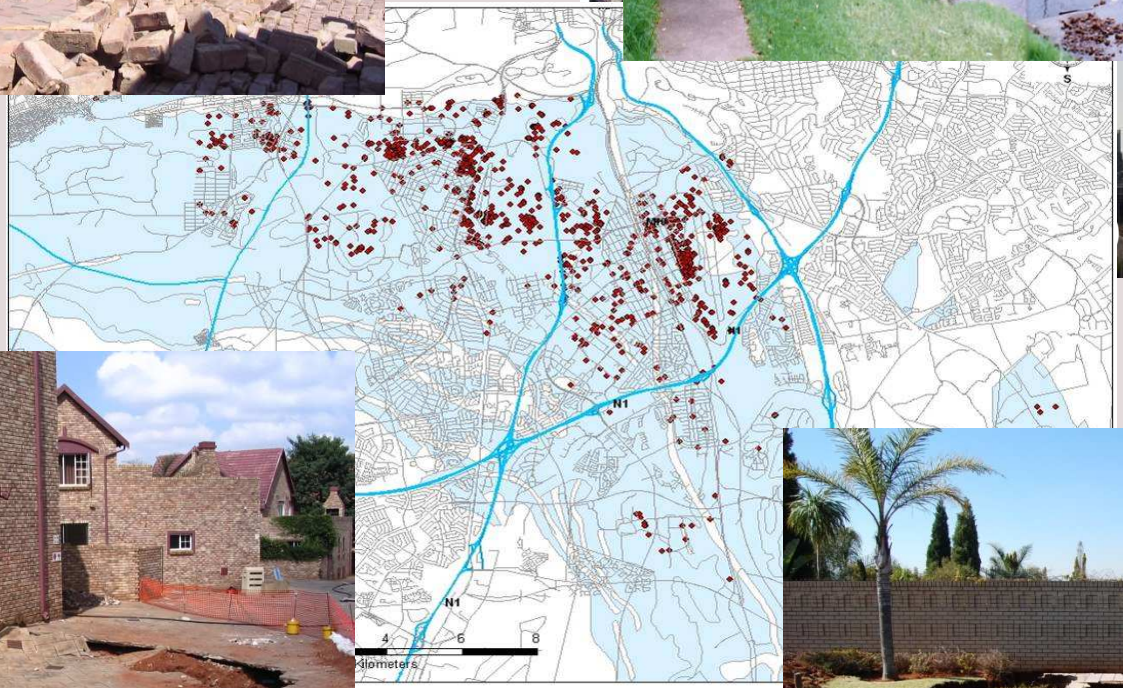

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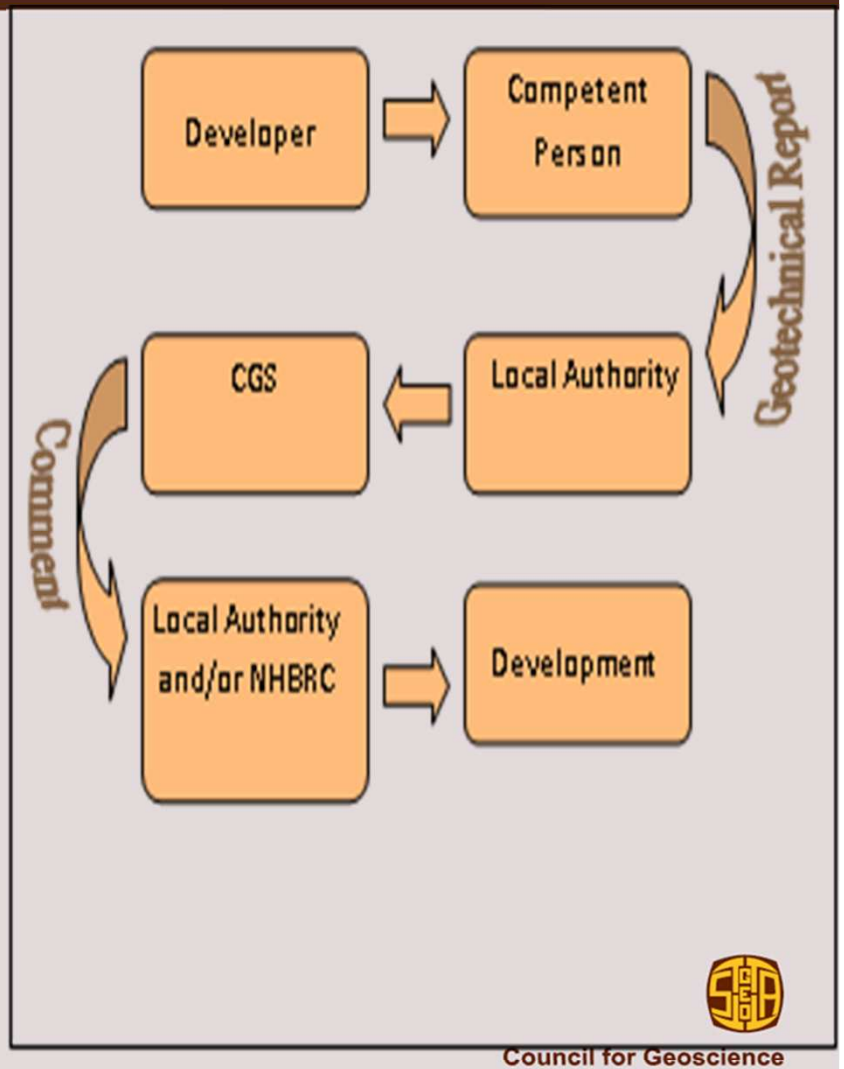
Land development processes on dolomite in SA

- 1965→ relevant provincial authorities established certain regulations in connection with township proclamation.
- The Township developer → appointed a Competent Person → Council for Geoscience (CGS) → Dolomite Stability reports → routinely submitted for review.
- Geoscience Act (100 of 1993) →CGS to advise government institutions and the general public on the 'judicious and safe use of the land', with respect to geological conditions.
- After reviewing → recommendations by the CGS → Local Authority and the National Home Builders Registration Council (NHBRC).



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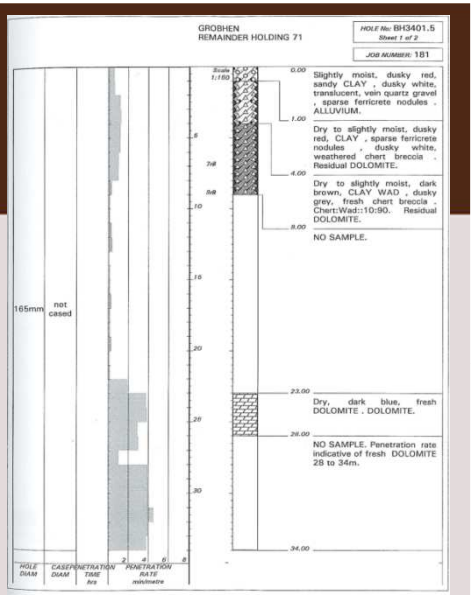
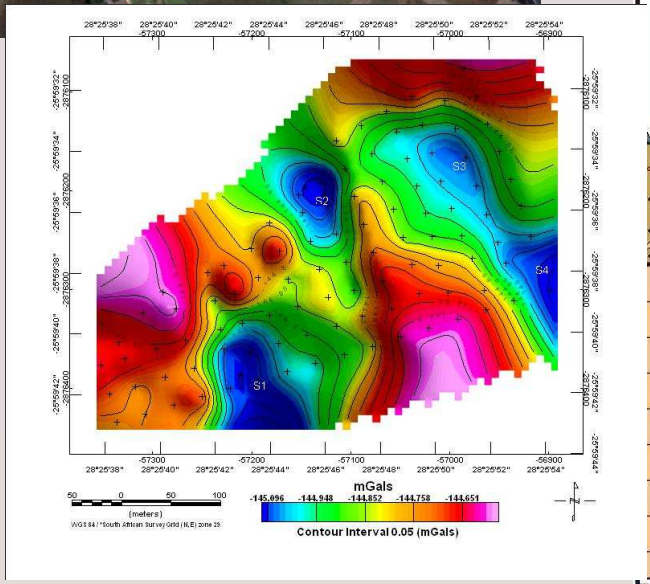
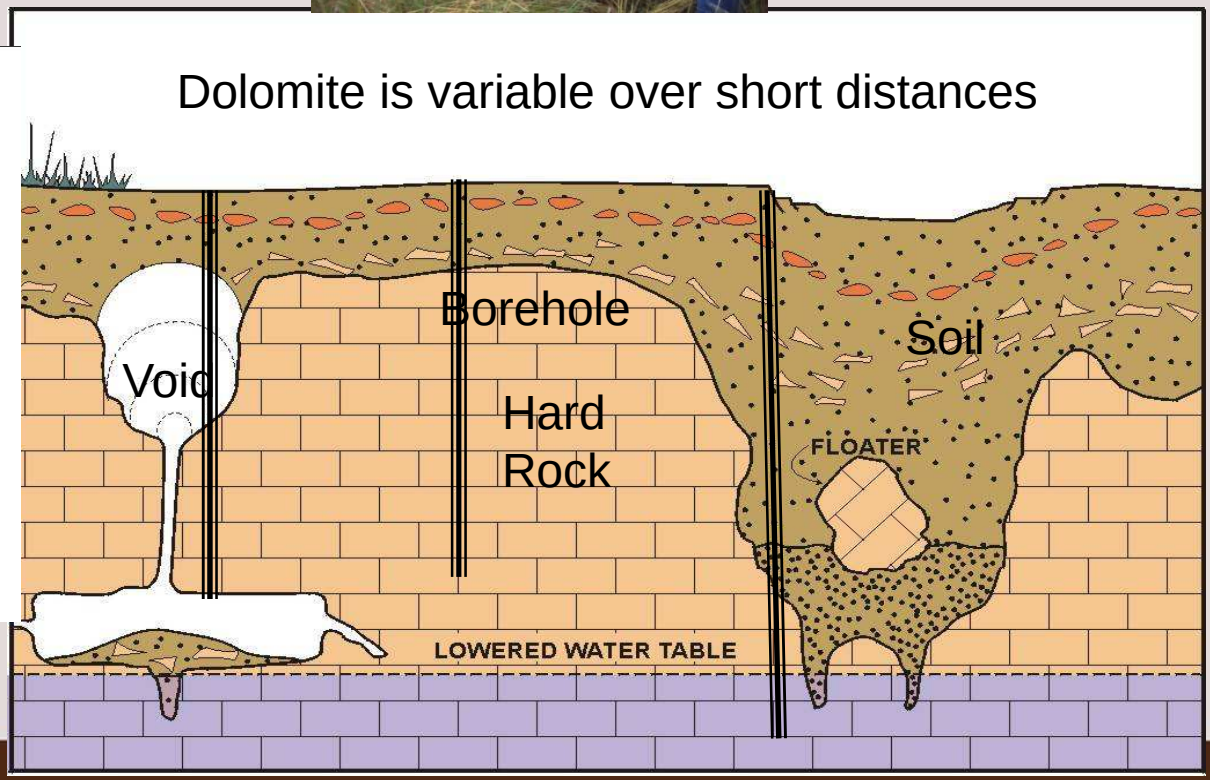
Principles of assessment





Dolomite is variable over short distances



Principles of assessment

- ‘Method of Scenario Supposition’

Inherent Hazard Class (IHC)	Small sinkhole (<2m)	Medium sinkhole (2-5m)	Large sinkhole (5-15m)	Very large sinkhole (>15m)	Subsidence Formation	Recommended development types
1	Low	Low	Low	Low	Low	All types of residential (limited density), commercial and industrial development.
2	Medium	Low	Low	Low	Medium	All types of residential (limited density), commercial and industrial development.
3	Medium	Medium	Low	Low	Medium	Selected residential development (limited density), commercial or light (dry) industrial development.
4	Medium	Medium	Medium	Low	Medium	Selected residential development (limited density), commercial or light (dry) industrial development.
5	High	Medium	Low	Low	High	Certain selected residential may be considered, commercial and light industrial development.
6	High	High	Medium	Low	High	No residential development. Selected commercial or light industrial development may be considered. Expensive foundation designs may be necessary.
7	High	High	High	Medium	High	No residential development. Selected commercial or light industrial (dry) development only. Special design criteria. All surfaces sealed. Suitable for parkland.
8	High	High	High	High	High	No development.

Precautionary Measures & Risk Management

HDPE pipes

Stormwater canals

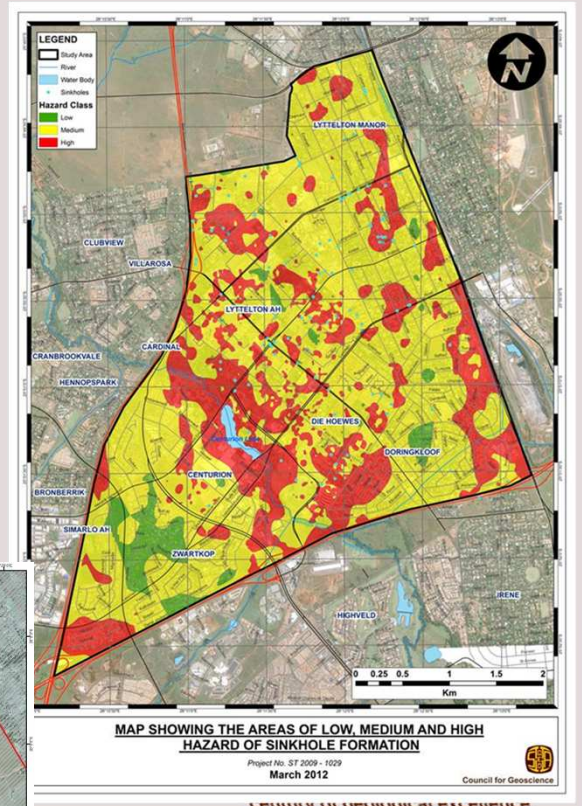
Gutters & downpipes

Aprons

Raft Foundations

CGS expertise

- CGS developed Guidelines; 2004, 2007.
- CGS has compiled dolomite databank, which contains Information for development
  - ~ 5000 reports
  - ~ 40 000 Boreholes logs
- Sinkhole surveys ~ 3000 sinkholes since 1960
- Dolomite research- hazard zonation maps
- Queries from public and private sector
- Guidance to Local Authorities
- Dolomite stability investigations
- develop expertise and consistency in report reviewing and guiding development.



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Latest developments in policy

South African National Standards (SANS 1936) now officially published, sets out requirements for the development on dolomite→ CGS was involved with development of SANS.

- SANS 1936 consists of the following parts, under the general title Development of dolomite land:
- *Part 1: General principles and requirements.*
- *Part 2: Geotechnical investigations and determinations.*
- *Part 3: Design and construction of buildings, structures and infrastructure.*
- *Part 4: Risk management.*

Geosciences Amendment Act

- Commencement of the Geoscience Act (Act No. 16 of 2010), 1 July 2012 with the exception of certain sections
- Regulations are being formulated.
- **NATIONAL ADVISORY AUTHORITY FUNCTION IN TERMS OF GEOHAZARDS.**
- **Dolomite**

So how safe is your house?

- To date there have been over 3000 sinkholes, which have only resulted in 39 deaths, but in billions of Rands of damage.
- Expensive investigations are required and carried out to attempt to mitigate effects, i.e. build on low, medium hazard ground rather than high hazard ground.
- Suitable foundation design
- Implementation of ongoing water precautionary and risk management measures
- There does appear to be a reduction in events affecting private stands, more on road reserves etc.
- Still no guarantee that nothing will happen to your house…

You can never rest in peace on dolomite…

THANK YOU

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