

THE UNITED REPUBLIC OF TANZANIA



3. REPORT ON THE STATE OF CONSERVATION OF NGORONGORO

CONSERVATION AREA (C/N 39)

- a. **State Party:** United Republic of Tanzania
- b. **Name of World Heritage Property:** Ngorongoro Conservation Area
- c. **Geographical Coordinates:** 3o 15'S, 35o 30'E
- d. **Date of Inscription on the World Heritage List:** 1979 as Natural World Heritage and 2010 as Mixed World Heritage Site
- e. **Organization responsible for the preparation of the report:**

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Date of Submission of Report: 1st December 2016

Signature on Behalf of State Party:

A handwritten signature in black ink, appearing to read 'Moshi M. Kimizi'.

Dr. Moshi M. Kimizi (PhD)

SECRETARY GENERAL a.i.
UNESCO NATIONAL COMMISSION
OF THE UNITED REPUBLIC OF TANZANIA

EXECUTIVE SUMMARY

Summary of Report on the State of Conservation of Ngorongoro Conservation Area (c/n 39) for submission to the World Heritage Committee on 1st December 2016.

Ngorongoro Conservation Area (NCA) reports progress made in addressing the recommendations of the 2012 Reactive Monitoring Mission and decisions of the COM 7B.61 adopted at its 39th session.

NCAA developed scheme of services and got approval to employ further human resources needed to adequately suffice responsibilities and duties expected in the Department of Cultural Heritage in April 2017, It is also worth to report that development of management plans for cultural assets within NCA are in good progress and will be incorporated in the property General Management Plans, currently under review.

As requested by Operational guidelines, all development projects are strictly subjected to EIA and HIA in accordance with Tanzanian Environmental guidelines and IUCN's & ICOMOS Guidelines. The property will continue to share these reports with WHC.

It may be recalled that, Feasibility study, that includes Environmental and Heritage Impact Assessment Studies have been completed for the section of Loduare – Golini and access to Olduvai site; the report has been shared with WHC in July 2016, NCAA awaits WHC recommendations and inputs for smooth operation of this activity.

NCAA further reports on accomplishment of the Heritage Impact Assessment for the construction of Laetoli Museum and associated facilities, efforts are underway to complete conservation and other necessary studies; The State party invites ICOMOS Advisory mission and international assistance in terms of expertise and Monetary terms for the preparation of the detailed report for the newly set of footprints discovered in 2015.

NCAA is continuing with dialogues and studies to holistically explore alternatives to address pressure from growing pastoralist activities by continuing sensitizations and encourage pastoralist to voluntarily relocate to the developed land outside NCA (Jema Village in Ngorongoro district) and other parts of Tanzania while working with UNESCO and other partners such as District council, reputable NGOs and CBOs to re define the future of NCA amidst growing human – wildlife conflicts within NCA.

The property continues to implement State Party's 2012 Anti – Poaching and Illegal Wildlife Trade strategy with success such that it has recorded zero case of Elephant poaching within the reporting period.

NCAA is updating its 10-year Management Plans with important additions of the road strategy and plans for managing cultural Heritage assets within NCA.

The site maintains an effective monitoring plan for safeguarding the state of conservation and it intends to comply with the direction of the technical and regulatory documents for management of site presented by WHC and Advisory bodies for review.

Response from the State Party to the World Heritage Committee's

Decision 39 COM 7B.34

The World Heritage Committee,

1. **Having examined Document WHC-15/39.COM/7B.Add,**
2. **Recalling Decisions 34 COM 8B.13, 36 COM 7B.35 and 38 COM 7B.61, adopted at its 34th (Brasilia, 2010), 36th (Saint-Petersburg, 2012) and 38th (Doha, 2014) sessions respectively,**
3. **Welcomes, the establishment of the Cultural Heritage Department within the Ngorongoro Conservation Area Authority (NCAA) and encourages the State Party to continue allocating adequate resources for its long-term operation;**

Response

Complied, the department continues to get priority in terms of resource allocation during annual budget plans for the NCAA; the department developed and got approval of its scheme of services to continue with further recruitment in April 2017.

4. **Notes the decision to relocate the lodge development projects from the crater rim to other areas that the State Party considers less ecologically sensitive, and requests the State Party to submit an Environmental Impact Assessment (EIA) on the projects including a specific assessment of the impacts of the proposed development on the Outstanding Universal Value (OUV) of the property, as recognized under all its inscription criteria, in accordance with IUCN's World Heritage Advice Note on Environmental Assessment and ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage properties (HIAs), and inform the World Heritage Centre of any further changes or developments that may negatively impact the OUV of the property, in line with the Paragraph 172 of the *Operational Guidelines*;**

Response

Complied, all development projects, including hotels, are directed to less ecologically sensitive areas and are subjected to EIA and HIA in accordance to Tanzanian Environmental regulations, IUCN's and ICOMOS guidelines.

5. **Urges the State Party to mobilize necessary funds to complete the initiated work on the EIA, including an HIA, for the proposed road surfacing options, including a specific assessment of impacts on OUV in accordance with the IUCN World Heritage Advice Note on Environmental Assessment, and the ICOMOS Guidance on HIAs for Cultural World Heritage properties, and to submit it to the World Heritage Centre, for review by the Advisory Bodies;**

Response

EIA and HIA works have been completed on the part of the road (Loduaire – golini section and access road to Olduvai site), the report has been submitted to NEMC and WHC in July 2016. The

studies have been done in accordance with Tanzanian Environmental regulations, IUCN's and ICOMOS guidelines.

6. **Also welcomes the continued efforts to maintain an open dialogue process with all stakeholders through the “People and Wildlife” project with UNESCO and other efforts to address sustainable livelihood and wildlife protection with stakeholders and to reduce the impacts of livestock grazing and increased population pressure on the OUV of the property, and also requests a holistic sustainable strategy for the property be developed to address all property issues in close cooperation with the different stakeholders and in particular the resident communities;**

Response

The NCAA has held about four open dialogue meetings with key stakeholders, including the local communities on sustainable livelihood and wildlife protection of the property. Further open dialogues, which are also aimed at addressing a directive by the State's Prime Minister's Office on sustainability of the property's ecosystem are on progress. In addition, preliminary report on “Ngorongoro Conservation Area Situation Analysis and Tourism Needs Assessment, which will be integrated into the Holistic sustainable strategy for the property is in its final stages. Furthermore, efforts to secure funds for undertaking assessment of other six areas of critical importance to the sustainability of the property are going on.

7. **Further welcomes the creation of the international Advisory Committee for the Laetoli Hominid Footprints Conservation Project, as well as the feasibility study commissioned on the Laetoli Museum project, and further requests that a copy of the Feasibility Study, the project implementation document and cultural heritage impact assessment be submitted to the World Heritage Centre, for review by the Advisory Bodies;**

Response

Feasibility studies for the Laetoli Museum Project needs science driven patience, NCAA has completed Heritage Impact Assessment (report hereby attached); other reports and documents related to the project will be submitted as they become available.

8. **Also encourages the State Party to seek International Assistance for the preparation of a detailed report on the new set of footprints discovered at the site in October 2014, and further encourages the State Party to consider inviting an ICOMOS Advisory mission to address the conservation needs of both sets of footprints;**

Response

Currently, NCAA is conducting a number of Feasibility Studies along with continuing studies at Laetoli site. The State Party intends to apply for international Assistance for the preparation of a detailed report on the new set of footprints discovered and will invite an ICOMOS Advisory mission in the course of 2017.

9. **Requests furthermore the State Party to submit updated information on any further progress achieved in addressing the threat of poaching, particularly affecting elephant populations as well as progress made in implementing the outstanding recommendations of the 2012 Reactive Monitoring mission to the property, including development of an invasive species control strategy, with particular reference to Parthenium weed (Parthenium hysterophorus);**

Response

While implementing the State Party's 2013 National Anti- Poaching and Illegal Wildlife Trade Strategy, the property established two new Rangers posts in the poaching prone areas and

increased the frequency of patrols by 10%. These efforts have resulted in total elimination of elephant poaching within the reporting period.

The property added **Parthenium weed (Parthenium hysterophorus)** in its 2011 invasive Alien Plants Strategic Management plan that is in current use. The **Parthenium weed (Parthenium hysterophorus)** has been controlled and is no longer a threat to the property.

10. **Requests moreover the State Party to submit to the World Heritage Centre, for review by the Advisory Bodies, the updated 10-year general management plan, which should also include the following elements:**

a) **the forthcoming sustainable tourism development strategy for the Ngorongoro Conservation Area,**

b) **the road strategy,**

c) **general management plans for the cultural assets within the Ngorongoro Conservation Area;**

Response

NCAA has started reviewing holistically its General Management Plans as well as Corporate Strategic Plan to include all emerging issues and challenges such as sustainable tourism development strategy, road strategy and plans for managing cultural sites within NCA. The holistically revised draft GMP will be submitted to the WHC for review upon completion.

11. **Finally requests the State Party to submit to the World Heritage Centre, by 1 December 2016, an updated report, including a 1-page executive summary, on the state of conservation of the property and the implementation of the above, for examination by the World Heritage Committee at its 41st session in 2017.**

Response

Complied, the state of conservation report of the property is hereby submitted.

CULTURAL HERITAGE IMPACT ASSESSMENT REPORT
NGORONGORO CONSERVATION AREA AUTHORITY
(NCAA)
LAETOLI PALEOANTHROPOLOGICAL SITE

Project Brief for the Proposed Laetoli Hominin Footprints Museum

Proper Name of the WHS property: Ngorongoro Conservation Area. The area of Interest (AOI) is Laetoli Paleoanthropological Site (particularly the hominin footprints Site G).

Geographical Coordinates: Ngorongoro Conservation Area is 3°11' South and 35°26' East in northern Tanzania, while Laetoli lies within the NCA between Latitude 3° 11' - S3°15' South and Longitude 35°09' - 35°13' East.

Date of Inscription: Ngorongoro Conservation Area was inscribed as a World Heritage Site under natural criteria (vii), (viii), (ix), and (x) in 1979, and under cultural criterion (iv) in 2010 serving multiple-use as a natural and cultural heritage site.

Contract No AE/055/2012-13/HQ/C/14: Consultancy Services for Design, Construction and Supervision of Laetoli State of Art Museum.

Date of the CHIA Reports: Draft Report - July 19, 2015; Project Brief Report: June 2016,

CHIA Report prepared by: Prof. Fidelis T. Masao, P.O. Box 70566, Dar es Salaam, Tanzania. Email: fitman@udsm.ac.tz or taliwawamasao@yahoo.com; Tel. +255 754 274277 or +255 784 274277

CHIA Report prepared for: Ngorongoro Conservation Area Authority, P.O. Box 1, Ngorongoro Crater, Arusha, Tanzania to be presented to the Director General, National Environment Management Council (NEMC), Dar es Salaam, Tanzania.

Disclaimer: Draft CHIA Report was presented for review and discussion at the Laetoli Hominin Footprints Museum Project International Consultative Meeting, which was held in Karatu, Arusha 22 -26 November, 2014 in purviews of UNESCO Draft Decision: 34 COM 8B.14 article 5. The Report was peer-reviewed by a team of experts including: Dr. Joseph King (ICROM), Dr. Moshi M. Kimizi and Dr. Erick Kajiru (UNESCO National Commission of the United Republic of Tanzania), Dr. Harvey Johnson (Heritage Division Office, Environment and Heritage, South Wales, Australia), Mr. Matthias Maluck (State Archaeological Department of Schleswig-Holstein, Germany), Dr. Godwin Mollel (Apex Geosciences Ltd, Canada), Prof. Audax Z.P. Mabulla (National Museum of Tanzania) Prof. Charles Musiba (Department of Anthropology, University of Colorado Denver, USA), and Mr. Donatius Kamamba (Antiquities Division, Ministry of Natural Resources and Tourism, Tanzania).

1. Non-technical Summary

Acknowledging that the primary responsibility of conservation, preservation, safeguarding and sustainable use of Tanzania's cultural heritage resources require full-time commitment of all Tanzanians, who are the primary custodians of all these assets. The need to manage and to protect these resources is paramount to the nation and the communities surrounding them as physical and human-induced forces continue to damage the paleoanthropological and archaeological assets that document the historical events that shaped humanity's existence in Tanzania. A drastic measure to preserve and protect Tanzania's cultural heritage in accordance with the World Heritage Convention, the Tanzanian Antiquities Cultural Heritage Policy Strategy of 2013-2017 (with its objectives and stated activities to enhance conservation, protection and management of cultural heritage in Tanzania) is being considered by the NCAA. Based on the 2012-2017 UNESCO Action Plan for the African Heritage, particularly objectives 2 - 5 (Sec. 36 COM 10A), Tanzania identified Laetoli paleoanthropological site as a national cultural heritage priority and mandated the NCAA to implement a long-term conservation roadmap, which will focus on sound conservation strategies while promoting science, education, and sustainable use of the asset to empower and enable communities surrounding it.

Ngorongoro Conservation Area Authority (NCAA), which attained full custodianship of the Laetoli and Olduvai Gorge paleoanthropological sites in 2013, is in the initial preparations of implementing a conservation plan at Laetoli paleoanthropological site. The plan is two-phased, with an initial proposed construction of a research and education facility to facilitate a comprehensive and long term data gathering process that will be used in determining better conservation and preservation measures of the hominin footprints at Site G. As a paleoanthropological heritage resource with scientific and cultural attributes, the integrity of the Laetoli hominin footprints and its Outstanding Universal Value (OUV) is not only threatened by current poor conservation conditions but also natural and human activities, including overgrazing, sediment erosion and uncoordinated, narrowly-focused scientific research with no future sound conservation and preservation plans. Most of the research that has taken place at Laetoli had no broader impacts on long term conservation or local communities with no contribution to better understanding of the importance of Laetoli paleoanthropological site at national and local community levels.

Cognizant to these issues, the proposed NCAA conservation project at Laetoli, which is the first of its kind in Eastern Africa, intends to create a science and education (including an onsite museum) complex that will provide coordinated research and data-gathering that will be used to determine the best conservation methods for the Laetoli hominin footprints trackway at site G. The proposed facility will not only provide cultural tourism attraction but also education opportunities to Tanzanians and the international community. The proposed complex will be designed to be an environmentally friendly, culturally sensitive, and scientifically appropriate to cater for the 21st century conservation challenges of cultural heritage in Tanzania while at the same time enhancing the OUV of Laetoli paleoanthropological site, especially the scientific knowledge that will enrich our understanding of humanity's evolutionary trajectory.

The project, which is slated to be implemented in two phases, starting with the construction of a visitor's center, entrance, research and training compounds and education facility (Phase 1), which will facilitate an intensive scientific data gathering on geochemical, geomorphological, stratigraphical, lithological, and sedimentological nature of the fossil footprints bearing sediment layers at Site G. The coordinated research at the facility will provide a baseline data that will become a platform for determining the best conservation strategies, best practices and best sustainable use of the Laetoli hominin footprints site. A

process, which eventually will allow for an onsite museum to be constructed (Phase 2) at Site G, which will provide the best presentation solution of the hominin footprints as part of a human origin exhibit that will present the story of the Laetoli print makers in the broader context of hominin evolution, adaptability, and the Earth's geological history. The proposed project (especially the facilities design and construction) is committed to fully utilizing of natural materials that are easily available at Laetoli and within the NCAA, thus reducing its carbon footprint while at the same time guaranteeing the integrity and the preservation of the outstanding universal values of the site. In fact, the proposed project will enhance the OUV of Laetoli paleoanthropological site by being able to provide coordinated research opportunities and better understanding of human origins and adaptability in East Africa.

Under the National Laws and Regulations of the United Republic of Tanzania and the Antiquities Act, particularly the 2008 Policy, the Ngorongoro Conservation Area Authority, who is in this report a “**Client**”, is required to conduct a Cultural Heritage Impact Assessment (CHIA). The CHIA, which was conducted in June, September, October of 2014 and March of 2015 aimed at: assessing potential negative and positive impacts of the proposed project to both sub-surface and surface archaeological and paleontological heritage, recommend ways to mitigate or avoid, and/or reduce negative impacts to the Laetoli hominin footprints site G and the broader Ngorongoro World Heritage Site. A complete assessment of the area of interest (which will further be discussed in this document) also produced some major discoveries of new hominin and animal trackways, which are additions to the existing hominin footprints, and further provide detailed scientific information of the nature and gait patterns of Laetoli bipeds. The CHIA also became part of a comprehensive Monitoring Plan, which will be promoted in collaboration with the national regulatory authority (The National Environment Management Council, NEMC), it will guide the NCAA (the client/project developer) to implement the best heritage conservation practices and to avoid or adequately mitigate the identified negative impacts.

While this proposed project presents some clear challenges in terms of conservation and consolidation of the tuffaceous sediments, delicately preserving the 3.6 million years old hominin footprints, management and mitigation of potential adverse impacts from increased human presence and activities during construction and operation; the benefits of the proposed project outweigh the negative impacts and risks that have been identified in this Report. In fact, the proposed conservation effort will add value to the site, thus enhancing its OUV. Therefore, the consultant strongly recommends that this project be registered with the National Environmental Regulatory Authority (NEMC) for the ESIA and CHIA process that will afford permission for the proposed project to proceed in a timely manner.

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3. Background to the Cultural Heritage Assessment

3.1. Statement of Outstanding Universal Value (OUV) and Location of the Site

The Ngorongoro Conservation Area which is located at longitude 35°30'E and latitude 3°15'S covering an area of 8292 square kilometers in the northern volcanic highlands of Tanzania (Figure 1 in section S. a.), was inscribed as a World Heritage Site in 1979 under natural criteria (vii), (viii), (ix) and (x), and under cultural criterion (iv) in 2010. Its global importance and recognition stems from its rich and diverse fauna and flora, where its OUV is its grasslands and woodlands ecosystem that support very large and diverse flora and fauna populations, largely undisturbed by cultivation at the time of inscription. Equally exceptional are the archaeological remains and many sites of unrivaled archaeological and paleoanthropological milieus, where significant finds contributing to the scientific understanding of human origins have and continue to be discovered at sites such as Laetoli and Olduvai Gorge.

For more than 90 years, the paleoanthropological sites of Laetoli and Olduvai Gorge within the NCA had and continue to host some extensive scientific research on human origins, where a prolonged geological sequence covering the last four million years containing evidence of human evolution and adaptability have been unearthed. At Laetoli, the evidence includes: well preserved animal and hominin footprints (associated with the evolution of upright posture and bipedal gait), and fossil fauna remains (including hominin remains attributed to *Australopithecus afarensis*, *Paranthropus aethiopicus* and early *Homo sapiens*). Stone tools of an Early Middle Stone Age industry have been recovered from the uppermost Ngaloba Beds at Laetoli, dating to 200 Kya. At Olduvai Gorge, a sequence of diverse, evolving hominin species ranging from *Australopithecus boisei* (previously known as *Zinjanthropus boisei* to some early members of the genus *Homo* (*Homo habilis*, *Homo erectus* and *Homo sapiens*) have been documented. Olduvai's geological sequence holds the only unbroken archaeological record in the World, ranging from Oldowan, Acheulian, Middle Stone Age to Later Stone Age toolkits, documenting a time span from 2 million to 45 Kya. Furthermore, discoveries of an archaic form of *Homo sapiens* fossil remains at Lake Ndutu associated with a developed Acheulian toolkit, and modern human remains in the Ngorongoro crater associated with stone bowls, document the Mid/Late Pleistocene lithic variability and developments and the transition to the use of bow and arrows and later on iron technology. The occurrence of Maasai *Olpul* rock art clearly demonstrates the continuous use of NCA landscape from 4 million years ago to the present. Consequently, the overall landscape of the NCA, is considered as a cultural landscape with great potentials of revealing more evidence concerning the rise and developments of anatomically modern humans, modern behavior and human ecology in East Africa.

Accordingly, the statement of integrity of NCA reflects the integrity for its natural values at the date of inscription in 1979, and for its cultural value in 2010 as clearly described in the following criterion:

Criterion (iv): Ngorongoro Conservation Area has yielded an exceptionally long sequence of crucial evidence related to human evolution and human-environment dynamics, collectively extending from four million years ago to the beginning of this era, including physical evidence of the most important benchmarks in human evolutionary development. Although the interpretation of many of the assemblages of Olduvai Gorge is still debatable, their extent and density are remarkable. Several of the type fossils in the hominin lineage come from this site. Furthermore, future research in the property is likely to reveal much more evidence concerning the rise of anatomically modern humans, modern behavior and human ecology.

Criterion (vii): The stunning landscape of Ngorongoro Crater combined with its spectacular concentration of wildlife is one of the greatest natural wonders of the planet. Spectacular wildebeest numbers (well over 1 million animals) pass through the property as part of the annual migration of wildebeest across the Serengeti ecosystem and calve in the short grass plains which straddle the Ngorongoro Conservation Area/Serengeti National Park boundary. This constitutes a truly superb natural phenomenon.

Criterion (viii): Ngorongoro crater is the largest unbroken caldera in the world. The crater, together with the Olmoti and Empakaai craters are part of the eastern Rift Valley, whose volcanism dates back to the late Mesozoic / early Tertiary periods and is famous for its geology. The property also includes Laetoli and Olduvai Gorge, which contain an important paleontological record related to human evolution.

Criterion (ix): The variations in climate, landforms and altitude have resulted in several overlapping ecosystems and distinct habitats, with short grass plains, highland catchment forests, savanna woodlands, montane long grass plains and high open moorlands. The property is part of the Serengeti ecosystem, one of the last intact ecosystems in the world which harbors large and spectacular animal migrations.

Criterion (x): Ngorongoro Conservation Area is home to a population of some 25,000 large animals, mostly ungulates, alongside the highest density of mammalian predators in Africa including the densest known population of lion (estimated 68 in 1987). The property harbors a range of endangered species, such as the Black Rhino, Wild hunting dog and Golden Cat and 500 species of birds. It also supports one of the largest animal migrations on earth, including over 1 million wildebeest, 720,000 zebras, and about 350,000 Thompson and Grant gazelles, just to name a few.

3.2. Laetoli Paleoanthropological Site

The paleoanthropological site of Laetoli lies in the southwestern plains in the western zone of the Ngorongoro Crater Volcanic Highlands. The site, which spans from the Pliocene to the Pleistocene epoch is characterized by fossiliferous sediments, draping an approximately 100 square kilometers' area between longitude 35°09' - 35°15' East and latitude 3° 11' - 3°15' South on the western flanks of the Eyasi plateau. Laetoli is located at the divide between the Olduvai and Lake Eyasi watersheds on the southeastern edge of the Serengeti Plains and about 30 km south of Olduvai Gorge (Figure 2 in section S. a.). Physiographically, the site covers the slopes and flood plain of the Garusi River. On either side of the Garusi River are undulated slopes known by the local Maasai inhabitants as *Lachani* on the left,

and *Alaanamrua* on the right. The elevation within the Garusi River bed gradually rises to the Ndolanya Hill on the west exposing some fossiliferous beds where a long sequence of Plio-Pleistocene through Holocene volcanoclastic sediment deposits overlying the basalt metamorphic rock can easily be distinguished (Figure 3 in section S. a.).

Laetoli area is known in the paleontological record since the 1930's through scientific reports of Kohl-Larsen expedition; in fact, Kohl-Larsen, while camping within the Garusi River Beds at Laetoli in 1934 unsuspectingly discovered the first *Australopithecus afarensis* specimens, originally attributed to *Meganthropus africanus* and or *Praeanthropus africanus*, also commonly known as the Garusi I and II hominins (Kohl-Larsen 1936, Muller-Beck 1977). The fame of Laetoli climaxed in 1976, with the discoveries of spectacular and well preserved fossil animal and hominin footprint trackways at site G by Mary Leakey and her co-workers associated with fossil fauna remains (Table 1) from at least 38 localities, including Locality 8 (Figure 4 in section S. a.), which is part of this CHIA report.

Table 1. List of fossil remains that have been identified at Laetoli's various paleoanthropological localities.

Taxa	No. of species/genera
Bovidae	22
Carnivora (all taxa)	24
Cercopithecidae	5
Elephantidae	2
Equidae	4
Giraffidae	4
Hominine	3
Leporidae	1
Pedetidae	2
Rhinocerotidae	2
Rodentia	22

Preserved in a layer of volcanic tuff and extending for a distance of 30 meters, the footprints were partially excavated by Dr. Mary Leakey's team in 1976. According to Leakey et al., (1987) and many other scientists, the hominin trackway represents the only currently available and earliest evidence of bipedalism in hominins dating to 3.6 million years ago. The footprints are putatively recognized as those of the hominin species *Australopithecus afarensis*. The trackway was formed short after a volcanic eruption, when fine ash originating from Satiman volcano in the east, was blown and settled in the area followed by short rains that consistently liquefied and solidified the ash into a consistent cement-like soft sediments where at least four hominin individuals and other animals and birds traversing the landscape left behind their footprint impressions. A subsequent ash-fall from another volcanic eruption covered the hardening cement-like sediments, preserving them for the 3.6 million, until when they were accidentally discovered in 1976. It was previously thought that the hominin prints were left behind by three individuals, but recent re-analysis of the prints in 2011 suggest that four individuals may have left those prints behind, with three individual overprinted prints and one separate individual footprints of similar statures. Leakey and her co-workers (1987) meticulously recorded the

prints and made molds and plaster replicas of the trackway, and then reburied the trackway, using fine sand, cotton soil, and lava boulders.

Although Laetoli hominin footprints have extensively been studied, the interpretation of the printmakers is yet to be settled as it ranges from its taxonomic attribution to *Australopithecus afarensis* – like hominin (Robinson 1987; White & Suwa 1987; Tuttle 1987, 1992), to a more human-like *Australopithecines* (Musiba et al. 2012; Medrum et. al. 2011; Raichen et al. 2010, 2008; Tuttle 2008; Berge et.al. 2006; Day & Wickens 1980; White 1980). The hominin trackway has obviously dominated the significance of Laetoli, but it must be underscored, that preserved in the same levels are many prints of a broad variety of animals both extinct and extant, including avian foot prints (Table 2), which together provide a snapshot of past environment and fauna composition with important clues to the paleoecology of Laetoli (Gentry 1981, Harris 1985, Verdcourt 1987, Day & Wickens 1980, Leakey 1987a, 1987b, Musiba et al. 2008). While the distribution of archaeological remains is not as rich or diversified, as that of the nearby Olduvai Gorge; Laetoli lithic assemblage is dominated by Early Middle Stone Age artifacts, that may provide concrete evidence of the technological and cultural behaviors of early anatomically modern humans in East Africa as represented by the Laetoli Hominin (LH) 18 famously known as the Ngaloba skull, which was discovered at Laetoli in 1976.

Table 2. List of identifiable insects, birds, and mammal taxa from the footprints and animal trackway at Laetoli (after Musiba et al. 2008)

Taxa
Insects
Beatles and termitaries
Birds
Aves indent.
Struthianidae
Phasianidae
Mammals
Largomorpha
Cercopithecidae
Carnivora indent.
Hyaenidae
Proboscidea
Rhinocerotidae
<i>Hipparion</i>
Chalicotheridae (including <i>Ancylotheriopus tanzaniae</i> ichnosp. nov.) ¹
Suidae
Giraffidae
<i>Simatherium kohllarseni</i>
Bovidae (including <i>Madoqua</i>), and various indent. bovid species
Hominine gen. et sp. Indet. ²

¹Synonymous with *Ancylotherium hennig* (Leakey and Harris, 1987)

²The taxonomic specific of the Laetoli footprints is currently debatable, but they are currently attributed to *Australopithecus afarensis* by many researchers (Tuttle, 1991, Reichel et 2004)

Furthermore, the discovery of the Ngaloba skull is of great interest and importance in that its antiquity and its anatomically modern human like skull morphology has considerable implications for the antiquity and origin of anatomically modern humans, which is a scientifically heated debate and a subject of longstanding interest. Considered by many to be Archaic *Homo sapiens* though some take it to be an early Anatomically Modern Human (AMH); the skull is dated to 190 Kya and was discovered in association with EMSA stone tools (Day & Magori 1980, Leakey 1987, Mabulla in press).

As a paleontological site, Laetoli is characterized by numerous exposures of fossiliferous sediment of varying depth, age, and lithology, which are geologically described as Beds: The Laetolil Beds spanning from 4.36 to 3.62 Ma; the Ndolanya Beds, which overlie the Laetolil Bed with sediments dated from 3.58 to 2.66 Ma, the Ogol Lavas overlying the Ndolanya Beds and lithologically bracketed between 2.32 and 2.28 Ma, the Naibadad Beds spanning from 2.15 to 2.05 Ma, overlain by the youngest Ngaloba Beds, which are less than 200,000 years old (Figure 3 in section S. a.). The fossiliferous layers at Laetoli are usually exposed, thus experiencing constant erosion and re-vegetative process. This frequently occur when the area experience heavy and continuous rains. Where erosion has not taken its toll on the landscape, especially at locality 8 (including Site G), the exposed area then is usually covered with Acacia dominated by *Acacia dreinolabium* and *Acacia lahai*. Other acacia includes *Acacia xanthophlea* and *Acacia melifera* (Figure 10 in section S. d.). In some patches, erosion has exposed tuffs, including the foot printed tuff, which, in some places, is heavily weathered and cracked and in some places covered by sediments, that are characterized by black cotton clay.

4. Background to Project Requirement

In the years following the burial of the hominin trackway, as part of the preservation measures, it was observed that trees and shrubs began to establish and grow over the area of the covered trackway (where seeds having been introduced in by the sand and soil used to cover the trackway), thus threatening the integrity of the footprints. The condition prompted Tanzanian archaeologists to warn the Antiquities Division (formerly the custodian of Laetoli and Olduvai Gorge paleoanthropological sites) that the roots of these plants might be damaging the delicate trackway bearing volcanic tuff. As a result, in 1996 the Department of Antiquities in collaboration with the Getty Conservation Institute uncovered the trackway, removed all biological and sedimentological debris and agents of destruction from the tuff and re-covered the trackway with layers of herbicide-impregnated bio-barrier made of geotextile and enkamat material, designed to prevent biological organisms and physical diagenesis from destroying the footprint bearing tuff layer. This conservation effort lasted for over 15 years with mixed success and additional unforeseeable and impeding threats, which were brought to the attention of the Antiquities Division in 2008 (For detailed discussion on the issue, see Antiquities Technical Reports on the 2011 Partial re-excavation of the hominin footprints trackway, which were submitted to World Heritage Center in 2014).

Subsequently, the Antiquities Division working in collaboration with the Ngorongoro Conservation Area Authority embarked on a quest to sustainably conserve the hominin footprints trackway at Site G. In April 2013, the Ngorongoro Conservation Area Authority issued a Request for Proposals for Consultancy Services for Design, Construction and Supervision of Laetoli State of Art Museum – Tender No AE/055/2012-13/HQ/C/14 with the following Consultancy Scope:

1. Preparation of the Laetoli footprints Museum concept;
2. Preparation of conservation, management and exhibition systems for the footprints;
3. Preparation of a master plan for development of the Laetoli project area;
4. Design, construction and construction supervision of the “State of Art Laetoli Footprints Museum” (subsequently officially re-designated as “The Laetoli Hominin Footprints Museum”).

The Contract was awarded to M/s Peter Rich Architects of Johannesburg, South Africa, as per the Letter of Award of the 25th September 2013, which was followed by the Contract Agreement that was signed on the 21st February 2014.

The primary aim of the construction of the Laetoli Hominin Footprints Museum (hereafter in this document referred to as “the Project”) is to sustainably conserve and monitor the hominin footprints while at the same time providing a rare opportunity for the general public to view, observe, and appreciate the Laetoli fossil footprints, as they are preserved in the volcanic tuffs. A secondary outcome of this project is to provide scientific background information to hominin evolution and to place the site in the wider context of human evolution and Earth history. The proposed construction is required to meet this primary aim, while ensuring that the integrity and OUV of the site is not compromised.

The current proposal is to establish an onsite museum at the site, then partially uncover some prints for conservation monitoring and public viewing. In addition to the onsite museum, a main exhibit in the museum, an education, training and research facilities will also be developed. This proposed development is the subject of the Cultural Heritage Impact Assessment (CHIA), which was conducted by Prof. Fidelis Masao, an archeologist and a member of the Project Consultancy Team, and hereafter referred to as “the CHIA Consultant”.

The designated Laetoli paleoanthropological site (as delineated by the Tanzanian Department of Antiquities), which also contains the fossilized hominin footprints, covers an area of 4300 hectares (Figure 1 in section S. a.). The Project will cover only the area of interest, which is the 2.25 square kilometers consisting of the hominin footprints Site G, and the rest will remain zoned and restricted for paleoanthropological research (Figure 6 in section S. b.). The proposed onsite museum, education and research facilities at Laetoli is estimated to cover about 15,000 m² (Figure 2 in section S. a.).

4.1. Requirement for the Cultural Heritage Impact Assessment

As part of the World Heritage Site and due to the nature of the project, its category and size in terms of investment, and particularly where changes may affect the OUV of the property during the execution and operation of the proposed project, requirements and guidelines for a project executed within a World Heritage Property; the developer considers the project to be an ‘ESIA Development’ and therefore a formal ESIA is required. According to UNESCO *Operational Guidelines* (UNESCO, 2008) and ICOMOS *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*, the project also requires a comprehensive CHI assessment. Since the Project development is intended to

open, preserve and conserve the paleoanthropological (archaeological and paleontological) features that make Laetoli unique, the CHIA report is expected to be part of the ESIA report to ensure all effects (positive and negative) are considered to minimize any negative impact on the site, while promoting all positive impacts, that will enhance the OUV of the site.

Several policies, both international and national stipulate that developers of new projects (including those within the WH properties) are required to undertake CHIA in order to identify the heritage that is likely to be adversely impacted by the project and suggest ways of mitigating the impacts. One of those policies is the World Heritage Convention for the protection of the World's natural and cultural heritage that came into existence in 1972. It recognizes properties of Outstanding Universal Value (OUV) that are part of the World's heritage of humankind.

In Tanzania, the National Environmental Council, The Antiquities Act of 1964 and the Cultural Policy of 2008, all stress the requirement for CHIA; the costs of which have to be borne by the developer. In Tanzania, CHIA is part of Environmental and Sociological Impact assessment (ESIA), which specifically addresses the impact that may be inherent in a development project on cultural heritage. In the case of Laetoli, the assessment retrieved paleontological materials that predate the earliest known culture in the world. In the context of the proposed onsite museum, educational, training and research facilities; the CHIA work as per terms of reference included:

- Assessment of subsurface cultural heritage resources;
- Proposing mitigating measures in cultural resources;
- Securing of movable cultural resources;
- Analyzing micro settlement pattern;
- Carrying out excavation and securing of all archaeological resources according to the acceptable technical terms.

4.2. Purpose of this Report

The purpose of this report is to evaluate the seriousness of the threats (if any) posed by the proposed development project and inform the NCAA of the impact (both positive and negative) of the intended project on conservation and sustainable use of Laetoli paleoanthropological site, in particular the fossil hominin footprint trackways at site G. The NCAA is proposing a conservation and sustainable use of Laetoli, which is currently under-developed and under-utilized as a World Heritage property. The factors affecting the OUV of the property consists of three primary factors: development of an interpretative and visitation facilities at Laetoli (visitor's center, training, research and education center, and future site museum); ground transportation infrastructure (car park and a walking trail); society's valuing of the property (changes in values leading to new uses of heritage resources); and changes in physical characteristics of the site (erosion, vibration, relative humidity, temperature, dust, and micro-organisms).

A team of experts was commissioned in 2011 to evaluate the current conservation and preservation status of the Laetoli hominin footprint trackway where a small portion of the trackway was uncovered in order to digitally document and assess the state of preservation of the footprints bearing tuff following the 1996 efforts to conserve and preserve the trackway. As a result, a full report on the state of conservation was prepared and presented to a national scientific technical committee, which

proposed that a best way to conserve and sustainably use Laetoli paleoanthropological site was to develop the site by establishing a research, training and education center to facilitated long-term data collection, that could be used as baseline for sustained long-term conservation efforts of the site. At present the NCAA plans to properly develop the site and add value to its OUV where an onsite museum will eventually be built to afford local and international scholars, students of human origins, and visitors alike to observe and appreciate humanity's heritage (the footprints) firsthand. As a result, Dr. Masao and his team of archaeologists and conservation technicians conducted cultural heritage impact assessment at Laetoli paleoanthropological locality 8 (Site G) and 7.

In this CHIA assessment report, the process was in essence simple and straightforward, it was considered:

- What was the heritage at risk and why was it important, namely how did or does it contribute to the OUV?
- How will the proposed project change or impact on the OUV?
- How could these effects be avoided, reduced, rehabilitated or compensated?

Therefore, this Report deliberates how the heritage in the area of study, namely the Laetoli hominin footprint trackway at Site G, was assessed based on the above listed critical questions in the course of three seasons of fieldwork (2014/2015) and proposes mitigation actions.

This document is meant to report to the Client (NCAA), NEMC, and other relevant stakeholders (WH Center):

- i. Assessment of the cultural heritage present in the area of interest chosen for provision of the space for the development of the proposed project, in this case The Laetoli Hominin Footprints Museum and related Facilities;
- ii. Efforts undertaken to rescue some of the heritage; salvaging as much of the threatened heritage as possible, through systematic surface collection and excavation;
- iii. Suggesting measures of mitigating the adverse effects that will result from the implementation of the proposed project, including monitoring during the different phases of development;
- iv. Suggest measures pertinent to immediate conservation of special features discovered and paleoanthropological and archaeological finds, retrieved during the assessment.

5. Methodology

The CHIA was undertaken in accordance with the *Guidance on Heritage Impact Assessments for Cultural World Heritage* (ICOMOS, 2011) and the *Recommendations on International Principles Applicable to Archaeological Excavations* (UNESCO, The New Delhi Recommendations of 1959) using well established archaeological surveys and field excavation adopted by African archaeologists and paleoanthropologists. To achieve the goals of CHIA at Laetoli, systematic surface surveys and documentation of recovered materials was carried out (see details in Section 4F. *Impact Assessment Methodology*).

A. Data Sources

To achieve the purpose/objectives of the CHIA, the team conducted preliminary desktop research followed by three complementary approaches, survey and excavation, which generated superficial and *in situ* archaeological and paleontological remains at Site G at Locality 8 and at Locality 7. The CHIA Consultant, having had prior knowledge of the area to be impacted by the Project and after consulting a few relevant publications at hand to prioritize the assessment process, set the fieldwork scene, which was accomplished in three fieldwork seasons.

B. Published works

As the only upland paleoanthropological site in Eastern Africa, Laetoli provides a unique opportunity for human origins and paleoecological studies, associated with human evolution in Africa, and, as a result, it has hosted many paleoanthropological field research and summer education field school programs since the 1970's with extensive publications in peer-reviewed journals and magazines ranging from National Geographic, New York Times, and scientific American, just to name a few. A comprehensive list of published work on Laetoli paleoanthropological site is included in appendices (b. Desk studies).

C. Unpublished reports

Numerous unpublished reports including theses and dissertation works have been reported and some are housed within the Antiquities Department library, the National Museum of Tanzania in Dar es Salaam, the Commission for Science and Technology in Tanzania, and various universities, including the University of Dar es Salaam, University of London, University of Colorado Boulder, Rutgers University, University of Colorado Denver, New York University, University of Chicago, and University of California Berkeley, just to mention a few. Additionally, University Microfiche (UMI) services in the US and other European countries also houses unpublished theses on Laetoli.

D. Databases

Microsoft Excel-based and Microsoft Access databases on Laetoli paleontological remains exist, the most extensive one is that combines work by the late Dr. Mary Leakey's collection at the National Museum of Tanzania in Dar es Salaam and the National Museum of Kenya in Nairobi. Standalone databases by individual researchers at Laetoli such as Profs. Cassian Magori, Terry Harrison and Charles Musiba and their co-workers exists. Efforts to standardize and consolidate these databases is underway as part of the PaleoCore initiative, which is National Science Foundation (NSF) funded (NSF 726205) data management system and data repository that allows research teams in Africa to collaboratively manage, edit and analyze data online. The data stored in PaleoCore are standardized according the PaleoCore implementation of Dublin Core and Darwin Core data standards. The data stored in PaleoCore are secure and hosted on servers maintained at the NSF funded Texas Advanced Computing Center (TACC) in Austin Texas. Here, we are recommending that COSTECH should emulate the PaleoCore initiative and provide space for Tanzania's paleontological and archaeological record to be cloud-stored at their computing facility in Dar es Salaam.

E. Field Surveys

Traditionally, paleoanthropological and archaeological research involve field surveys, at Laetoli, numerous field surveys, particularly geological surveys were conducted by Mollel et al. (2011), Ditchfield (2011), Manega (1993), Drake and Curtis (1987), Hay (1978, 1980, and 1987), Kent (1941), Hay and Leakey (1982), Kohl-Larsen (1943), and Kent (1941). Additionally, field research reports that include site surveys also have been reported and some are available in the library of the Antiquities Division in the Ministry of Natural Resources and Tourism in Dar es Salaam.

F. Impact Assessment Methodology

Since the distribution of paleoanthropological exposures, especially those with fossiliferous beds at Laetoli and hence the potential high-yield areas is known to the CHIA Consultant, the target for surface prospecting and excavation for the CHIA was carefully identified, as being those close to the proposed area where the project will take place. The bulk of the work involved systematic surface prospecting for exposed lithic material and fossils near Site G, where crawls were performed when lithic material and fossils were identified, and recovery of any additional fragments or associated other material were meticulously performed. If there appeared to be some possibility of any *in situ* material, localized excavations of 2m x 2m square test trenches were established (Figures 13 C. and E. in section S. e.). All recovered material, whether superficial or *in situ*, were carefully numbered, recorded, bagged and logged in a prepared database (Excel derived data logging sheet, Table 3 in appendix a) and deposited into Olduvai archive. In addition, data for each artifact and fossil, including the individual fossil's spatial coordinates, elevation, date and time of collection, collector, provisional taxonomic identification and anatomical element were recorded. For each find photographs were also taken as part of the permanent record.

G. Scope of Assessment

The scope of assessment included: (a) subsurface assessment of cultural heritage resources on the property, (b) recovering and securing of movable cultural resources, (c) analyses of micro settlement pattern, (d) systematic surface survey and conducting archaeological excavation and securing all artifacts and fossil assemblages as indicated in terms of references, (e) proposing mitigating measures on cultural heritage resources.

Originally field assessment study was conducted in two seasons, covering areas earmarked by the Consultant, as being most proximal to the project location and hence prone to maximum adverse impact. These area is referred to as Site G within Locality 8, (Figure 2 in section S. a.). Followed by third field season in Locality 7, discussed in paragraph I. Assessment of Scale of Specific Impact and Change further on.

June 21-30, 2014

The CHIA team, which consisted of archaeologists, cartographers, conservators and skilled excavators spent ten days on the site to obtain an overview of the cultural heritage in the area of interest. During this visit, the team arbitrarily adopted a rather generous view of the area to be impacted by the Project and to that end surveyed all the area within 500 meters' radius from site G at Locality 8, the area of the trackway and the nucleus of the proposed project. The archaeologists

were convinced that a mini landscape approach was necessary and, not only did it provide a good idea of what paleoanthropological materials to expect, but also a better sense of the activities of the proposed construction, which could not in realistic terms be restricted only to the hominin footprints at site G. The area was therefore surveyed in order to assess the potential of any surface concentration of paleoanthropological remains, and to retrieve a representative sample. In particular, the survey took the team to other animal trackway Sites A, C, E, and G Location 8 (Figure 13D. and Figure 15A. in section S. e.). The surface was littered with eroded paleoanthropological remains in varying concentrations, which were systematically collected and recorded as described in previous paragraphs above. Locations of unusual concentration of both or either artifacts and or fossil bones were recorded by GPS coordinates.

September 13 – October 22, 2014

The team of archaeologists, conservators, illustrators, and skilled excavators spent 40 days investigating the area of maximum impact at Site G, concentrating on excavating areas that will directly be impacted by the proposed project at Site G. GMP Consulting Engineers Ltd, the Project Manager, produced a cadastral map of the area of maximum impact, which guided the archaeological work in setting up a grid system consisting 62 squares of 15 x 15 m transects, which were further divided into archaeological excavation squares of 2 x 2m pits with the view of assessing the paleoanthropological and ichnofossil heritage in each square. These squares were systematically and meticulously excavated down to varying tuffaceous layers where some few paleoanthropological remains were collected in the process. The 2 x 2m pits translated into a sample size of 2%, which was considered a sufficient representative sample, especially since an archaeologist is expected to be on site monitoring the encounter of any significant artifacts and fossils during construction period.

Whenever there were good reasons to extend the 2 x 2 meter trenches, such as the presence of animal or hominin trace features, we were not bound by the 2 x 2m trench limitations, therefore we increased the trench size depending on attenuating circumstances. Examples of such circumstances included trenches *L8*, *M8*, *M9* and *M10*, which were extended due to the recovery of some paleoanthropological remains in the process. Indeed, an extra trench was excavated between trenches *A0* and *A1*, both of which yielded an isolated primate tooth. The extension of the trench was conducted with the view of finding out if more of the remains could be recovered.

This phase of field survey included the following:

- a) Intensive investigation was directed at the area of maximum impact arising from civil works associated with the planned construction;
- b) Screening of the sediments in order to augment recovery of micro-paleoanthropological remains, could not be carried out and was found impractical for the following reasons:
 - i. the black cotton overburden and the underlying tuffaceous sediments were so compacted that screening was impossible;
 - ii. given the number of trenches (62) to be excavated and the time at our disposal, it would have been impossible to excavate all the trenches
- c) To reduce post excavation modification (damage) of paleoanthropological remains, we used light excavation equipment such as trowels and small picks (Figure 13E. in section S. e.), however, given the nature of the sediments, the crew had had no option but to use large picks

and coffee dagger (archaeological chisels) to prick through the hard sterile tuffaceous layers covering the fossiliferous horizons.

- d) The sediments were found to contain very few artifacts most of which being macro-lithic ($\geq 5\text{cm}$), and easily recognized and retrieved during excavation. Ideally, and should resources have permitted, every grid proximal to the trackway would have been excavated since most of the area will be impacted by the project. An increase in the number of pits especially proximal to the trackway would have approximated a more statistically/reasonable representative sample.
- e) Most of the pits were excavated to 2.5m deep beyond which the sediments posed dangers of possible cave-in (collapse) and therefore life threatening.
- f) Because of the nature and scope of the work, a large labor force for the excavation was involved, so that the earmarked trenches could be completed within the proposed time.

H. Evaluation of Heritage Resource

Evaluation of the heritage resources mainly focused on surface and subsurface layers, where meticulous investigation of the presence and absence of fossil faunal assemblages, artifacts, and the ichnofossil record (animal footprints) within the earmarked areas of interests was carried out. Upon discovery of exposure of any such remains or features, the excavation was extended as far out as possible in order to obtain a proper appraisal of the feature without exposing too much of it to precipitate conservation problems. The features were then meticulously cleaned using very soft brushes, documented, photographed and reported to the sediment (Tuff) conservator, if there was any at the site for further instructions.

In order to assess and rescue any stratified cultural heritage that would be threatened by the project, 62 areas identified as areas of interest, which would be prone to construction disturbance were earmarked and selected for archaeological excavations to check if they contained any heritage remains. A grid system was established, and as surface clearing work progressed, it was cleared noted that the sediments, which consist of black cotton soils, was hard and compact, thus slowing down the excavation process. The compaction and denseness of the soil layers prevented the team from using sieves (Figure 16B. in section S. e.). Floatation, which could have been another alternative to sieving, could not be carried out due to lack of floatation tank and enough water in the area. Therefore, picks, shovels, and chisels were used to remove the topmost black cotton layers before any other fine excavation tools could be used.

The ichnofossil-bearing tuffaceous layers: Sedimentologically, Laetolil Beds, particularly the fossiliferous beds are laminated into several layers that represent periodic and probably prolonged ash fall followed by volcanic eruptions from nearby volcanoes at Sadiman In order to establish whether any of the constituting tuffaceous layers contained ichnofossil elements, the laminated layers had to meticulously be peeled off using picks and wooden tongue depressors, as it turned out, the layers were heavily consolidated, cemented and hard to peel.

Artifacts and any other cultural remains in the tuffaceous layers: It was safe to assume that there were no cultural remains below the tuff which is part of the Laetolil Beds dated to 3.6 Ma on the basis of the fact that the sediments did not contain any lithic material at all. Furthermore, given the nature of the tuffaceous layers that we excavated and their thickness (>30 meters), it was almost

impossible to excavate the entire area. The trenches where excavation was successfully done, yielded almost no artifacts, therefore, it is safe to conclude that these tuffaceous sediments are sterile of artifacts. This conclusion is supported by other extensive excavations, which has previously been conducted by other teams at Laetoli (Leakey et al., 1987; Musiba et al., 2008; Harrison et al., 2011).

On instructions from the Consultant, 2 x 2 m pits were excavated in 62 of the 15 x 15 m gridded area. Test trenches revealed a rather complex stratigraphy (Figure 16A. in section S. e.), which can conveniently be subsumed into two broad categories: The black cotton soil and the Tuffaceous sediments of varying grade and chemical composition.

1. Black Cotton Soils of varying thickness between 40 and 100 cm; the soils were dense, moist and compact. They were generally dark brown in color. Graded compaction and moisture were observed, which tended to increase with depth; as the contact with the tuffaceous sediments was approached, it became sticky due to increase in moisture. The sediments had high content of waxy clay. These sediments were reworked and contained some carbonate nodules, concretions, gravel and were poorly sorted and water-worked. In terms of artifact recovery, the black cotton soil yielded most of the artifacts which on the basis of cursory examination are suggestive of the Middle Stone Age (MSA) equivalent of the Ngaloba beds and associated with LH 18. The excel spread sheet shows lithic and fossils recovered from the Black (Table 3 in appendix a).
2. Tuffaceous layers: The Stratigraphy below the black cotton soil is complex and characterized by several reworked tuffs. Without the geochemical and lithological studies, it would be difficult to distinguish one tuffaceous layer from another, but suffice it to mention the different degrees of compaction, hardness, color and inclusion were observed during the excavation. Overall they can be described as being buff grey in color and either sandy or clayey. In some cases, an almost impervious horizon was encountered. Soft carbonate layer was seen in some cases where it invariably associated itself with a foot printed surface. If the tuffaceous sediments represent water reworked tuffs which are chemically altered (probably more than 10 m thick), it is quite possible they could have artifacts but very few were recovered from the sediments. Fossil bones were however recovered, but most were highly fragmented, unidentifiable splinters lacking any articular surface. Due to their undiagnostic nature, the remains can be declared to be of no paleontological or paleoanthropological value.

I. Assessment of Scale of Specific Impact and Change

In the process of assessing the heritage resources that would be impacted by the proposed project, new hominin-like footprints and animal trackways were discovered about 100 to 150 meters southwest of the hominin footprints trackway at Site G (Figure 13B. in section S. e.). The discovery has once again confirmed that the hominin footprint tuff described first in the 1970s by Mary Leakey and her co-workers is part of a broader ichnofossil record (foot-printed surface/paleolandscape) or set of footprints concentrations spanning a large area than previous thought (Figure 14 in section S. e.). As such, this new discovery demonstrates the potential to add a wealth of new information not only about hominin pedal morphology and locomotion, but also possibilities of establishing the taxonomic specific of the print makers, the depositional history in a broader context.

As a result of the discovery, the Consultant, in agreement with the Client, suggested the relocation of the proposed site for educational, training and research facilities from Site G to a new area at between Locality 7 and west of the Mungororoni Hill, which resulted in additional assessment work that was carried out in March 2015.

The CHIA Consultant and his team investigated the cultural heritage within the new proposed area, one kilometer from the hominin footprints Site G, Locality 7 and west of the Mungororoni Hill. The area was subjected to a ten days' fieldwork commencing from March 21st to 30th in 2015 assessing any occurrence of heritage therein, and recommend measures to mitigate the impact.

This new site can be described as a ridge or small plateau one kilometer away on the northeastern fringe of Locality 8 within and past Locality 7. This area had come under cultivation as a result of continued Maasai settlements within the Essere-Laetoli area and as such, the surface and the top soil have been disturbed and thus rendering any paleoanthropological and archaeological material therein out of context, thus of inconsequential importance. The agricultural activities also have led to the cutting down of many trees that may have been there when the site was officially described by Mary Leakey and her co-workers, therefore completely altering the landscape, transforming it to present day cover, which is dominated by short grass.

Methods of Investigation

Following procedures already established and discussed in details in Section F & G in this document, and in the absence of cadastral survey that would establish a baseline system for archaeological survey, random surface survey followed by ten excavated pits was undertaken in an area covering about 1.5 km² at Locality 7. Various out of context archaeological and paleontological materials including lithic, faunal remains, pottery and slag were found from the surface and occasionally in some of the excavations within undisturbed stratigraphical context (Figure 15B. & C. in section S. e.).

As excavation of the ten pits progressed, the team studied the stratigraphy and looked for paleoanthropological relics and any other features such as footprint impression that might be jeopardized by the proposed project (A summary of the excavations and findings is provided in appendix in Section S. e.).

J. Evaluation of Overall Impact

Systematic surface collection, surveys, and excavation at Laetoli fossil hominin footprints Site G produced very few paleoanthropological and archaeological collection with the exception of a new discovery of another hominin footprint trail 100 meters away on the southwest fringe of Site G. The assessment however, noted much of the anthropogenic and natural damage to various sites within Laetoli paleoanthropological site which could be summed up as:

- i. Human occupation within the paleoanthropological site has accelerated massive surface erosion specifically induced by livestock (trampling and overgrazing). Perhaps one of the biggest tragedy that has been overlooked at Laetoli was the trenching of a water dam for livestock, at Locality 2, which was initiated by politicians and a foreign NGO in in 2010. As a result, this has encouraged massive migration of pastoralists from Esere to Laetoli who have established numerous Bomas, which are very visible at the site. Major areas where these Bomas are visible include Localities 7, 8, 10, and 11 thus resulting in even accelerated erosion of the Laetolil Beds. Locality 2 (northwest of Dr. Mary Leakey's 1978 field campsite) for example, was paleoanthropologically one of a highly productive site with rich fossiliferous Laetolil Beds, now the area is completely pulverized and all fossiliferous layers have been reduced to fine ash and dust.
- ii. Overgrazing and tree fetching for construction material for new Bomas in the area, thus leaving most of the paleoanthropological exposure prone to erosion as well reducing food resources to resident browsing and grazing animals within Laetoli paleoanthropological area.
- iii. Natural erosion frequently washes out new exposures with paleoanthropological sites; resulting in quick disintegration of exposed fossil fauna remains. This process occurs every year during the long rain season that is followed by the short rain season. This has direct impact on paleoanthropological finds which are constantly exposed by rain and quickly becomes destroyed by animal trampling, particularly by livestock at many sites and also due to the fact that Laetoli has not been developed to accommodate an onsite resident paleoanthropologist and archaeologist who could establish a regular fossil surface recovery plan for new exposures at different localities within the paleoanthropological area.
- iv. The survey and excavation retrieved paleontological remains in the form of fossils of different extinct and extant animal species and archaeological material at targeted site G and Locality 7 that would be liable to destruction by activities related to the project. Having been rescued, they have been analyzed and packed for conservation treatment commensurate with accepted procedure.
- v. The surface on the proposed project area was littered with archaeological and paleontological finds in varying concentrations, and a sample was collected. Locations of unusual concentration of both or either artifacts and or fossil bones were recorded by GPS coordinates and summarized elsewhere in this document. Based on our survey of the area of interest: The project will definitely adversely impact the cultural heritage in the area. Not only will the construction alter and obscure the stratigraphy, but also loss of primary contexts of the paleoanthropological finds at the site will occur. Also movement of workers and machinery, including vehicles will destroy whatever finds lies on the surface within the vicinity of the area or location of the project.

K. Definition of the Assessment Area

Laetoli paleoanthropological site can be defined as the only upland Plio-Pleistocene paleoanthropological sites in eastern Africa without major rivers or standing water body, thus making it one of the most unique paleoecological site in Africa associated with the origin of

humanity in Africa. The site consists of over 23 paleoanthropological localities spanning from 4.0 million years ago to the last 10,000 years covering an area over 100 square meters on the western slopes of the Ngorongoro Conservation Area. The area of interest for this Heritage Assessment report is the Laetoli hominin footprints trackway, also known as Site G, which is within Locality 8 paleoanthropological site south of the Garusi River (Figure 2 in section S. a., and Figure 7 in section S. c.). Locality 8 is about a kilometer long, running NE to SW including Site G, with a rich ichnofossil record of three footprints trail of hominins preserved in a tuffaceous layer that has been distinguished as the footprints bearing Tuff 7. The tuffaceous layer is exposed over a large area preserving a few mammalian prints including the hominins prints, rhinoceros, hipparion, lagomorphs, birds, elephants, lions, and bovid (Figure 13B. in section S. e). The footprints tuff in which the hominin footprints are preserved forms a large, flat platform that overlies the fossiliferous layers that produced important fossil hominins. The footprint trail and its adjacent expanse of Tuff 7 covers an area over 182 square meters. The current physiographical description of the area is characterized by sparsely distributed acacia trees, short and long grasslands with patches of eroded paleontological exposures dipping into a massive cotton-soil slope on the southern edge, which rises to form the Esere sub-plateau on the south. On the northern end of the preserved prints there is a channelized gully with erosional fossiliferous sediments that continue to yield some paleoanthropological remains, mainly indistinguishable and highly fragmented fossil bones from the PlioPleistocene period.

L. Description of changes or developments proposed

Currently Laetoli paleoanthropological site does not have any supporting infrastructure such as a visitor pavilion and or a research center for the site to fully function as a WHS. Recognizing that conservation of trace fossil record of paleoanthropological significance such as the Laetoli hominin footprints is a challenge to the scientific community with few options that can be used to preserve such record; the NCAA is seeking a long-term conservation approach that will require a construction of a research and education facility as part of the visitor interpretive facility that will provide an opportunity for long-term site monitoring and a systematic data collection (Figures 7, 8, and 9 in section S. c.), which will guide it in implementing a sustainable solution to the conservation of the Laetoli hominin footprints trackway.

Since their discovery in 1976/77 by Mary Leakey and her co-workers, the 3.6 million years old Laetoli hominin footprints have and continue to pose conservation and preservation challenges for Tanzania and the scientific community. The footprints, which are preserved in hardened and yet delicate volcanic Tuff 7, are the rarest, oldest, and important trace fossil evidence today documenting the onset of bipedalism in humans. The footprints are unique in that they are preserved in a soft, cemented volcanic ash, which is softly consolidated, thus making them highly vulnerable to erosion and physical diagenesis. In such circumstances, the Laetoli hominin footprints require a comprehensive conservation strategy that will take into account their long-term preservation, educational and scientific significance, as well as their importance as cultural and natural heritage resources in Tanzania. As a result, the NCA has commissioned the first infrastructure development project at Laetoli that will enable it to come up with a long-term and comprehensive conservation strategy of the Laetoli hominin footprints trackways and other fossiliferous sites of significance in understanding human evolution in Africa.

Changes that will affect the site are those that are associated with the development of the currently needed basic research and education infrastructure at the site, which include the establishment of a

reception and or control pavilion, ranger's station, custodian offices and an observation platform, which should have been established before the site was inscribed. Furthermore, the site lacks proper research and education facilities essential for short- and long-term data collection to facilitate sound scientific based development of conservation strategies for the Laetoli hominin footprint trackways at Site G. As a result, the NCA proposes the construction of a control pavilion with reception, ranger's station and site custodian office at Locality 8 as well as a research, training and education center southwest of Locality 7 at the Mungororoni Hill. The project is slated to be a springboard for the sound conservation and sustainable use solution of the hominin footprints site G and it will be executed into two phases as described below.

Phased nature of the development

Following the discovery in October 2014 of what has initially been identified as a second Hominin trackway, the entire project building design has been altered to avoid disturbing this potentially significant find until further investigation has been possible. The construction of the project buildings will now follow a phased schedule with construction around or adjacent to the recent find deferred if necessary to ensure that no unnecessary damage occurs. At the time of submission of this Project Brief, the development will proceed in two phases as resolved at the Design and Construction Supervision meeting of 20th April 2015, and listed below:

Project Phasing:

Phase I – Reception/Control Pavilion, Rangers' Station & Custodian Office, and Observation Platform, Training, Research, Educational Facilities and NCAA Staff Housing with the relevant infrastructure: 2016 – 2018 (Figure 6, 7, 8, and 9 in section S. c.)

Phase II – Laetoli Hominin Footprints Museum – 2020 -2025.

M. Assessment and evaluation of overall impact of the proposed changes

Assessment and evaluation of factors affecting the Laetoli hominin footprint trackways at Site G was carried out following the framework of the Periodic Reporting (section II) adopted in 2008 by the World Heritage Committee as a standard list used to evaluate any threats affecting the Outstanding Universal Value(s) of the property, namely Laetoli paleoanthropological site. This document presents results of the evaluation of the effects associated with any changes and or development changes that associated with the long-term conservation efforts proposed by the NCAA.

Project phases	Positive impacts	Negative impacts	Mitigation
Design	Affords opportunity to assess the cultural heritage property, identify and propose mitigation plans	Trampling and unscrupulous collection of paleoanthropological finds by an influx of people to the site in search of employment and working	Establishment of a regular collection schedule of paleoanthropological finds at site. Expert to mount total surface collection of paleoanthropological finds
Site Clearance	Enhances paleoanthropological visibility and hence more efficient ways of retrieving exposed heritage.	More visibility might increase chances of destruction by trampling and unscrupulous collection of paleoanthropological finds	Site Manager and resident archaeologist will augment the retrieval exercise started in the design phase by initiating subsurface survey and collection of the heritage through archaeological excavations, non-destructive survey and mapping of subsurface finds using LIDAR technology and photogrammetry.
Construction	Benefits to the local community in terms of employment, technology transfer, and infrastructure enhancement.	The construction activities; digging of foundations and use of heavy earth moving machinery might expose and destroy important paleoanthropological and archaeological remains such as fossil fauna, subsurface ichnofossil, and stone tools.	Experts such as paleoanthropologists and geologists (ichnofossil experts) have to be on site during construction to retrieve, record and provide adequate curatorial services to finds being exposed and to regularly educate construction team not to disturb the site, the paleoanthropological and archaeological finds they will encounter
Handover of property after proposed infrastructure improvement	Destructive activities will have stopped after a Site General Management Plan has been operational. Research facility will allow real-time site monitoring, data	Influx of people in search of employment opportunities. Originally this was seen as a key problem and might jeopardize the finds if they have not been properly stored.	Finds should be properly documented and stored in appropriate facility which is easily accessible. Phase one of the proposed project after completion will provide controlled access to the site

	collection and analyses. Conservation solutions could be tested out on site and data collected and analyzed to provide best site management and conservation practices.		and will also provide a research facility to house all paleoanthropological and archaeological remains while at the same time providing unique opportunities for scientists to study the recovered remains in a timely manner. Agreements have been made where all finds will be temporarily stored at Olduvai Gorge and later will all be transferred to Laetoli, once a research facility and paleontological and archaeological collection vault has been built.
Operational	Finds will have become of museum exhibits. Improvement of the OUV of the site. Communities surrounding the site will have educational opportunities to participate in various programs that will be established by the facility.	Currently there is inadequate curatorial and storage facility for archaeological and paleontological material (only Olduvai Gorge has a makeshift facility that was initially constructed by Mary Leakey and the late Ezra Amin Mhuri; Drs. Rob Blumenschine & Fidelis Masa and their co-workers).	Provide adequate storage and curatorial facility. The proposed project will provide such facilities, including research laboratories and proper fossil collection facility.

N. Measures to avoid, to reduce or to compensate for impacts – Mitigation Measures

Although this report has clearly pointed out all negative impacts that the proposed project will have at Laetoli hominin footprints Site G; there are also positive impacts that the project will have such as a better control and management of the site, efforts to relocate and or reduce the number of livestock that enter the paleoanthropological sites adjacent to Site G, opportunity to develop a clear site specific management plan that will have short and long term conservation measures, research and education priorities to enhance the OUV of Laetoli.

Measures to avoid, reduce or compensate for the impacts include:

A. Short-term measures

- i. Salvaging as much of the threatened heritage as possible through surface collection as well as excavation,
- ii. Preliminary analysis of the cultural and paleontological heritage rescued
- iii. Packing the material and presenting it to Ngorongoro Conservation Area Authority (NCAA) for curation and storage
- iv. Proposing mitigation measures including immediate conservation of special features encountered in the fieldwork and proposing monitoring schedule and

- v. Preparing a schedule of monitoring during different phases of the project including: surface collection of newly exposed fossiliferous sediments at Locality 8, Site G, and Locality 7 and establish a similar schedule for other localities at Laetoli, establishing a salvage paleoanthropological team to work closely with the Consultant and the Project Manager of the proposed development at Laetoli, establish zones with specific functions.
- vi. Mitigation at design stage – proposed building shall be designed with the minimum environmental and cultural impact.
- vii. Mitigation during Construction – the working areas shall be strictly limited, movement of personnel and equipment restricted, use of heavy equipment should not be allowed.

a. Assessment and Retrieval

In the project's design phase, as is now, the potential mitigation measures have been about understanding what needs to be undertaken as recommend by the ICOMOS' Guidelines on Heritage Impact Assessments for World Cultural Heritage Properties. To this end, effort were mounted to find out the attributes of the heritage that would be jeopardized and or sacrificed in the implementation of the project. This was done as already remarked through literature review, landscape and subsurface surveys.

b. Monitoring during construction phase

Ideally, the Client's proposed Department of Geopark and Cultural Heritage will have qualified staff, who will be embedded with the project. It would be presumptuous to think that all the heritage liable to destruction by the project is known and that appropriate mitigation measures have been adopted. Depending on the client's progress on recruiting qualified personnel for the department, the CHIA team will only need to be at the site if the NCAA experts deems necessary depending on the nature of the heritage monitoring process at hand. This will only be necessary for part of the CHIA team to be on site to monitor the construction activities if the client deems necessary with the view to retrieve any attributes of the heritage that might be exposed and threatened by the construction activities.

c. Monitoring during the operational phase

It is fair to assume that a good sample of heritage threatened by the project will have been salvaged during the Design and Construction phases with regular monitoring by the Site Manager and resident archaeologists employed by the NCAA. The NCA has already established the Department of Geopark and Cultural Heritage, that has become operational since beginning of 2016.

O. Summary and Conclusions

This CHIA report was prepared in accordance with NEMC standards for Environmental, Social Impact and Cultural Heritage Assessment, IUCN World Heritage Advice Note: Environmental Assessment guidance, UNESCO Operational Guidelines for the Implementation of World Heritage Conventions, and ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties. Although the proposed development project, namely the visitor's center, education, training and research facility at Laetoli will have an impact on the site, it will however not alter or change the OUV of the property. In fact, the proposed development will enhance the OUV of the

site, in that it will provide the site with the much needed oversight and controlled access, which currently lacks at the site. Based on the potential impacts identified in this report, the following section describes the associated mitigation measures that NCAA and awarded contractor are required to implement. These are aimed at reducing potential negative environmental and social impacts and enhancing potential positive environmental and social impacts.

Laetoli Archaeological assets are non-renewable resources and the primary goal of hominin fossil footprint/ paleoanthropological heritage management should be their physical preservation (i.e. to avoid direct or indirect impact where practicable).

The project area been into remoteness of the site it needs improvement of essential infrastructures, and most important ones are water supply, power-electricity, access road, security and medical service. In order to minimize the potential impacts, mitigation measures have been proposed, together with mitigation measures enhancement measures has been prepared to enhance positive impacts.

i. Archaeological remains

As described elsewhere, the whole area can be referred to as an archaeological landscape of significant prehistoric and historic value. Surface survey revealed a rich scatter of artifacts (almost all out of context) spanning the Middle Stone Age (MSA) to Later Stone Age (LSA) continuum with a possibility of the Early Stone Age (ESA). The artifacts consist of different stone implements manufactured from a variety of raw materials (stones) dominated by quartzite and lava. Having being exposed to the elements they display different degrees of weathering including building a patina on the cortex. On top scattered artifact, some highly fragmented and heavily weathered fauna remains were recovered, they include a non-descriptive hominin tooth, most likely belonging to *Australopithecus afarensis* hypodigm, and is currently stored at Olduvai Gorge. The specimen will be catalogued and eventually deposited with the rest of the Laetoli hominins at the National Museum of Tanzania in Dar es Salaam. Hominin remains are as a rule scarce and when one is found, it is considered great discovery, especially if they are in context. Unfortunately, no stratigraphic context can be assigned to the tooth since it was found on the surface, but on the other hand, the find shows that even surface remains may include rare finds such as hominin remains, which may be of scientific value when it comes into understanding dietary and ecological adaptations of our earliest ancestors.

ii. Paleontological remains

Though not as abundant as the archaeological remains, some fossil bones were also found scattered on the surface. These include different skeletal parts of species that are normally associated with open cover and wooded landscapes, such as equid, suids, giraffids, and bovid.

iii. Trace fossil (ichnofossil) impressions

An very important result of this CHIA is the discovery of additional hominin and animal footprints in October 2014. This is the first such discovery since Mary Leakey's discovery of similar features in 1976.

iv. *Geology and stratigraphy*

The sketches of the profile in the annexes show that the stratigraphy is multilayered and that in some areas the foot-printed tuff is more than 2.5m deep. However, the tuff appears weathered so much that it has developed cracks which are deleterious to the conservation of the footprints. Where exposed or close to the surface, the foot-printed tuff is badly weathered and as such raises major conservation problems.

The Laetoli sediments were deposited on top of the basement rock of basaltic origin. The Upper and Lower Laetoli beds were deposited on broadly uplifted dome overlying the Precambrian in the Eyasi plateau (Figure 1 in section S. a.). The Laetoli beds occur in a series of shallow outcrops with many discontinuous exposures spreading about 1,600 m² to the south and west of Lemagruti and northwest of Lake Masek and Ndutu (Hay 1987, Manega 1993, Deino 2011) (Figure 2 in section S. a.). The Laetoli beds (Figure 3 in section S. a.), especially the upper beds preserve a unique type of fossil record including the ichnofossil that have been dated to 3.6 Mya. A generalized description of the columnar section of the Plio-Pleistocene Laetoli sediments by Hay (1987) indicate that lithologically the Laetoli Beds consist of deposits characterized by lava flows, tuffs (Fig 5) and claystone. The topmost part of the Lower Unit is about 75% reworked tuff of aeolean origin.

The general Stratigraphy is subsumed into a series of beds distinguished by lithological and paleontological character, often separated by erosive disconformities (Figure 5 in section S. a.). These beds are (from oldest to youngest) the Lower and Upper Laetolil (LL and UL), Ndolanya (ND), Naibadad (NB), Olpiro, and Ngaloba Beds (Hay 1987). (Figure 3 in section S. a.).

v. *Site monitoring*

A qualified full-time paleoanthropologist, archaeologist and cultural heritage manager should be on site during the construction period, especially to monitor all activities that impact the ground in any way. The discovery of the hominin trackway several meters from the earlier trackway makes this an obvious requirement.

vi. *Curation of paleoanthropological and archaeological finds*

Paleontological and archaeological finds resulting from the CHIA investigation have been provided with adequate storage, they have been accessed, documented and curated and some of these could form part of the museum exhibits once a museum has been erected at Laetoli. The finds resulting from the investigation were deposited at Olduvai Archive.

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Q. Glossary of terms used

1. **Acheulian:** A lower Paleolithic stone tool technology, which is wide spread in Africa, Europe and parts of Asia that evolved from the *Oldowan* Industry and is characterized by handaxes and cleavers. The technology is associated with *Homo erectus* and archaic *Homo sapiens* spanning from 1.5 million years ago to 150,000 years ago.
2. **Anatomically modern human:** Human beings that appeared about 150,000 years ago sharing conspicuous morphological characteristics with current humans, despite their differences in terms of culture and symbolic behaviors.
3. **Archaeology:** The study of historic and prehistoric human populations through the analysis of material remains (culture).
4. **Artifacts:** Material objects from past cultures.
5. **Assemblage:** A group of objects found together in an archaeological setting.
6. **Aves:** Birds
7. **Australopithecine:** The common term for a member of the genus *Australopithecus*.
8. **Australopithecus:** An extinct genus of the tribe *Hominini* where species commonly assigned to this genus include: *Australopithecus anamensis*, *Australopithecus afarensis*, *Australopithecus africanus*, *Australopithecus bahrelghazali*, *Australopithecus africanus*, *Australopithecus ghari*, and *Australopithecus sediba*.
9. **Australopithecus afarensis:** An early australopithecine from East Africa that had a brain equivalent to a modern chimpanzee's and is thought to be a direct human ancestor.
10. **Basalt:** an *alphanitic* mafic igneous rock comprising *plagioclase feldspar* more calcic than An_{50} and *pyroxene*, perhaps with *nepheline*, *olivine*, or *quartz* and with accessory iron-titanium oxide.
11. **Biotite:** A brown/green *phyllosicate mica*.
12. **Boma:** Traditional Maasai homestead.
13. **Bovidae:** A mammalian family characterized by animals that have permanent horns, hollow, unbrached, supported on a bony cores and possessing high-crowned cheek-teeth.
14. **Calcrete:** A powdery, nodular to highly indurated, near-surface terrestrial material mainly composed of calcium carbonate, resulting from cementation and the introduction of calcite into the soil, sediment and rock by ground water in arid to semi-arid regions.
15. **Calcite:** ($CaCO_3$) the most common carbonate mineral, which is also the principle component of limestone.
16. **Darwin Core Data Standards:** A predefined subset of the terms that have common use across a wide variety of biodiversity applications.
17. **Dublin Core Data Standards:** A small set of vocabulary terms that can be used to describe web resources (video, images, web pages, etc.), as well as physical resources such as books or CDs, and objects like artworks.
18. **Fauna:** Animals or animal component of an ecosystem
19. **Flora:** Plants or plant component of an ecosystem
20. **Fossil:** Preserved physical remains of part or all of once-living organism, mostly bones and teeth or impressions that have become mineralized by the replacement of organic component with inorganic materials.
21. **Geology:** The study of Earth's physical history.
22. **GPS:** Global Positioning System
23. **Hominin:** Humans and humanlike ancestors belonging to the tribe *Hominini*.

24. **Hyaenidae:** A mammalian family consisting of hyaena and aardwolf, characterized by animals with typically massive heads, shoulders markedly higher than hindquarters, powerful jaws and teeth, ears large, tail and hind-leg short, and usually four toes on each foot, except for the aardwolf, which has five toes on forefeet and four on hind-feet.
25. **Ichnofossils:** Trace fossils or impressions left behind by once living organisms including animals' prints, insect trails and plant (leaf) impressions.
26. **Kya:** Thousand years ago.
27. **Laminae:** Fine, graded sedimentary layers.
28. **Lithic:** A stone artifact (implement).
29. **Lithology:** The study of the general physical characteristics of rocks.
30. **Oldowan:** A name given to a stone-tool industry characterized by flakes and chopping tools produced by hard-hammer percussion of small cobbles. This is an industry that began around 2.5 million years ago and was widely spread in parts of Africa and Asia until 200,000 years ago.
31. **Paleoanthropology:** The multidisciplinary study of human evolution.
32. **PaleoCore:** An initiative to develop data standards and digital infrastructure for paleoanthropology.
33. **Paleoecology:** A study of past ecological settings.
34. **Paleontology:** A study of fossils and the biology of extinct organisms.
35. **Phasianidae:** Family of heavy, ground-living birds which includes pheasants, partridges, jungle-fowl, chickens, Old World quail, and peafowl.
36. **Pliocene:** The final epoch of the Tertiary period, spanning from about 5.2 million years ago to 1.64 million years ago
37. **Pleistocene:** The first epoch of the Quaternary period, which lasted from about 1.64 million years ago to 10,000 years ago, and saw the radiation of the genus *Homo*.
38. **Proboscidae:** A mammalian order comprising of elephants and some of its fossil sister taxa, apart from great size, most striking feature of this group of animals is the trunk (elongated nose) used for seizing food, taking up water for drinking and bathing.
39. **Metamorphic rock:** A rock which results from the partial or complete recrystallization in the solid state under elevated temperature and pressure with respect to the surface.
40. **Rhinocerotidae:** A mammalian family consisting of rhinos.
41. **Sedimentology:** The study of sediments and their deposition and accumulation.
42. **Suidae:** A mammalian family of animals consisting of pigs, usually moderate size, short legs body covered with coarsen hair, muzzle long, ends in mobile snout, they are omnivorous with a complete set of teeth , canines curved outwards and project as defensive tusks.
43. **Stratigraphy:** The study of the order of rock layers and the sequence of events they reflect.
44. **Struthionidae**
45. **Taxonomy:** A study or system of classification of organisms according to their evolutionary relationships. Also referred to as the rules and procedures used in the classification of organisms.
46. **Tuff:** Solidified layer of ash from volcanic eruption. Also referred to as rock formed by the cementing or compression of volcanic ashes.
47. **Tuffaceous:** Descriptive of solidified layer of ash from volcanic eruption.
48. **Volcanoclastic:** Description of a clastic rock/sediment containing volcanic material (sometime referred to as volcanoclastic)

R. Acknowledgements and authorship

The author of this Report will like to extend his gratitude and thanks to the NCAA for initiating this very important development project that will enhance the OUV of Laetoli Paleoanthropological World Heritage Site, particularly in afford the site the proper infrastructure that will allow systematic and targeted research that will shed more information about human origins in Africa.

Without the technical input and expertise from various stakeholders, especially Professors Charles Musiba and Audax Mabulla, this report would not have been as complete and detailed as it is now, therefore heartfelt thanks go to them for their tireless edits and comments on this report.

We would like to that the people of Endulen and Esere, the real custodians of the Laetoli paleoanthropological landscape for their inputs.

Draft of this Report was reviewed and discussed by a team of experts lead by Dr. Joseph King (ICROM), Dr. Moshi M. Kimizi and Dr. Erick Kajiru (UNESCO National Commission of the United Republic of Tanzania), Dr. Harvey Johnson (Heritage Division Office, Environment and Heritage, South Wales, Australia), Mr. Matthias Maluck (State Archaeological Department of Schleswig-Holstein, Germany), Dr. Godwin Mollel (Apex Geosciences Ltd, Canada), Prof. Audax Z.P. Mabulla (National Museum of Tanzania) Prof. Charles Musiba (Department of Anthropology, University of Colorado Denver, USA), and Mr. Donatius Kamamba (Antiquities Division, Ministry of Natural Resources and Tourism, Tanzania) at the Laetoli Hominin Footprints Museum Project International Consultative Meeting, which took place in Karatu, Arusha from 22 - 26 November, 2014.

This document was prepared by Dr. Fidelis T. Masao and his team of archaeologists and conservation technicians in compliance with UNESCO Draft Decision: 34 COM 8B.14 article 5.

S. Illustrations and photographs

- a. Location and extent of sites, including buffer zones (use GMP Consulting Engineers survey map to establish buffer zone)**



Figure 1. Map showing the Ngorongoro Conservation Area and other major key features including Laetoli and Olduvai Paleoanthropological Sites (Source NCAA Map Project).



Figure 2. Map showing the Paleoanthropological Localities (numbered and gray-shaded) and the area of interest (red circle) for this report at Laetoli World Heritage Site (modified after Ditchfield and Harrison, 2011).

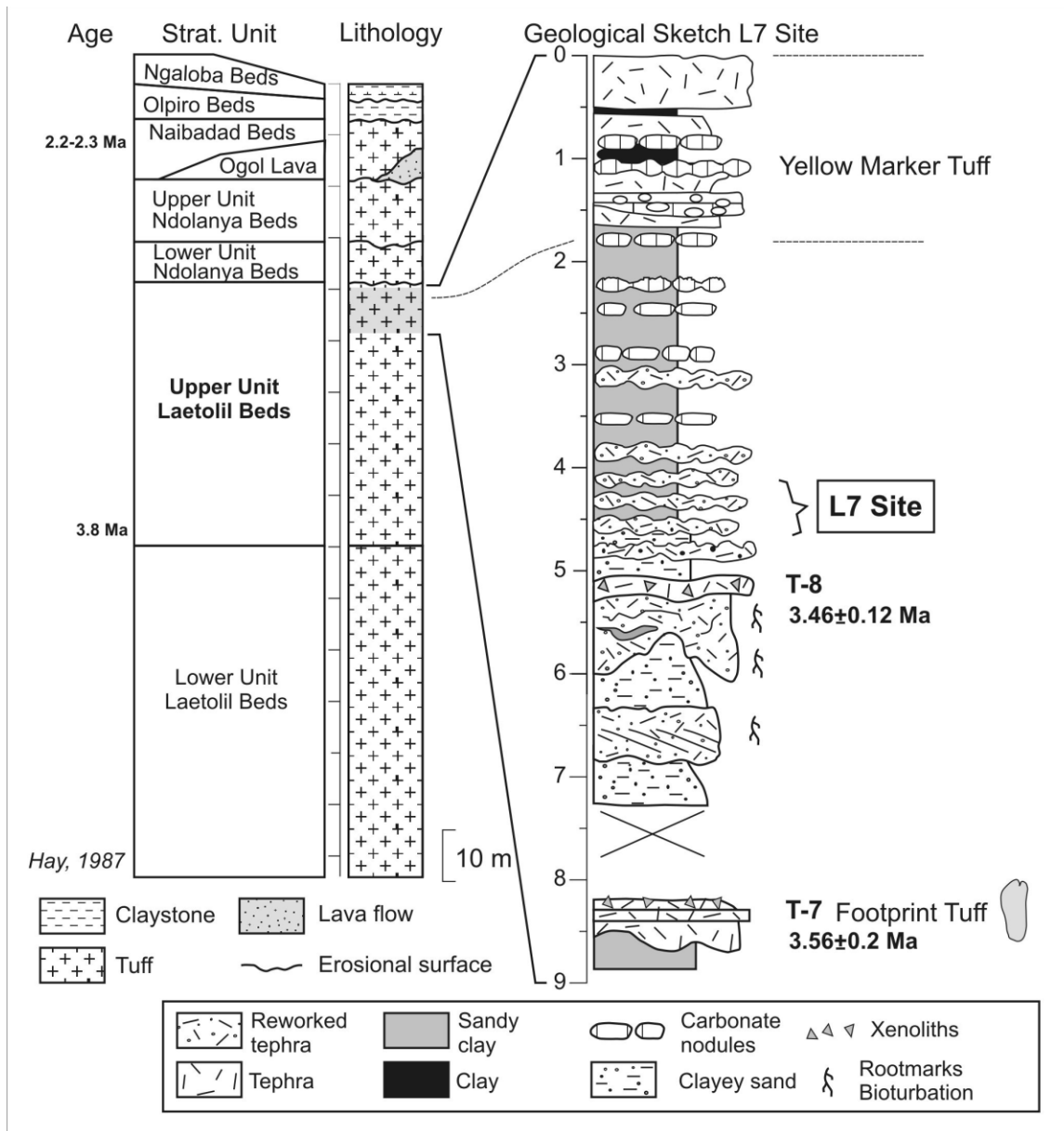


Figure 3. Generalized stratigraphic profile of Laetoli Paleolithic Site (After Musiba et al., 2012).



Figure 4. Photos showing some key hominin remains that have been recovered at Laetoli: Laetoli hominin (A. LH 4) a holotype of *Australopithecus afarensis*, and Laetoli hominin (B. LH 18) an anatomically modern human skull (Photos by Charles Musiba).

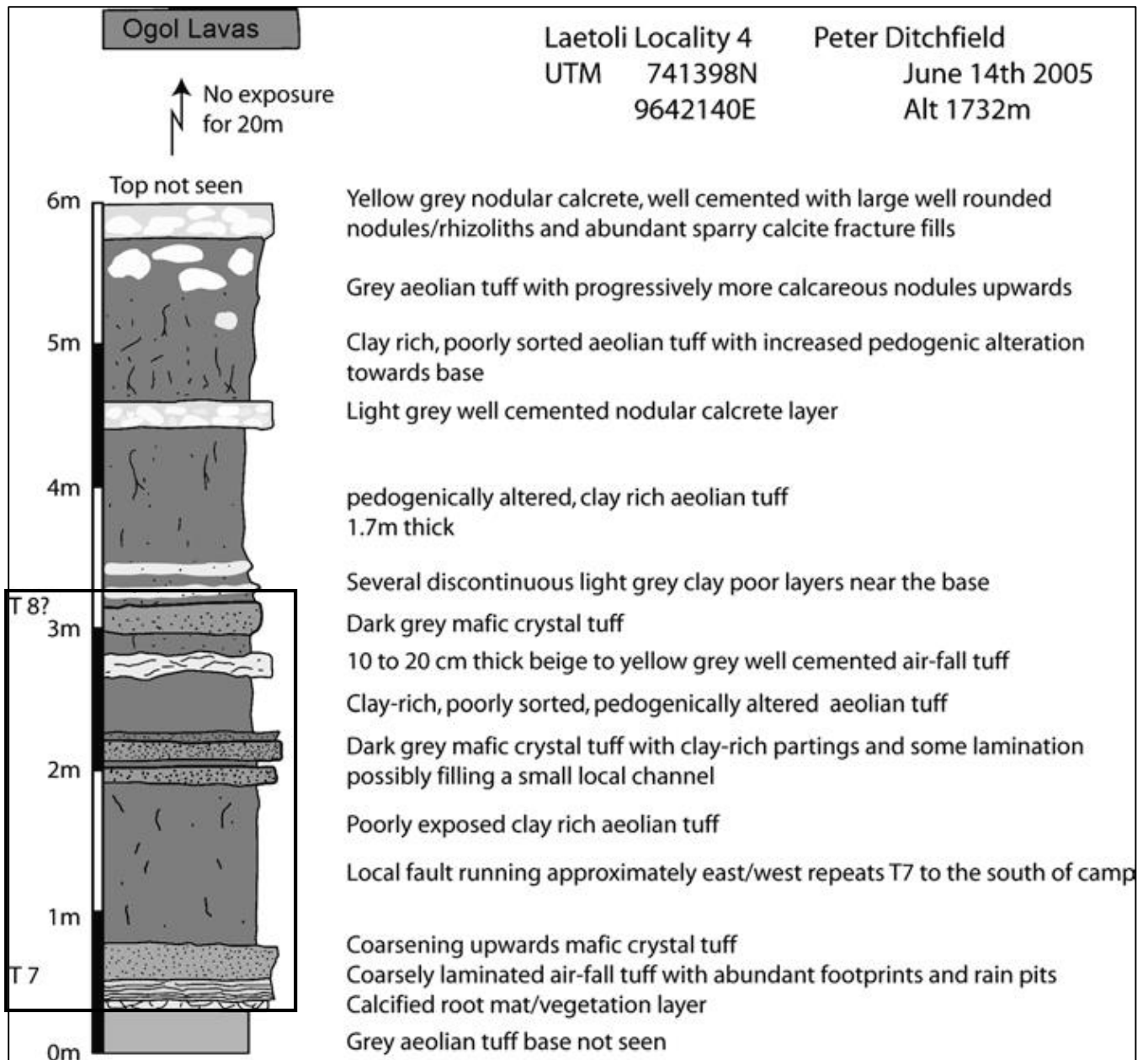


Figure 5. Stratigraphic profile showing various geologic and lithologic features at Locality 4 with similar exposures [boxed] like those at Locality 8 and the hominin footprint Site G. Tuff T7 and T8 contains most of the animal and hominin footprints (after Ditchfield and Harrison, 2011, Hay, 1980).

b. Any study area defined

The proposed area of study lies within the Ngorongoro Conservation Area, which is a UNESCO World Heritage Site. The property was registered initially as a natural site under criteria vii, viii, ix and x in 1979 (3rd Session) with Reference number 39, and as a “Cultural” Site under criterion iv in 2010. The Cultural Site status recognized in part the global significance of the preserved 3.6 million years old hominin footprints trackway discovered in 1978 by members of Dr. Mary Leakey’s team. As a paleoanthropological site, Laetoli covers about 100 square kilometers characterized by fossiliferous volcanoclastic deposits of varying age and lithology along the Garusi, *Gadjingero*, *Nompopong* and *Olaitole* river valleys. The trackway at Laetoli has been reburied for the past 19 years without significant benefits to the scientific value and economy of the people surrounding the site and the country in general.

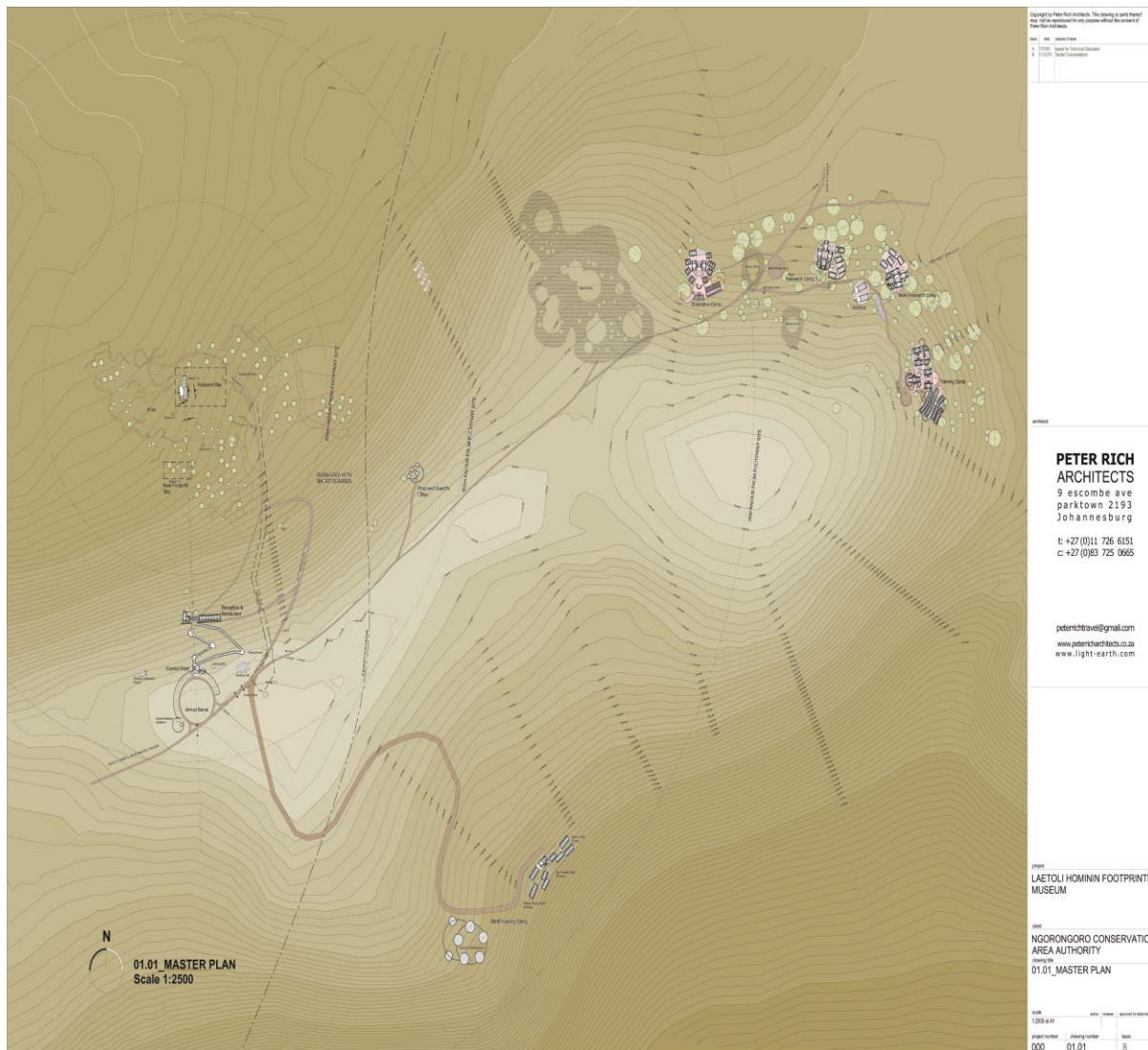


Figure 6. Master Plan for the proposed project at Laetoli including the Vistors Pavillion site, Staff and other supporting personnel site, Education, Research, Archive and Training Camp sites.

c. Development or proposals for change

Ngorongoro Conservation Area Authority (NCAA), which attained fully custodianship of the Laetoli and Olduvai Gorge paleoanthropological sites in 2013 will be implementing a two-phased conservation plan at Laetoli paleoanthropological site with an initial proposed construction of a reception pavilion, training, research and educational facilities to facilitate a comprehensive and long term conservation and preservation plan for the hominin footprints at Site G. As a paleoanthropological heritage resource with scientific and cultural attributes, the integrity of the Laetoli hominin footprints and its Outstanding Universal Value (OUV) is not only threatened by current poor conservation conditions but also natural and human activities. As a result, the NCAA has embarked on smart conservation and sustainable use of the Laetoli paleoanthropological site.

In accordance with the Contract Terms of Reference, the NCAA contracted Peter Rich Architects of Johannesburg, South Africa in collaboration with Tanzanian experts/sub-consultants in project management, archeology, financial analysis, environmental study, land survey, structural, civil, mechanical, electrical and ICT engineering, as well as international experts Laetoli footprints conservation study (Prof. A. Zaitzev of University of Saint Petersburg, Russia); anthropologist (Prof. M. Butovskaya of Russian Academy of Science), museum curatorial (N. Leibhammers of Morningside, South Africa) – to carry out the conservation and sustainable use of Laetoli.

In subsequent recommendations of the Inception Report Meeting in Arusha of April 2014, the First International Consultative Meeting in Karatu of November 2014, and guidance from Prof Charles Musiba and all members of the advisory committee, the Consultant (Peter Rich Architects), the Project Manager (GMP Consulting Engineers Ltd), in agreement with the Client (the NCAA), developed the following Project Brief to constitute the basis for the Design and Construction:

A – Project Phasing

Phase I – Reception Centre and Ranges’ Post, Training, Research, Educational Facilities and NCAA Staff Housing with the relevant infrastructure – “work-in-progress”

Phase II – Museum Complex - feasibility study (monitoring & stone conservation research) and Museum Building.

B – Project Brief/Schedule of Facilities:

- i) Training – training/educational facilities for **40** trainees/students
 - Dormitories: 2 units of 10 bedrooms each with 2 sharing with common ablutions (male/female).
 - Training: 1-unit general research laboratories; 2 units controlled environment laboratory; storage room; office; ablutions; 2 shaded open court terrace.
 - Classrooms: 2 units’ classroom/office; ablutions; shaded open court terrace.
 - Dining/Recreation.
- ii) Archive: 2 units: (a) – archive from Olduvai; (b) – Laetoli – new findings archive.
- iii) Research: 2 camps for 12 researchers each; total **24**

Each camp to have

- Accommodation: 4 units with 3 three self-contained bedrooms each; common dining/kitchen self-catering facilities; cloakroom.
 - Research: 2 units' general research laboratories; storage room; office; tea room; ablutions; 2 shaded open court terrace.
- iv) Educational – accommodation and lecturing facilities for **56** pupils and **4** teachers
- Dormitories: 2 units, each unit for 28 pupils and 2 teachers:
 - 4 pupils sharing with common ablutions (male/female);
 - 2 teachers – 2 rooms per unit; ablutions (male/female).
 - Kitchen/Dining
 - Shaded open court lecturing auditorium.
- v) Staff Housing (total **62** persons)
- Senior Staff: 10 units, in 2 blocks of 5 – two-bedroom, self-contained accommodation with kitchenette (no family) – **10** persons.
 - Skilled Staff: 10 units, in 2 blocks of 5 – self-contained accommodation with kitchenette (no family) – **10** persons.
 - Visiting/Semi-skilled Staff: 10 units, in 2 blocks of 5 rooms, 2 people sharing, common ablutions: **20** persons.
 - Canteen
 - Rangers/Office: 1 unit to accommodate 2 rangers – 1 room each; office; common ablutions - Maasai *boma* type housing on the ridge in close proximity to the Museum Complex Buildings: **2** persons
 - Unskilled staff accommodation: 5 units to accommodate **20** personnel, 4 sharing, common ablutions - Maasai *boma* type housing in close proximity to the Museum Complex Buildings.
- vi) Infrastructure
- Museum proximity - Relocation of access road
 - Museum proximity - Protective Storm water drainage
 - Provision of Electrical Power
 - Provision of Water distribution and storage
 - Sewerage and Waste Management
 - Recommendation on upgrade of access roads
- vii) Museum Complex – Footprints Hall and 8 Exhibitions' Pavilions.

A Call for Expression of interest

Expression of Interest for Preparation of Architectural Brief for the Design Concept Requirements for the Proposed Laetoli Hominin Footprints Onsite Museum.

The Ngorongoro Conservation Area Authority (NCAA) has set aside some funds in this financial year 2012/2013 for conducting an Architectural Design Concept competition in order to acquire drawings for the proposed State of the Art onsite Museum to be constructed at Laetoli in order to permanently and sustainably conserve and use the 3.6 Ma Laetoli Hominin Footprints currently buried for preservation purposes.

However, the Design Concept Competition will require Preliminary Site Information. Therefore, this call for expression of interest requires the eligible applicant to prepare Architectural Brief document that will be used to guide the applicants in the design concept competition.

The short listed applicants will be given Preliminary Design Requirements that can debrief them about the assignment once they are asked to submit proposals for Tender Bidding.

You are therefore asked to express your interest for the Preparation of Architectural Brief for the Proposed Laetoli Hominin Footprints State of Art Museum.

Only the successfully short listed applicants shall receive a call for submission of proposals whereby the Client will provide you with the Preliminary Design Requirement document to guide you in writing your proposal for bidding.

Your Expression of Interest application letters should reach the addressee below by 31st October, 2012 before 15:30 Hours. Only hand delivered letters and stamped by a receiver or delivered by DHL or postage shall be considered. Letters delivered by E-mail or FAX shall not be considered.

**The Conservator
Ngorongoro Conservation Area Authority (NCAA)
P.O.BOX 1
Ngorongoro
ARUSHA.**

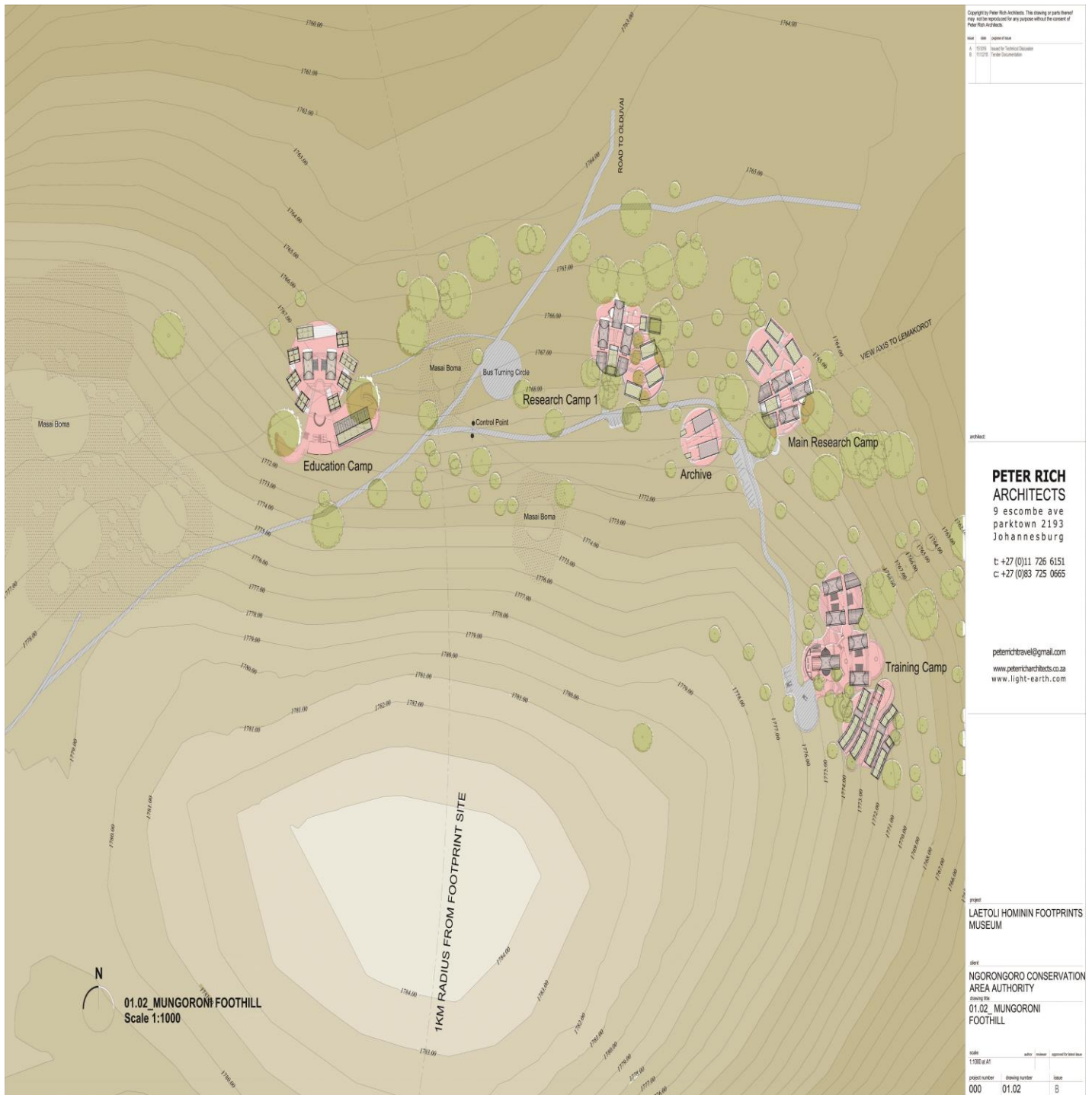


Figure 7. Topographic survey map with proposed locations of the Education, Research, Archive and Training Camps at Locality 7 and the Mungororoni Hill.



Figure 8. Rendered Education Camp Ground Floor Plan.



Figure 9. Rendered Training Camp Ground Floor Plan.

d. Visual or inter-visibility analyses

The CHIA did not include any specific visual or inter-visibility analyses apart from cadastral and site survey which were conducted by GMP Consulting Engineers Ltd and the Client. The Esere-Laetoli area, which is part of the NCA's Western Zone, is an extension of the Endulen-Laetoli tract which extends from the Ngorongoro Volcanic Highlands in the east on the foothill of Mount Lemagrut all the way to Kakesio along the Eyasi Escarpment in the west. The tract encompasses an area of approximately 250 km², physiographically characterized by flat topography sloping gently from almost 2,000 meters in the east to about 1,750 meters in the west. The area can be defined as an undulated landscape consisting of low hills and ridges, with drainage radiating out from the eastern highlands emptying into the Esere Plains. Laetoli is situated on the Southern edge of the Serengeti ecosystem, which is a large area of woodland and grassland. The greater Laetoli area has three broad vegetation zones: Zone I, grasslands making up approximately 25% of the greater Serengeti ecosystem; Zone II, *Acacia* woodlands making up approximately three quarters of the entire ecosystem (Japer, 1982; Andrews and Bamford, 2008); and Zone III woodlands with relic forests in the northeast, which are now been replaced or dominated by *Combretum-Terminalia* woodlands as a result of burning (Schmidt, 1975; Andrews et al., 2011).

As part of the NCA's Western Slopes, Laetoli and Esere sport the critically endangered African Wild Dog (*Lycaon pictus*) during the rainy season (Figure 10A in section S. d.), with packs frequently denning and breeding in the area to coincide with the arrival of the migrating herds. This species is afforded the highest level of protection under IUCN guidelines and the operational phase of the Project will need to accommodate any breeding attempts by this species in the vicinity or within the Site itself. Additionally, other resident wildlife at Laetoli include several species of bovids (antelope such as Impala, hartebeest, and gazelles, and kudus), zebras, giraffes, cheetahs, lions, spotted and striped Hyenas, and elephants. Furthermore, some small to medium-sized mammalian species such as honey badgers, porcupines and aardvarks are also found in the area. Paleontological evidence shows that there was a large and diverse fauna of herbivorous mammals present in the Pliocene, with 13 bovid species, 3 giraffe species, 2 rhinos, and 3 elephant species (Leakey and Harris, 1987). This is a considerably greater diversity of megafauna than is currently present in the area, which has been attributed to the wetter climate regimes that were prevalent during the Pliocene.

Laetoli which sits within the orographic shadow of the Mount Lemagrut and the Ngorongoro Volcanic Highlands experiences extreme ranges of seasonality characterized by prolonged heavy rains, short rains, and some dry and hot months, an indication that Laetoli area falls within a single climatic zone, and that variations in climate within this area are due to local changes in altitude and topography. Despite its proximity to the equator, Laetoli's elevation of about 1,750 m on the west of Ngorongoro, keeps temperatures relatively low and alleviates humidity. Cool dry air is prevalent for much of the year. The temperature ranges between 13° C and 30° C with an average around 25°C. It has distinct wet and dry seasons, and experiences an eastern prevailing wind from the Indian Ocean, some five hundred kilometers to the east.



Figure 10. Photos showing some African wild dogs in the vicinity of Laetoli (A), and the footprint Site G during wet season while the in-seat shows the same site during the dry season (B).

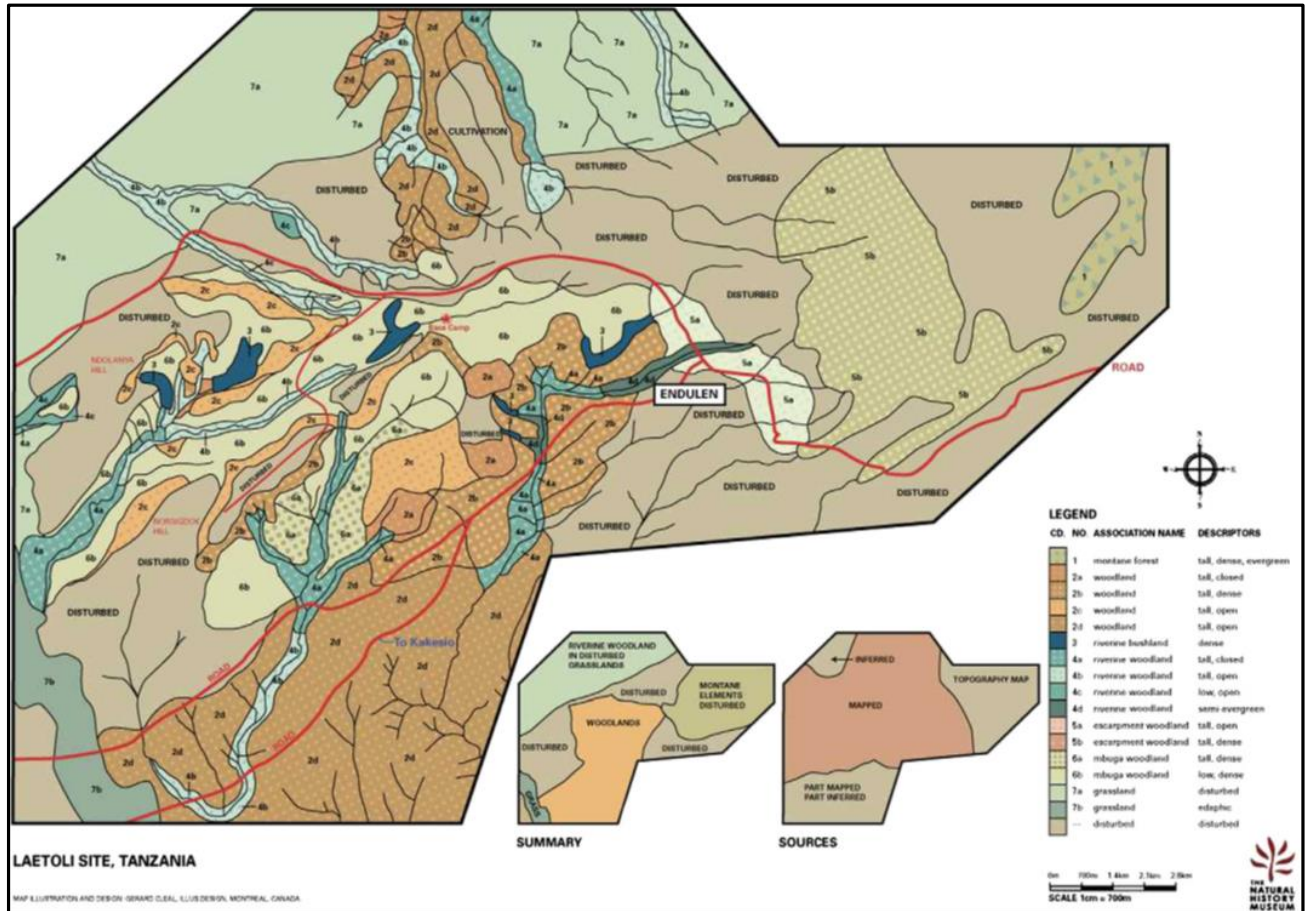


Figure 11. Vegetation and soil characteristics map of Laetoli and the Ngorongoro Highlands (after Andrews and Bamford, 2011).

e. Archaeological excavation log entry at Locality 7

Test Pit 1 El. 1780m and UTM 360744278/9642332. A 2 x 1.5 m pit excavated at the north of new site. Excavation was taken down to 2.3m deep spanning a generalized Upper Laetoli stratigraphic succession described in details first by Hay (1980), Manega (1993), and Ditchfield and Harrison (2011) observed during excavation as follows:

1. Black cotton soil measuring 20 cm on the average and forming the top layer.
2. Reworked calcite mottled by concretion and measuring about 145 cm thick. No paleontological/archaeological materials were seen.
3. A layer of huge lightly grey cement nodular calcrete layer measuring about 70 cm to the bottom (See detailed stratigraphic profile of the placement of various fossiliferous layer associated with animal and hominin footprints in Figure 5 in section S. a.). In between the layer, some diverse splintered fossil bones were observed and collected.

NB: we do not know how deep the layer is because the excavation stopped at the contact with the underlying more compact nodular calcrete layer.

Test Pit 2 El. 1780 m and UTM of 360744264/9642206. The excavation was comparable to the preceding one, except for a few diagnostic artifacts observed on the surface and within the top layer. These consist of obsidian, pottery and some faunal remains. However, the cultural significances of these findings as intimated earlier cannot be established because the area has recently been impinged with agricultural activities.

Test Pit 3 El. 1780 m and UTM 360744264/9624806. A 2.10 x 1.70 m pit was excavated on the eastern side of Test Pit 2. The pit was dug down to a depth of 170 cm spanning three stratigraphic units, which are more or less like in the preceding trenches.

Test Pit 4 El.1791m and UTM. 360744096/9642698. A 2.15 x 1.7 m pit was excavated slightly north of Test Pit 3 and revealed three distinct stratigraphic units as explained below:

1. Black cotton soil measuring 65 cm in thickness and yielding few paleoanthropological materials represented by pottery, lithic and bones. As remarked earlier, the significance of these finding cannot be established because of agricultural activities, which may have disturbed the context of the findings.
2. A layer of calcite mottled by concretions and measuring 28 cm and supposedly sterile.
3. Extremely reworked calcite turning into gravel measuring 100 cm and continues. Few paleoanthropological findings were recovered.

Test Pit 5 El.1791 m and UTM. 360744096/9642698. A 1.90 x 1.50 m pit was excavated west of Test Pit 4 and with comparable section to the previous one. However, some paleoanthropological materials i.e. bone and lithic artifact were recovered from about 40 cm, which again could have been impacted by agricultural activities.

Test Pit 6: El 1754 m UTM 360744872/9642792. A 2.00 x 1.60 m pit was dug north east of pit no 5 down to 1.87 m below surface. Sediments include black cotton soil at the top followed by calcrete which turns to pisolithic gravel and thereafter to the boulder rich horizon which has been described as a light grey, well cemented nodular calcrete layer. A few non-contextual paleoanthropological relics represented by obsidian and quartzite artifacts were observed and retrieved from the reworked stratigraphic unit

Test Pit 7: El 1777 m UTM 3600744007/9642680. A 2 x 1.5 m pit excavated south of Test Pit 6 to 150 cm below surface and revealing four distinctive map-able stratigraphic horizons; Compact black cotton soil, Nodular calcite, brownish reworked concretions (calcrete) and blocky calcrete. A few highly fragmented bones (splinters) and stone artifacts were found in the first layer comingled with pottery and lithics.

Test Pit 8: El 1777 m UTM 3600744007/9642680. A 2 x 1.5 m pit was dug west of Test Pit 7 down to 120 cm below surface. Two stratigraphic units were revealed; black cotton soil 70 cm thick and an extremely compact calcrete reaching to a depth of 120 cm below surface.

Test Pit 9: El 1777 m UTM 3600744007/9642680. A 2 x 1.5 m pit was excavated to 170 cm deep and three stratigraphic levels were revealed:

1. Black cotton soil 90 cm thick and containing comingled microlithics and recent bone accumulations;
2. Nodular calcite devoid of paleoanthropological material, and
3. Reworked calcite turning to gravel with no paleoanthropological remains.

Test Pit 10: El 1779 m UTM 360743970/9642716. A 2.0 x 1.5 m pit was excavated also revealing three stratigraphic levels, which are a mirror image of the above pit.

As the digging progressed, the sediments were examined for cultural and paleontological materials, i.e. stone tools, fossilized bones, ichnofossil and other important features. All the pits showed three or four stratigraphic/sedimentary units which are from the top to bottom recognized as black cotton soil, calcrete, reworked calcrete turning into gavel or pisolithic layer and finally boulders of nodular calcrete layer full of biotite, compaction of the sediments varied considerably but as a rule compaction increased with depth.

Black Cotton Soil: This unit was thicker in the trenches located on the top of the ridge or plateau and thinnest in the trenches on the eastern gradual slopes, varying from 80 to 20 cm thick. A few artifacts were seen in the sediments of this layer. Since the unit would have been impinged by agricultural activities as alluded to above, the artifacts cannot be expected to be in their primary context and therefore of limited cultural values. Artifacts included historical ones such as pottery, pieces of a *tuyere*, slag, splinter bones and some artifacts dominated by obsidian flakes.

Calcrete/Calcite: Underlying the black cotton soil was a unit characterized by ashy compact sediments which on acid test proved to be a form of calcite. Varying in compaction with depth this

unit was encountered in all trenches. In some trenches, the sediments seem to have weathered into gravel.

A few artifacts, predominantly of MSA and made from lava and a rock type reminiscent of Banded Iron Formation were encountered and a sample collected. This horizon was ca 40cm thick on the average.

Light grey, well cemented nodular calcrete layer: This was the most compact of all the sedimentary units and in most cases very difficult to dig through. This layer is composed of large nodular calcrete layer full of biotite, which seem to have been cemented together, presumably by volcanic ash. In the trenches on the eastern slopes the depth reached 50 cm and beyond. According to Ditchfield and Harrison (2011), this layer spans about 70 meters deep (see Figure 5 in section S. a.). There were few paleoanthropological materials which consisted of highly fragmented fossil bones as well as some artifacts.

The ten 2 x 1.5 m pits, which were dug at the new site with a varying depths spanning from 2.3 to 1.5 meters contained very few remains. It was very difficult to evaluate what the heritage at risk is at Locality 7 based only on the ten trenches that we established. If the finds from the trenches could be held, as representative of the whole, one could safely say that the planned Project will have minimum impact since the majority of the finds, microlithics, obsidian and pottery (Figures 13A., 14, and 15B and C in section S. e.) come from the Black Cotton soil which, as has been remarked above, has been disturbed by agricultural activities and hence rendering any cultural material therein less significant or of no scientific value (out of context).

f. Key sites and views (photos and maps)

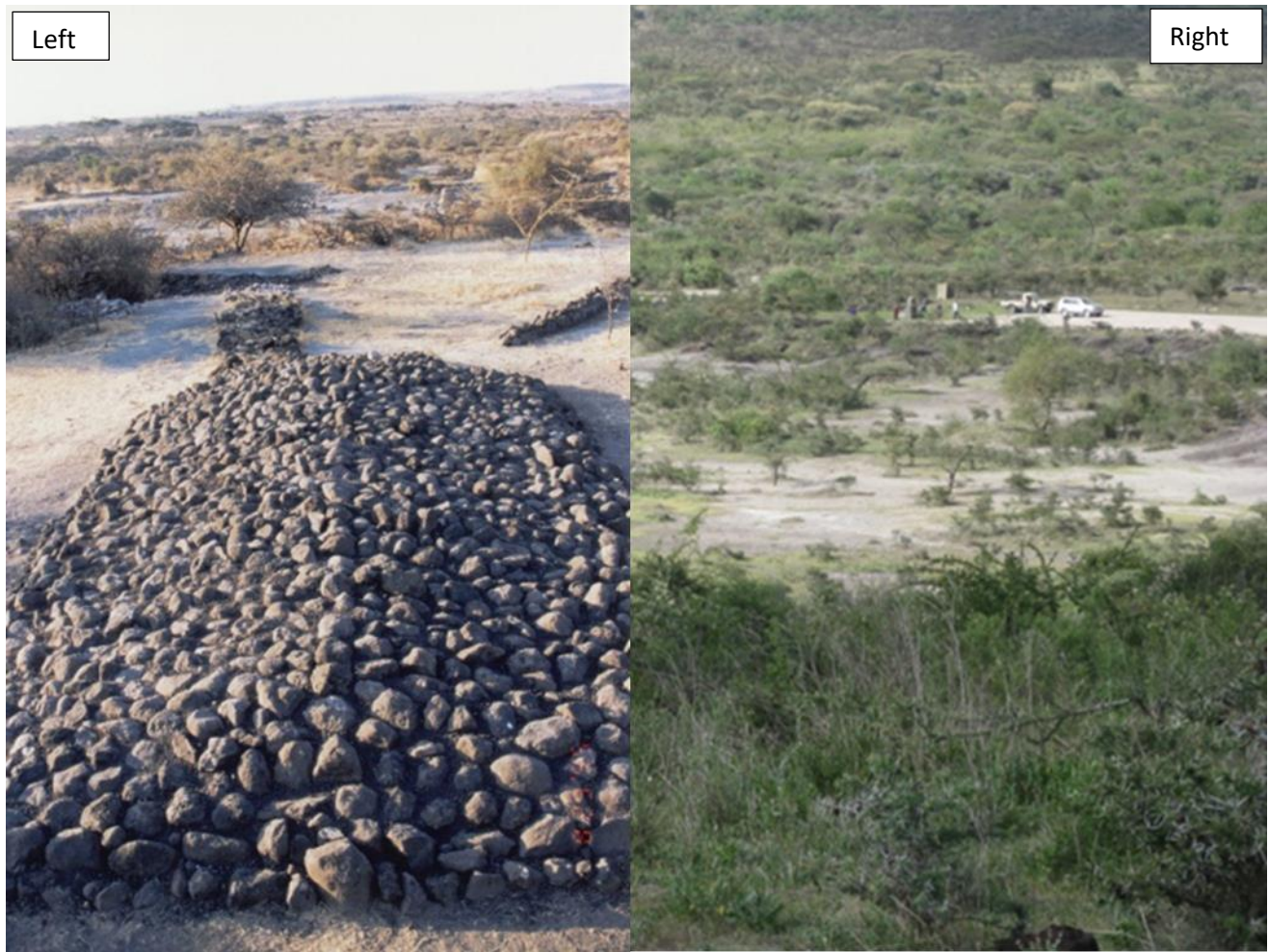


Figure 12. Photos showing the study area during dry season (left) and during the wet season(right).



Figure 13. Photos showing an isolated hominin premolar (A), the newly discovered hominin footprints (B.), excavation work north of Site G (C), back filled test trenches at Locality 8 (D.), and excavation through clay matrix in one of the test trench (E.).

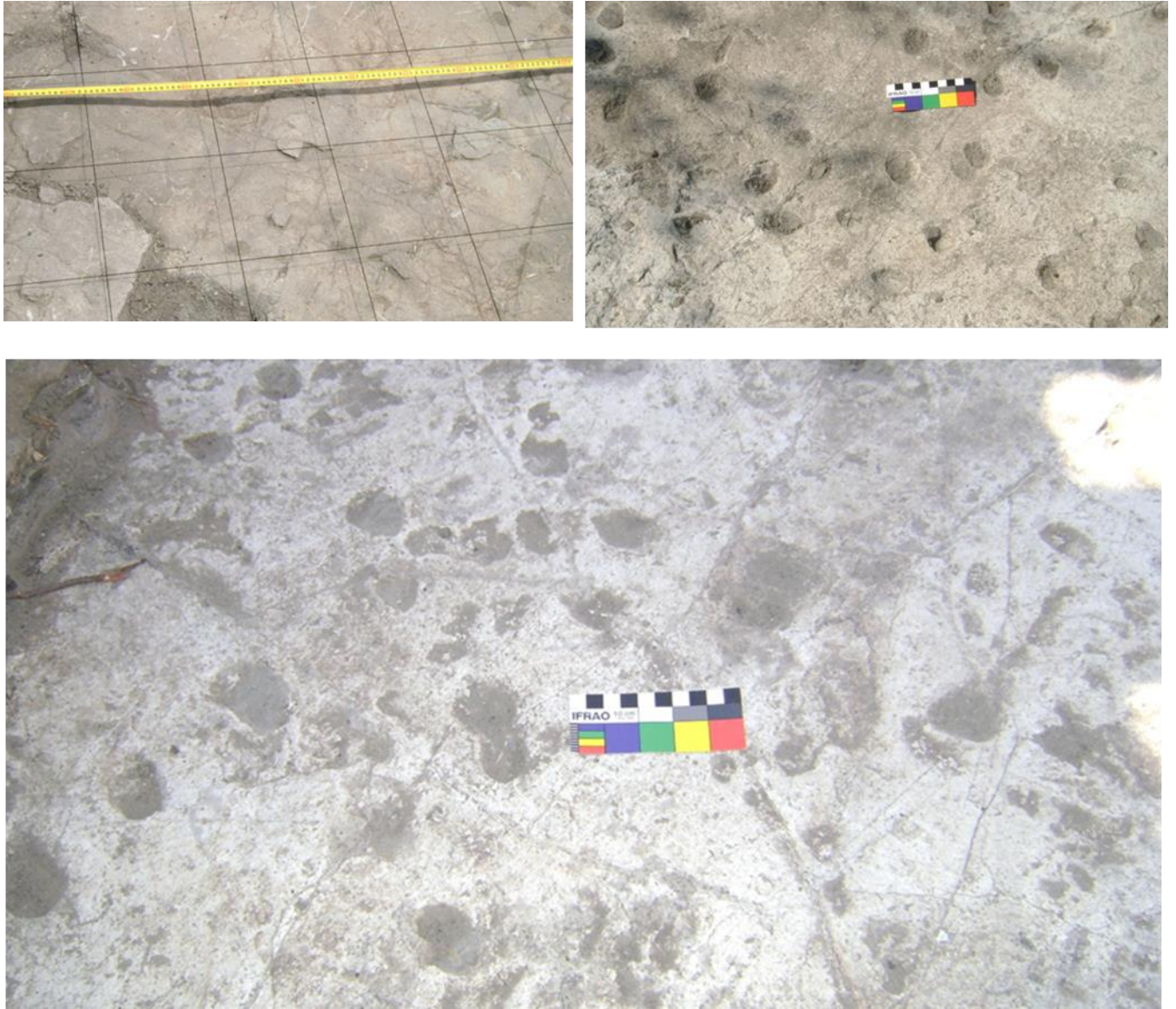


Figure 14. Photos showing animal footprints excavated during the CHI assessment.

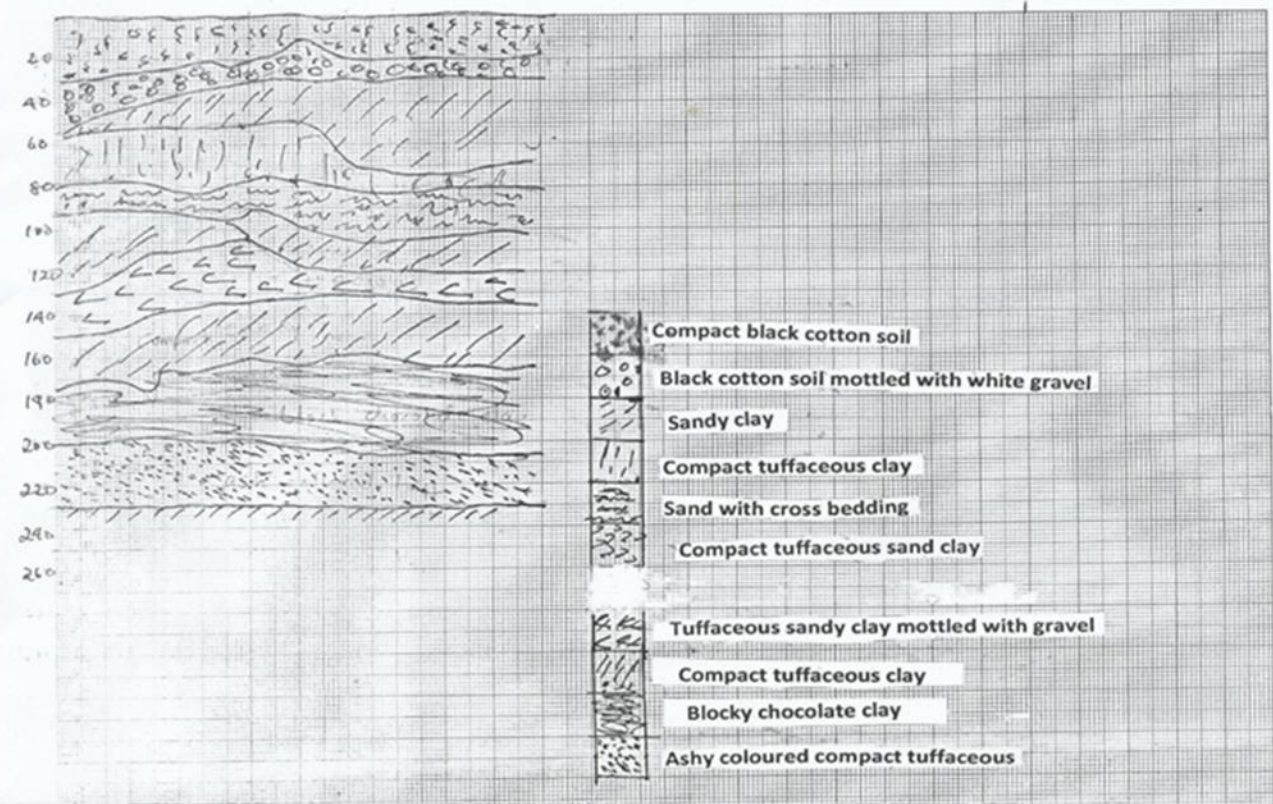


Figure 15. Photos showing the extent of the cotton soil in one of the test pit at Locality 7 (A.), pottery recovered at Locality 7 (B.), and stone tools of varying material recovered within the cotton soil layer (C.).

A.

IK: B-L LA1101
TIMETER #25 X 30 CM.
SCALE 1:1

47 1510



B.



Figure 16. Photos showing a rough sketch (A.) of the stratigraphic profile in one of the excavated test pit (B.) at Locality 7.

T. Appendices

a. Tables of individual sites or elements, summary description and summary of impacts

Table 3. Surface and sub-surface survey log.

Trench No	GPS Coordinates	Overall depth	Depth of tuff excavation	Finds	Comments
A 0	0313474/3511426	220 cm	220cm	Primate tooth	extremely compacted tuff and very difficult to dig through
A 1	0313473/3511418	130 cm	130cm		extremely compacted tuff and very difficult to dig through
B 0	0313481/3511427	250cm	88cm		extremely compacted tuff and very difficult to dig through
B 1	0313479/3511427	170cm	50cm		extremely compacted tuff and very difficult to dig through
B 2	0313481/3511418	240cm	110cm		extremely compacted tuff and very difficult to dig through
B 9	0313840/03511249	260cm	260cm		
C 0	0313489/3511227	270cm	50cm		
C 1	0313488/3511435	90cm	0cm		
C 2	0313487/3511444	200cm	50cm		
C 3	0313487/3511449	220cm	88cm		
C10	0313850/03511258	50cm	0cm		very close to the trackway and with animal foot prints
C11	0313848/03511264	20cm	0cm		Shallow and bearing animal footprints
C12	0313847/03511272	40cm	0cm		with animal foot prints
C13	0313850/03511278	270cm	160cm		
D 1	0313496/3511435	240cm	90cm		extremely compacted tuff and very difficult to dig through
D 2	0313498/3511437	220cm	80cm		extremely compacted tuff and very difficult to dig through
D 3	0313488/3511558	170cm	60cm		extremely compacted tuff and very difficult to dig through
D 9	0313854/03511250	250 cm	240cm		
D11	0313859/03511260	20cm	250cm		tuff and extremely compact
D13	0313855/03511281	240cm	210cm		
D12	0313858/03511271	250cm	210cm		
E 4	0313512/3511457	180cm	90cm		extremely compacted tuff and very difficult to dig through
E 5	0313505/3511465	200cm	200cm		extremely compacted tuff and very difficult to dig through
E 7	0313503/3511482	200cm	200cm		extremely compacted tuff and very difficult to dig through
E 8	0313892/03511242	250cm	210cm		
E 9	0313865/03511247	120cm	100cm		
E10	0313864/03511258	260cm	240cm		
E11	0313867/03511246	250cm	230cm		
E13	0313865/03511278	250cm	250cm		extremely compacted tuff and very difficult to dig through
F 4	0313512/3511459	200cm	200cm		extremely compacted tuff and very difficult to dig through
F 5	0313513/3511467	160cm	80cm		extremely compacted tuff and very difficult to dig through
F 7	0313512/3511480	170cm	140cm		extremely compacted tuff and very difficult to dig through
F 8	0313870/03511240				ANIMAL FOOT PRINTS
I 6	0313536/3511474	220cm	130cm		extremely compacted tuff and very difficult to dig through
I 8	0313537/3511490	160cm	140cm		extremely compacted tuff and very difficult to dig through
I 9	0313536/3511499	180cm	140cm		extremely compacted tuff and very difficult to dig through
J 6	0313547/3511477	180cm	120cm		
J 7	0313553/3511502	170cm	140cm		extremely compacted tuff and very difficult to dig through
J 8	0313546/3511492	180cm	180cm		extremely compacted tuff and very difficult to dig through
J14	0313910/3511284	152cm			animal foot prints at below surface
K 6	0313914/3511222	170cm	160cm		extremely compacted tuff and very difficult to dig through
K 7	0313552/3511484	150cm	150cm		extremely compacted tuff and very difficult to dig through
K13	0313923/3511277				
K14	0313915/3511287				
L 6	0313560/3511476	190cm	160cm		
L 7	0313561/3511483	160cm	110cm		
L 8	0313992/3511244	30cm	tuff surface	foot prints	hominid foot prints on weathered tuff
L13	0313925/3511279				
Exposed	0313931/3511241	200cm	190cm		prints were seen.
M 6	0313933/03511227				
M 9	0313929/3511242	80cm	50cm		hominin foot prints exposed
M10	0313431/3511257				
M11	0313429/3511265				
N 7	0313947/3511246				
A 1 Blue Flag	0313471/3511436	300cm	300cm		extremely compacted tuff and very difficult to dig through
Blue flag no id	0313498/3511482				
Primate Tr	0313832/03511179				extremely compacted

b. Desk studies (list of peer-reviewed articles/policies/treaties)

List of peer-reviewed articles on Laetoli Paleanthropological Site

1. Agnew, N. and M. Demas. 1998. Preserving the Laetoli footprints. *Scientific American*, Vol. 262, pp. 44–55.
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15. Bird, M. E. 1987. A preliminary comparative study of fossil and extant mammalian tracks and trails. In M. D. Leakey & J. M. Harris (Eds.), *Laetoli: A Pliocene site in northern Tanzania*, pp. 546–550. Oxford: Clarendon.
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Policies

- **National Environment Policy, 1997**

This EIA is developed within the framework of the National Environment Policy of 1997. The policy puts significant weight on the requirement to conduct an EIA study for any proposed project.

- **Cultural Heritage Policy, 2008**

The culture policy emphasizes the educational and tourist values of these treasures and uses culture to serve social development.

- **The National Environmental Management Act (2004)**

The Act provides mandatory action for environmental planning, environmental management for protected areas, conservation and protection of natural resources, conducting Environmental Impact Assessment and Environmental Audit, pollution prevention and control, waste Management and other actions of Importance to environmental conservation. The EIS for this project will be prepared with an inclusion of environmental management and monitoring plan, including recommendations for proper management of the project during all phases of the project, including design, construction, operation, and decommissioning.

- **National Antiquities Policy, 2008**

The Policy clarifies the roles and responsibilities of different actors and stakeholders of cultural heritage resources. NCAA realizes its roles, responsibilities for managing, preserving and conserving cultural and archaeological heritages.

- **The Antiquities Act of 1964**

Antiquities Act of 1964, the principal legislation and the Antiquities (Amendment) Act of 1979 (Act No 22 of 1979) together with Rules and Regulation of 1981, 1991, 1995 and 2001 forms the legal protection of Tanzanian cultural heritage resources. The 1964 Act offers general protection to objects or structures that are of archaeological, paleontology, historic, architectural, artistic, ethnological or scientific interest. The Project is intended for the protection of archaeological objects and promotion of tourism sector, and thus the focus of the Project implementation is to comply with the Act.

INTERNATIONAL TREATIES AND CONVENTIONS

- **UNESCO Convention the protection of the World Cultural and National Heritage 1972**

The convention establishing an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organized on a permanent basis and in accordance with modern scientific methods, project implementation will value and adhere to the Convention requirements. Tanzania ratified the Convention in 1977.

- **Convention for the Safeguarding of the Intangible Cultural Heritage 2003;**

Traditional or living expression inherited from our ancestors and passed on to our descendants such as oral traditions, social practice, rituals, festive events, knowledge and practices concerning nature and universe, and traditional craftsmanship knowledge and techniques, project implementation will value and adhere to the Convention requirements. Tanzania ratified the Convention in 1977.

- **The UNESCO Convention on the means of prohibiting and preventing the illicit import, export and transfer of ownership of cultural property, 1970**

The Convention requires its States to take preventive measures which includes inventories, export certificates, monitoring trade, imposition of penal or administrative sanction, educational campaigns, etc. The convention further requires State parties to undertake restitution provisions, taking appropriate steps to recover and return any such cultural property imported after the entry into force of the Convention in both States concerned, and it notified that the requesting state shall pay just compensation to an innocent purchaser or to a person who has valid title to that property. The Convention also stresses strengthening cooperation among and between State parties. Project management will adhere to the requirements of the Convention to prohibit and prevent the illicit import, export and transfer of ownership of fossils. Tanzania ratified the convention in 1977.

- **The UNESCO Convention on the protection of Cultural Property in the event of armed conflict, 1954**

The Convention emphasizes the respect of cultural property by refraining from any use of the property and its immediate surroundings of the appliance in use for its protection for purposes which are likely to expose it to destruct of damage in the event of armed conflict. The convention acceded by Tanzania in 1971.

c. List of consultees and consultation responses

List of Participants to the International Consultative Meeting held in Karatu, Arusha 22 -26 November, 2014:

1. Audax Z. P. Mabulla - National Museum of Tanzania
2. Harvey Johnston - Heritage Division Office Environment and Heritage, New South Wales, Australia
3. Mathias Maluck - State Archaeological Department of Schleswig – Holstein, Germany
4. Prof. Charles Musiba - University of Colorado Denver Co, USA
5. Prof. Fidelis T. Masao - University of Dar es Salaam
6. Jesuit Temba - Ministry of Natural Resources and Tourism, Antiquities Division
7. Dr. Godwin Mollel - APEX Geosciences Ltd, Canada
8. Simon Odunga - Antiquities Division, MNRT
9. Johnson Saiteu Laizer - Ngorongoro Conservation Area Authority
- 10 Joshua Mwankunda - Ngorongoro Conservation Area Authority
- 11 Eliwasa E. Maro - Antiquities Department, MNRT
- 12 Peter Rich - Peter Rich Architects Laetoli Project Main Consultant
- 13 Michael Leach - GMP Consulting Engineers Laetoli Project Consultant
- 14 Larissa Leach - GMP Consulting Engineers Laetoli Project Consultant
- 15 Andrew Lowassa - Ngorongoro Conservation Area Authority
- 16 Rogan Rich - Peter Rich Architects Laetoli Project Consultant team
- 17 Angus Gordon - Peter Rich Architects Laetoli Project Consultant team
- 18 Katherine Hall - Peter Rich Architects Laetoli Project Consultant team
- 19 Erick Kajiru - UNESCO National Commission of Tanzania.
- 20 John S. W. Kimaro - Antiquities Division, MNRT
- 21 Dr. M. M. Kimizi - UNESCO National Commission of Tanzania
- 22 Joseph King - ICCROM
- 23 Donatius Kamamba - Antiquities Division, MNRT
- 24 Godfrey K. Olle Moita - Department of Antiquities Cultural Heritage Management and Geopark Department, NCAA.
- 25 Eng. B. T. Baya - NEMC
- 26 Dr. Freddy Manongi - Ngorongoro Conservation Area Authority

Draft Recommendations

Preamble:

A meeting of the Laetoli Project Advisory Committee, working under the guidelines and terms of references provided by the NCAA in accordance with the Antiquities-NCAA MOU, met at the Kudu Lodge & Camp from November 22nd to the 26th, 2014 and hereby make the following recommendations.

Conservation:

The Advisory committee recognized that the conservation of the Laetoli hominin footprints is a paramount priority.

Short term

1. Need to improve drainage at the property (using topographic and other existing information) to ensure that the current conservation efforts of the footprints remain uncompromised.
2. Need to ensure regular and general maintenance of the property, especially removing trees.
3. A Monitoring Programme needs to be developed and started to look at medium/long term conservation solutions for the trackways (this will include installation of relevant probes).
4. Additional monitoring and exploration research (non-invasive) needs to be started on conservation of the newly discovered footprints. The NCAA in collaboration with the DA will identify and prioritize the research needs.
5. Small test excavations need to be carried out on other parts of the trackway, especially on the northern end to look at the current conservation of parts of the trackway that have not been examined.

Medium term

6. Carry out ongoing monitoring of the State of Conservation of the property and in particular the trackways (refer to item #3 in short term section).
7. Testing of conservation ideas on non-sensitive tuff areas of the property.
8. Based on monitoring and testing carried out on the property, a longer term conservation programme will need to be developed for the trackway. If the trackways are eventually to be exposed, the strategy for conservation will need to take into account the museum context.

Stakeholder Involvement

1. Recognize and encourage the involvement of stakeholders (local, national, regional and international) in the various phases of the Laetoli project.
2. The NCAA currently has a programme for stake holders' involvement. This program should be expanded to cater for cultural heritage needs in general (this will include Laetoli and other sites).

Capacity Building

1. Development of a capacity building strategy/plan including training and retention of human resources (this will include: conservation, site management, museums, curation, and other relevant fields).
2. ICCROM, ICOM and ICOMOS should be consulted for advice and assistance on the capacity building strategy.

Research, Education, Interpretation, and Presentation

1. A deliberate process for project development needs to be adopted which starts with the development of research and education facilities and then continues on to interpretation and presentation of the Laetoli Footprints site.

Administration

1. One single project document (Project Implementation Document) to cover all project phases' must be developed with advice and input from the Advisory Committee.
2. Necessary professional expertise will need to be included for the implementation of the project on the advice of the Advisory Committee (for example, a stone conservator will be pertinent for the architectural consultant).
3. Professional expertise on stone conservation is also necessary for the Advisory Committee.
4. Develop a visual mapping of the various entities (technical committee, steering committee, and advisory committee) involved in the overall project showing the relationships, flow of information, and decision-making.
5. The ICOMOS Guidelines for HIA should be followed in developing the CHIA for the museum and associated facilities (new areas also need to be included or added to the CHIA/EIA).
6. A progress report for the World Heritage Committee should be prepared by the State Party by February 1st, 2015.
7. We applaud the proposed Cultural Heritage Department within the NCAA in regard to management of the site while respecting governing national policy on cultural heritage conservation and encourage diligent adherence to best practices.

Funding / Fundraising

1. A comprehensive fundraising strategy (including expansion of the existing business plan to cover the next 20 years and beyond) will need to be developed for the overall project and for longer-term sustainability of conservation, research, education, and the museum.
2. Stable and continuous funding (cash-flow) is necessary for each project phase according to the PID and for sustainability of activities over time.

A fundraising team needs to be put together with a strong project document to attract donors (the status of the fundraising team still needs to be determined by the NCAA).

3. Develop a database of potential funders/donors for the project.
4. Stakeholders should be consulted (especially in the tourism industry) to discuss benefits of the project and add an additional possibility for funding from these direct beneficiaries.
5. NCAA should approach Tanzania National Parks to develop a more consistent approach to stakeholder fundraising. (See above – number 5).
6. Immediate consideration should be given to setting up an endowment fund or foundation for long-term sustainability of the activities at Laetoli.
7. Public-Private Partnerships should be explored as a possible funding mechanism.

d. The Scoping Statement

The scoping assessment and evaluation of factors affecting the Laetoli hominin footprint trackways at Site G was carried out following the framework of the Periodic Reporting (section II) adopted in 2008 by the World Heritage Committee as a standard list used to evaluate any threats affecting the Outstanding Universal Value(s) of the property:

- What is the impact of the proposed development to the heritage, why is it important, namely how does the proposed changes contribute to the OUV?
- How will the proposed project change or impact on the integrity of the site?
- How can the effects associated with the proposed development project be avoided, reduced, rehabilitated or compensated?

The assessment was conducted in three field seasons, covering areas earmarked by the Consultant, as being most proximal to the proposed project location and therefore susceptible to negative impact. The scoping was conducted at Site G within Locality 8, and Locality 7. The scope of assessment included:

- a. subsurface assessment of cultural heritage resources on the property,
- b. recovering and securing of movable cultural resources,
- c. analyses of micro settlement pattern,
- d. systematic surface survey and conducting archaeological excavation and securing all artifacts and fossil assemblages as indicated in terms of references, and
- e. proposing mitigating measures on cultural heritage resources.

Scoping statement summary:

1. The spatial scale of the impact: localized and restricted to the proposed area of development
2. The temporal scale of the impact: one-off
3. The impact on the attributes conveying the OUV: minor, the proposed development will enhance the OUV
4. The management response/capacity of management to respond to the proposed development and all associated changes on the property: medium with limited resources.

e. Scientific studies

Part 1. Preliminary geological and geochemical report (append or include the two reports 2015 reports)

Part 2. Geochemical analyses result and conservation recommendations (Zaitzev 2016 report)