GEOLOGIC HISTORY

HOLOCENE
Evaporite Series (0-9 ka): trona with interbedded clays. The Magadi Soda Company at Lake Magadi currently mines the trona.

PLEISTOCENE
High Magadi Beds (9-23.7 ka): yellow-brown silts over laminated clays with fish remains. Deposited during a period of higher lake levels in both lakes Natron and Magadi.

Chert Series/Green Beds (40-96 ka): lacustrine chert and associated sediments up to 30 meters thick above Oloronga beds. Cherts are typically surrounded by a green matrix of erionite tuffs and pyroclastic silts, and may rise diapirically through the High Magadi Beds (Behr & R hricht 2000, Behr 2002).

Kedong Flood (100 ka): sand and fine gravel covering the Ol Tepesi plain. Evidence for a flood is given by Baker & Mitchell (1976), and the source was likely the sudden emptying of Kedong Lake to the north. These deposits are distinctive in satellite imagery, but can be quite thin. For example, south of the Magadi-Nairobi road, most exposures would be dominated by the lake beds of the Olorgesailie basin.

Orkaramatian Beds: white clayey lake sediments containing the remains of fish and gastropods. Deposition occurred near the Kirikiti fault, and sediments in the scarp rim suggest that the scarp was less than 20m high at the time of deposition (Crossley 1979).

Oloronga Beds (300-800 ka): yellow water-lain tuffs are the remnants of a larger and fresher lake (Crossley 1979). About 45 m in outcrop, these sediments overlie the Magadi Trachytes, and contain chert, kunkar limestone, and layers of carbonate boxwork (Baker 1958, Potts et al. 1988).

Ol Doinyo Nyokie (0.66 - 1 Ma): trachytic ashes and obsidian erupted from a small cone. Chemical compositions indicate Nyokie may be related to the Magadi trachytes (Baker 1975), and may also be the source for the Olorgesailie tephra (Deino & Potts 1990).

Olorgesailie Lake Beds (0.2-1.2 Ma): diatomaceous, tuff and gravel beds of the Olorgesailie basin. The Olorgesailie Formation has been divided into 14 Members (0.5-1Ma). The youngest lake deposits from 0.22 Ma (Deino & Potts 1990) were designated part of the Olkesiteti Formation (not distinguished here) by Brooks et al. (2007).

Plateau/Magadi Trachyte (0.8-1.4 Ma): fine grained, peralkaline flood trachyte with a medium green to brown-grey matrix, and feldspar phenocrysts up to 0.5cm. This prominent trachyte is found between Lake Natron and Suswa, and is one of the several expansive "flood trachytes" that cover the rift floor.

Ol Tepesi Basalts (1.4-1.65 Ma) and Benmoreites (1.42Ma): these two formations were distinguished by Baker & Mitchell (1976) from the Ol Keju Nero and Singaraini basalts based on age. The benmoreite flow is at least 150m thick and features distinctive tabular and rhombic feldspar phenocrysts in a granular matrix.

N. Kordjya Trachyte: (1.45-1.7 Ma): trachytes with abundant phenocrysts up to 2 cm in size, that were previously mapped by Baker (1958) as "Orthophyre trachyte". These trachytes are intercalated with upper members of the Kordjya basalt and have similar thickness and surface textures as the Ewaso Ngiro trachyte (Crossley 1979).

Ol Keju Nero (Nyeru) Basalts: (1.65-1.79?): olivine and augite basalts erupted as 5 flows totaling 85m thick. The original mapped extent was subdivided by Baker and Mitchell (1976) to recognize the Ol Tepesi flows. The age, based on the assignation to the Gilsa Normal polarity event, may need to be reassessed as the Gilsa is now known to be younger (Channell et al. 2002). Either the maximum age for the overlying Ol Tepesi basalt is too old, or the Ol Keju Nero basalts belong to the Olduvai subchron.

Kordjya Basalt: (1.7-2.2 Ma): basalt with rare plagioclase phenocysts up to 1.5 cm. At least nine flows were erupted from minor volcanic centers and fissures.The Kordjya basalts can be traced under the Plateau Trachyte as far as the western edge of the Magadi trough (Crossley 1979).

Leshuta Trachyte: localized trachyte flow that was erupted into the lake created when the Ewaso Ngiro trachyte dammed the Lengitoto River (Crossley 1979).

Ewaso Ngiro Trachyte (2-2.2 Ma): peraluminous trachyte with abundant phenocrysts up to 2 cm. This trachyte was erupted as a single thick flow against the Lengitoto fault scarp which it locally overtopped. This flow was previously mapped by Baker (1958) as "Orthophyre trachyte".

Mosiro Trachyte (1.9 - 2.3 Ma): Comenditic trachytes with radial feldspar clusters (glomeroporphyritic texture). Similarities with the Limuru Trachytes in texture, age, and geochemistry, led Baker et al. (1988) to correlate these formations.

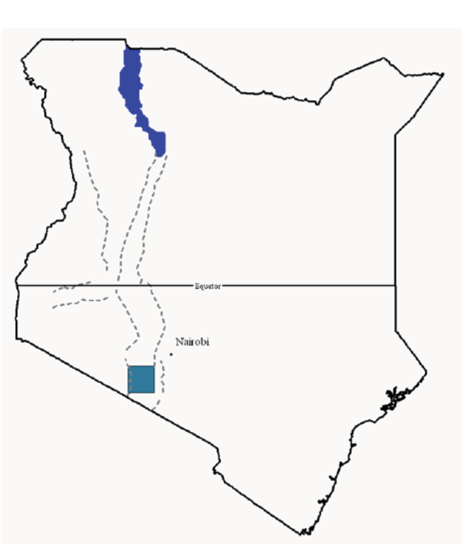
Singaraini Basalt (2.31-2.33 Ma): olivine basalts with occasional, small, feldspar phenocrysts. Five flows are exposed in a fault scarp, all have normal magnetic polarity, and outcrops are bouldery. See Baker and Mitchell (1976) for a discussion regarding previous correlations and dating of this formation.

Olorgesailie (2.2-2.7 Ma): central volcano that produced trachytes, augites, basalts and agglomerates. Nepheline-rich rocks are found near the summit. Related rocks exposed in the Kajiado area may be closer to 6 Ma (Baker et al. 1971).

PLIO-MIOCENE
Kirikiti Basalts (2.5-3.1 Ma): olivine basalts with rare plagioclase phenocrysts found in the western section of the map along the Nguruman escarpment. See Crossley (1979) for a discussion of issues regarding previous age dates for these basalts.

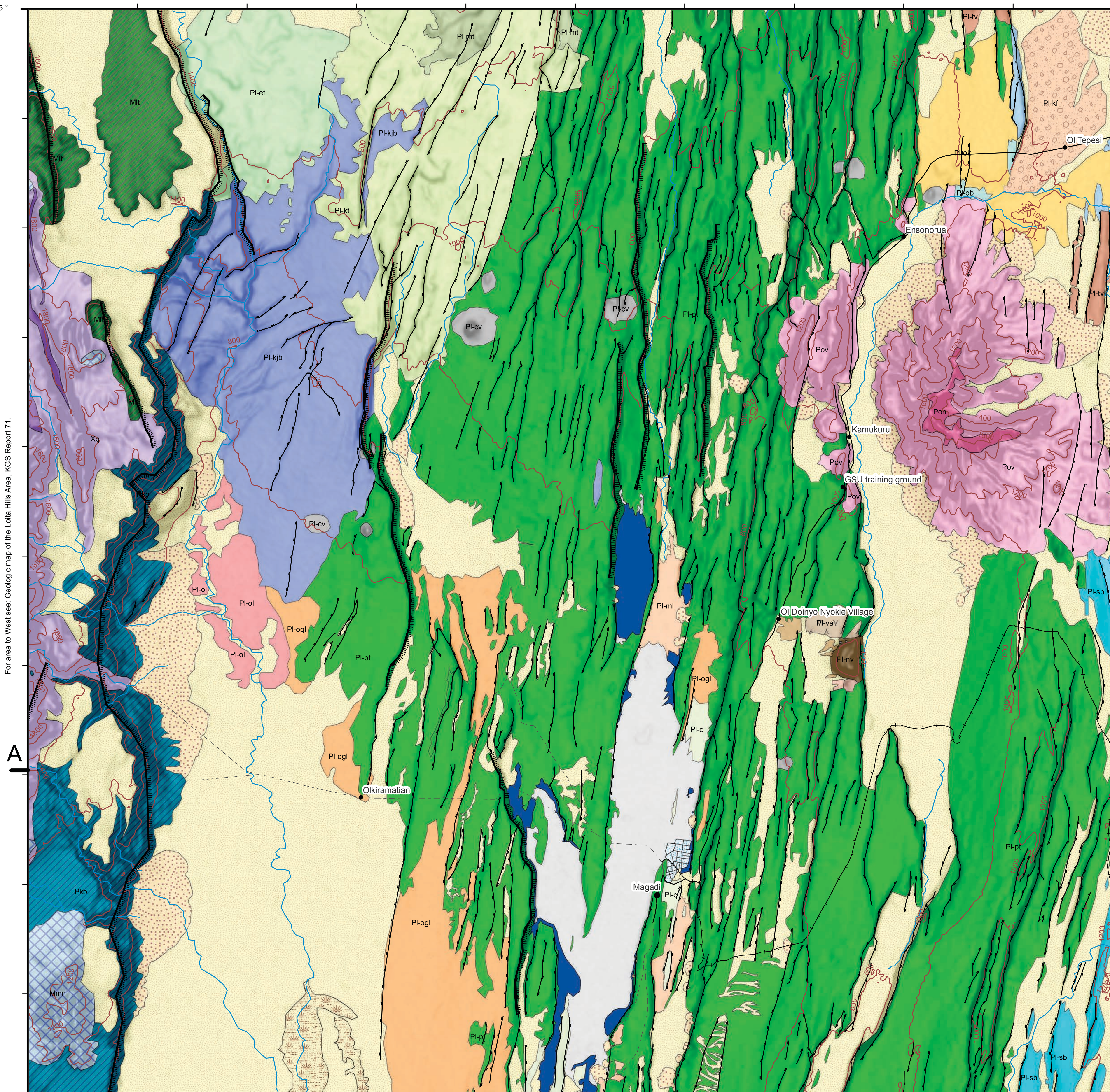
Lengitoto Trachyte: (5.0-6.9 Ma) peralkaline, comenditic, trachytes erupted onto the floor of the early rift (Crossley & Knight 1981). Samples indicate normal magnetic polarity (Crossley 1979).

BASEMENT SYSTEM:
The Precambrian metamorphic rocks exposed here are thought to represent sediments that were altered during the closure of the ancient Mozambique ocean (Nyamai et al., 2003). K-Ar dates on biotite place the cooling and uplifting of these rocks in the Cambrian.



Above: Location of presented geologic map (grey-square) in relation to the major rift bounding faults and Lake Turkana.

Geology of the Magadi Area, Kenya



0 5 10 20 30 Kilometers

N
W
E
S

Legend

Sediments

Holocene

- Trona
- Alluvial fan
- Lacustrine Sediments

Pleistocene

- Pl-ml' High Magadi Pebble Beds
- Pl-ml High Magadi Beds
- Pl-c Magadi Green Beds
- Pl-kf Kedong Flood
- Pl-ogl Oloronga Lake Beds
- Pl-ol Orkaramatian Lake Beds

Pleistocene: Calabrian

- Pl-okl Olorgesailie Lake Beds

Pleistocene

- Pl-cv Cinder cones

Nyokie

- satellite lava
- satellite
- ash flow
- Pl-na welded tuffs
- Pl-nv Ol Doinyo Nyokie

Pleistocene: Calabrian

- Pl-pt Magadi Trachyte
- Pl-tv Tepesi Benmoreite
- Pl-tb Tepesi Basalt
- Pl-ob Ol Keju Nero Basalt
- Pl-kt North Kordjya Trachyte

Pleistocene: Gelasian

- Pl-let Leshuta Trachyte
- Pl-kjb Kordjya Basalt
- Pl-mt Mosiro Trachyte
- Pl-et Ewaso Ngiro Trachyte
- Pl-sb Singaraini Basalt

Plio-Miocene

- Popn Olorgesailie Nephelinite
- Pov Olorgesailie
- Pkb Kirikiti Basalt
- Mlt Lengitoto Trachyte
- Mmn Melanephelinites

Metamorphics

- Xq Quartzites
- Xmg Muscovite schists

Volcanics

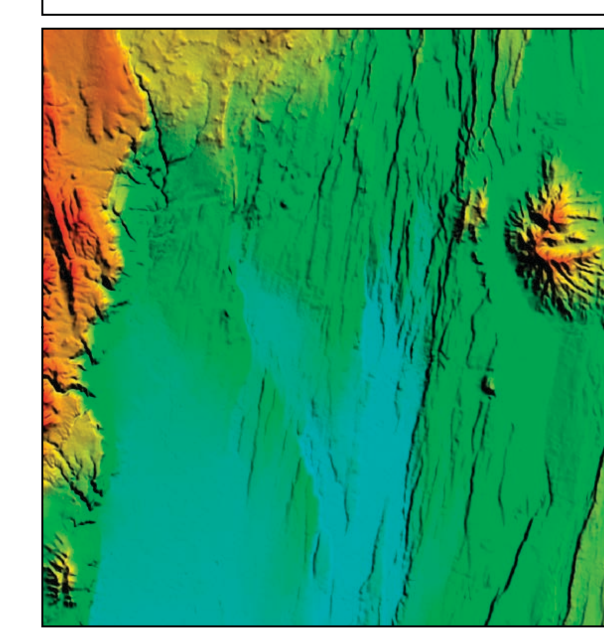
- faults-large
- faults-small
- rivers
- 200m-contour
- City
- Town
- Village
- Road-major
- Road-minor
- Road-track
- rail
- salt-ponds
- Lake, ephemeral
- Springs
- Swamp

PALEONTOLOGY
The lake beds at Olorgesailie host an impressive accumulation of stone hand axes, and Potts et al. (2004) announced the discovery of a partial hominin skull from this locality. Early, Middle, and Later Stone Age artifacts are known from the Oloronga beds, the Olkesiteti sediments (Olorgesailie Basin), and High Magadi beds respectively (Shipman et al. 1983, Potts and Deino 1995, Barthelme et al. 2003).

STRUCTURE
Numerous "grid faults" cut the rift floor and run roughly parallel to each other through the center of the rift. These faults may coincide in time with the deposition of the Oloronga lake beds (LeGall et al. 2008). The large Nguruman escarpment defines the western rift boundary in this area, and seismic data indicate 3.5 km of rift fill is adjacent to this fault (Simiyu & Keller 2001).

WATER RESOURCES
The Magadi region receives about 475 mm of precipitation per year, making this a semi-arid climate. While flooded during the two rainy seasons (Mar-Apr and Oct-Nov), the trona is exposed the rest of the year. Fresh water for the town of Magadi is brought in via a pipeline from the Nguruman Escarpment. While there are perennial springs around Lake Magadi, they are shallow and alkaline.

GEOTHERMAL PHENOMENA
Lake Magadi is surrounded by hot springs ranging from 32°C to 83°C, and there has been some investigation into locating a



Colored DEM with hillshade for the mapped region.
Elevation range from 596 - 1954m (cyan - red).

Reference map showing the source maps and their geographic coverage

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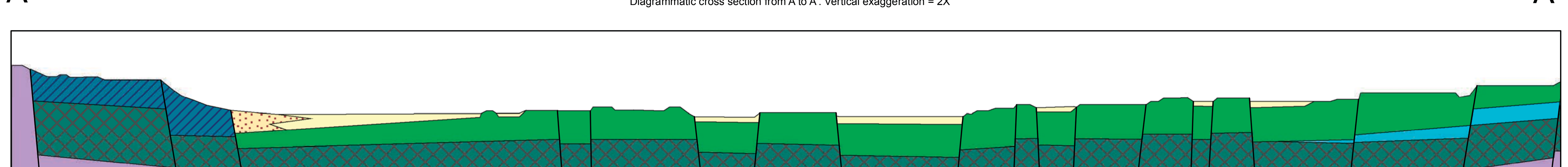
Cross Section Legend

- Alluvial fan
- Lacustrine Sediments
- Magadi Trachyte
- Singaraini Basalt
- Kirikiti Basalt
- Plio-Miocene
- Metamorphic

A A'

Diagrammatic cross section from A to A'. Vertical exaggeration = 2X



Geological Map of the Southern Kenya Rift

contour interval 200m

Location: Magadi, Kenya 36.0 E - 36.5 E, 1.5 S - 2.0 S	A. Guth, J. Wood (2013)
Coordinate System: Geographic WGS84	Michigan Technological University

DIGITAL MAP AND CHART SERIES DMCH016
DOI: 10.1130/2014.DMCH016.S3
Published by The Geological Society of America, Inc., 3300 Penrose Place • P.O. Box 9140, Boulder, Colorado 80301-9140