

# Report of Phase 1 Archaeological Impact Assessments

## Proposed Borrow Pits for Roads in the Still Bay and Vermaaklikheid environs, Hessequa Municipality, Western Cape Province

by

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## **Executive Summary**

### **Borrow Pit 01 (Oude Muragie)**

*No human heritage remains but invertebrate fossils possible in rocks of the Bokkeveld Formation. This study leaves any steps necessary with regard to the potential fossils to the decision of HWC.*

### **Borrow Pit 02 (Klein Muragie Trig)**

*There is a very thin and poor quality scatter of stone tools in the study area. Calcretised sediment present is potentially fossiliferous.*

*This report recommends no mitigation with regard to the occurrence of stone artefacts.*

*Regarding the possible occurrence of fossils, the only sensible strategy is a reactive one. In the event of discovery, the developer should instruct the contracted machine operators to cease operation immediately in the immediate area. Meanwhile, work can continue elsewhere within the proven reserve of sediment as long as this in no manner impacts on the occurrence. The developer should then employ professional archaeologists / palaeontologists to 1) retrieve the **disturbed** (i.e. loosened) fossil materials; 2) permanently **secure** the undisturbed portion of the occurrence against further deterioration by covering it with sand and calcrete rubble (and any other materials deemed necessary by HWC); and 3) demarcate a no-go zone around the occurrence beyond which quarrying can continue. The fossil occurrence can then be conserved and managed by HWC for future study and research.*

### **Borrow Pit 03 (Dassenklip North)**

*A thin and poor quality scatter of stone tools occurs in the study area. Calcretised sediment present is potentially fossiliferous. Recommendations as for BP02.*

### **Borrow Pit 05 (Melkhoutkraal)**

*Stone tools are common within the study area but have been ploughed and selectively moved during field clearance. Calcretised sediment present is potentially fossiliferous. Recommendations as for BP02.*

### **Borrow Pit 06 (Sinkpos)**

*A thin and widespread scatter of stone artefacts occurs within the study area. In addition, there are a few spots that could represent infilled solution caverns – the contents could be fossiliferous. Finally, in a few instances there are occurrences of calcrete blocks that do not seem natural arrangements.*

*This report recommends no mitigation with regard to the occurrence of stone artefacts.*

*The developer should employ an archaeologist to investigate further the stone features and the possible caverns before quarrying commences.*

### **Borrow Pit 08 (Mosselbankfontein)**

*No human heritage remains but fossils possible in calcretised sediments. Recommendations for the potential fossiliferous sediments as for BP02.*

## **Introduction**

Site Plan Consulting appointed CARM (trading then as MAPCRM) to undertake Phase 1 Archaeological Impact Assessments of proposed locations for borrow pits (BP) to be used in the upgrading of gravel roads in the general area of Still Bay and Vermaaklikheid, in the Hessequa Municipality, Western Cape Province.

The proposed borrow pits are BP01 (Oude Muragie), BP02 (Klein Muragie Trig), BP03 (Dassenklip North), BP05 (Melkhoutkraal) and BP08 (Mosselbankfontein). Locations of the proposed borrow pits are provided in Figure 15 (appended).

This report limits description of the study areas to those factors that are of immediate concern to the efficacy of the search and assessment.

## **Purpose and Scope of the Study**

The objectives of the AIA are:

- to assess the study area for evidence of archaeological materials;
- to evaluate the significance of archaeological materials in the study area;
- to assess the significance of the impact of the proposed development on archaeological resources;
- if necessary, to recommend measures in mitigation of the impacts of the proposed development on the archaeological resources and
- to prepare and submit a report to the client that meets standards required by Heritage Western Cape (HWC) in terms of the National Heritage Resources Act , No. 25 of 1999 (NHRA of 1999).

## **Approach to the Study**

Maps provided by the client provided the coordinates of the boundary beacons, which were then loaded into a Garmin etrex vista hand held GPS. The hand held GPS provided both navigation to remain within the study area as well as a record, both of observations as well as walk paths.

The study area was accessed and inspected on foot by one of the author's (RY) of this report. Records of the search include GPS walk trails, an assessment of the viability of the survey with respect to vegetation and visibility, notes on the materials found and the context, a GPS fix and digital photography.

Any archaeological heritage located during the survey was assessed in terms of its significance and scale of importance as well as in terms of the potential impacts of the proposed development, both without and with the implementation of mitigation.

The survey methods employed in this study are standard to archaeology the world over. If conducted diligently and under reasonable conditions for the search, the results would be a comprehensive record of surface traces of archaeological heritage and will provide a means of satisfying the requirements of the NHRA of 1999.

Given the situation in the study areas regarding visibility, this report estimates that the survey captured good information on most of the archaeological heritage present. The survey might well have overlooked isolated instances such as stone features and stone tools but this is an inevitable outcome of the prevailing methods accepted by HWC.

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# Borrow Pit 01 (Oude Muragie)

## Study Area

There is an existing quarry within the study area that is a few hundred metres in extent (refer to Figure 16 appended). As a consequence, there is extensive and intensive damage in this area. Natural vegetation occurs in the mostly undisturbed areas surrounding the quarry that will serve as much of the focus for extending the extraction of rock (refer to Figure 1). A lot of naturally occurring quartz lies around in the quarry as well as on the surrounding surface.

## Results

There is no sign of artefactual treatment to any of the numerous quartz fragments lying on the undisturbed land surface.

The undisturbed area in the east-south-eastern end of the study area has some modern 20<sup>th</sup> century litter associated with farm workers cottages nearby. There are also patches of ostrich eggshell fragments, again probably associated with the cottages rather than pre-colonial people, as there are no stone artefacts of any sort.

Rock in the quarry appears to be from the Bokkeveld Formation and, so there is a distinct possibility of non-vertebrate fossils for which the formation is well known at some localities.



Figure 1: BP01 showing the area with natural vegetation that is proposed as an extension to an existing quarry

## Assessment

Regarding human heritage remains, one can state with high confidence that they do not occur in any readily detectable form or density in the BP01 study area.

Invertebrate fossils are the only possible heritage remains in the study area, given the nature of the bedrock. Quarrying operations would be highly destructive of such a resource.

Table 1: Potential Impacts of the proposed development on Heritage Resources without Implementation of Measures of Mitigation

| Resource      | Significance | Status   | Confidence | Intensity | Extent    | Duration  | Probability    |
|---------------|--------------|----------|------------|-----------|-----------|-----------|----------------|
| Archaeology   | None         | Neutral  | High       | None      | None      | Permanent | High           |
| Palaeontology | Unknown      | Negative | High       | High      | Regional? | Permanent | <b>Unknown</b> |

## Proposed Measures of Mitigation

This study leaves any steps with regard to the possible presence of invertebrate fossils to the decision of HWC, as the matter falls outside of our area of expertise.

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## Borrow Pit 02 (Klein Muragie Trig)

### Study Area

The study area is essentially flat with a low but distinct ridge nearby to the east (housing the eponymous trigonometric beacon) (refer to Figure 2 and Figure 16 appended). There is some likelihood that farmers may have ploughed this area at some point in the past, as presently it is covered by low grass and leafy vegetation (grazing?) and sparsely scattered bushes. Visibility in the study area is quite good.

There is an ubiquitous scatter of tabular calcrete chunks and slabs over surface and here and there there are concentrations of quartzite cobbles (cobbles are larger in size and more common in adjacent ploughed field to the west). Geomorphological context of the study area thus is ancient river terrace.

Depressions or shallow holes of generally less than a metre in dimension occur throughout the study area - are these old diggings or collapsed burrows? Difficult to tell.

### Results

Very dispersed stone tools occur throughout the study area, usually in association with river cobbles. Observation 01 (refer to Figure 16 and Table 12 appended) is what passes for a "concentration" in this locality where a handful of artefacts lie dispersed over 30 to 40 m<sup>2</sup>. The best specimen seen comprised a rather lack lustre core and a chopper-like tool (refer to Figure 3).



*Figure 2: View of study area for BP02*



Figure 3: Stone tools from BP02 – the item on left is a core, that on the right is a crude chooper made on a cobble.

## Assessment

Materials present in the BP02 study area fall into the Early Stone Age sub-stage of early human history and broadly date from 1 million to 300,000 years ago.

These stone tools are part of a landscape-wide occurrence of stone tools associated with the ancient river gravels that characterise the area. At the very least, the tools are far more extensive in distribution than the study area. As far as seen, the tools do not occur in concentrations of primary context, the numbers are low and the evidence of manufacturing techniques is poor as a consequence.

Given that calcrete underlies the study area, this survey must consider the possibility that caverns may have formed or been excavated within the sediment and that they could have fossilised contents. Circumstances on site are not conducive to spotting this kind of occurrence. If such a resource did occur quarrying operations would be highly destructive of the resource.

Whilst there is a distinct chance of a fossil deposit, the probability of such an occurrence is **very low**.

Table 2: Potential Impacts of the proposed development on Heritage Resources without Implementation of Measures of Mitigation

| Resource      | Significance | Status   | Confidence | Intensity | Extent    | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|-----------|-----------|-------------|
| Archaeology   | Low          | Negative | High       | High      | Local     | Permanent | High        |
| Palaeontology | High         | Negative | High       | High      | Regional? | Permanent | <b>Low</b>  |

## Proposed Measures of Mitigation

This report recommends no mitigation with regard to the occurrence of stone artefacts, as there would be few appreciable gains from such measures. HWC should inform the developer whether a permit for destruction of the stone tools is required.

Regarding the possible occurrence of fossils, this report cannot recommend proactive measures of mitigation, as the actual negative impacts of the development on such resources is uncertain. The only sensible strategy is a reactive one.

The developer should instruct the contracted machine operators to cease operation immediately in the immediate area in the event that bones or other organic remains are uncovered by the quarrying operations. Work can continue elsewhere within the proven reserve of sediment as long as this in no manner impacts on the occurrence.

In the event that such a discovery is made, the developer should then employ professional archaeologists / palaeontologists to 1) retrieve the **disturbed** (i.e. loosened) fossil materials; 2) permanently **secure** the undisturbed portion of the occurrence against further deterioration by covering it with sand and calcrete rubble (and any other materials deemed necessary by HWC); and 3) demarcate a no-go zone around the occurrence beyond which quarrying can continue. The fossil occurrence can then be conserved and managed by HWC for future study and research.

*Table 3: Potential Impacts of the proposed development on Heritage Resources with Implementation of Measures of Mitigation*

| Resource      | Significance | Status   | Confidence | Intensity | Extent | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|--------|-----------|-------------|
| Archaeology   | Low          | Negative | High       | High      | Local  | Permanent | High        |
| Palaeontology | Low          | Negative | High       | High      | Local  | Permanent | High        |

## Borrow Pit 03 (Dassenklip North)

### Study Area

This study area straddles the head of a kloof leading down to the Uilenkraal River and mostly is undisturbed with the exception of the areas next to the adjacent ploughed fields (refer to Figure 4 and Figure 16 appended). Vegetation is quite thick, with both grass and bushes and visibility medium to poor. On the upper slopes of the valley a regular occurrence of open patches of soil facilitate the survey. Vegetation is substantially thicker in the valley bottoms and is thicker on the northern slope than on the southern.

Shale rock forms most of the sub-surface materials but calcrete occurs beneath the sands of the uplands areas. Cobbles also occur and geomorphologically the study area is a palaeo-river terrace.

### Results

A scatter of stone artefacts occurs in the study area, mostly towards the uplands rather than well within the steep valley sides. Where the artefacts occur, they are quite thinly scattered. Concentrations of artefacts are greater on the upper slopes of the northern side of the valley but it is possible that clearing the ploughed fields of stone resulted in artefacts as well as cobbles being spilled downslope.

The following are particular observations made during the search (refer to Figure 16 and Table 12 appended):

Observation 02 - quartzite core (refer to Figure 5)

Observation 03 - quartzite flake

Observation 04 - quartzite core

Observation 05 - quartzite flake with weathered notch

Observation 06 - well formed quartzite core made on a cobble

Observation 07 – centripetally flaked prepared core in quartzite, well formed

Observations 08 to 09 (on edge of field) - area of exposed river terrace with a greater density of stone tools. Area has been ploughed and this might have produced some of the "cores" and "flakes". Whilst of greater density, the occurrence is not particularly significant in terms of quality or quantity.



*Figure 4: proposed BP03 area, from the southern side of valley across to the northern*



*Figure 5: core made on quartzite, Observation 02*

## **Assessment**

Artefacts present in the study area likely are part of a landscape-wide occurrence of stone tools associated with the ancient river gravels that characterise the area. At the very least, the tools are far more extensive in distribution than the study area. As far as seen, the tools do not occur in concentrations of primary context, the numbers are low and widely dispersed and the evidence of production techniques is poor as a consequence. These artefacts fall into the Early Stone Age sub-stage of early human history and broadly date from 1 million to 300,000 years ago.

Given that calcrete underlies the study area, this survey must consider the possibility that caverns may have formed or been excavated within the sediment and that they could have fossilised contents. Circumstances on site are not conducive to spotting this kind of occurrence. If such a resource did occur quarrying operations would be highly destructive of the resource.

Whilst there is a distinct chance of a fossil deposit, the probability of such an occurrence **is very low**.

Table 4: Potential Impacts of the proposed development on Heritage Resources without Implementation of Measures of Mitigation

| Resource      | Significance | Status   | Confidence | Intensity | Extent    | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|-----------|-----------|-------------|
| Archaeology   | Low          | Negative | High       | High      | Local     | Permanent | High        |
| Palaeontology | High         | Negative | High       | High      | Regional? | Permanent | <b>Low</b>  |

### Proposed Measures of Mitigation

This report recommends no mitigation with regard to the occurrence of stone artefacts, as there would be few appreciable gains from such measures. HWC should inform the developer whether a permit for destruction of the stone tools is required.

Regarding the possible occurrence of fossils, this report cannot recommend proactive measures of mitigation, as the actual negative impacts of the development on such resources is uncertain. The only sensible strategy is a reactive one.

The developer should instruct the contracted machine operators to cease operation immediately in the immediate area in the event that bones or other organic remains are uncovered by the quarrying operations. Work can continue elsewhere within the proven reserve of sediment as long as this in no manner impacts on the occurrence.

In the event that such a discovery is made, the developer should then employ professional archaeologists / palaeontologists to 1) retrieve the **disturbed** (i.e. loosened) fossil materials; 2) permanently **secure** the undisturbed portion of the occurrence against further deterioration by covering it with sand and calcrete rubble (and any other materials deemed necessary by HWC); and 3) demarcate a no-go zone around the occurrence beyond which quarrying can continue. The fossil occurrence can then be conserved and managed by HWC for future study and research.

Table 5: Potential Impacts of the proposed development on Heritage Resources with Implementation of Measures of Mitigation

| Resource      | Significance | Status   | Confidence | Intensity | Extent | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|--------|-----------|-------------|
| Archaeology   | Low          | Negative | High       | High      | Local  | Permanent | High        |
| Palaeontology | Low          | Negative | High       | High      | Local  | Permanent | High        |

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## Borrow Pit 05 (Melkhoutkraal)

### Study Area

The study area consists of an extremely flat ancient river terrace that farmers have ploughed. This terrace is packed with cobbles varying in size from a few centimetres to a few tens of centimetres (30 cm or so being the outside) (refer to Figure 6 and Figure 17 appended). Given the situation, much plough damage can be expected on the cobbles at the very least.

Site Plan Consulting report that calcrete underlies the surface of the study area to a depth of approximately 1.5 metres.

### Results

Stone artefacts are a common occurrence on this terrace, although the scatter density is modest by the standards of some such sites. A small hand axe was noted in the adjacent public road next to the parked vehicle.

The artefacts are well patinated on the flake surfaces and this strongly separates them from plough damaged specimens, which display fresh quartzite scars and indeed, are a common occurrence.

Specific observations include (refer to Figure 17 and Table 12 appended):

Observation 10 - quartzite core on a cobble (refer to Figure 7)

Observation 11 - quartz core

Observation 12 - very large quartzite flake off a cobble

Observation 13 - scatter of cobbles with cobble core in centre (refer to Figure 8)



*Figure 6: BP05 view of proposed site*



*Figure 7: clear core produced on a quartzite cobble*



Figure 8: core on a cobble lying amongst unflaked cobbles



Figure 9: pile of cobbles and some tools collected by farm staff from ploughed fields such as that in the study area

## Assessment

Materials present in the BP05 study area fall into the Early Stone Age sub-stage of early human history and broadly date from 1 million to 300,000 years ago.

The scatter is most likely more extensive than the present field and may even extend beyond into areas not developed for ploughing. Unbiased collections of tools will exist in such places.

If calcrete exists beneath the surface then this survey must consider the possibility that caverns may have formed or been excavated within the sediment and that they could have fossilised contents. Circumstances on site are not conducive to spotting this kind of occurrence. If such a resource did occur quarrying operations would be highly destructive of the resource. The probability of such an occurrence **is very low**.

Table 6: Potential Impacts of the proposed development on Heritage Resources without Implementation of Measures of Mitigation

| Resource      | Significance | Status   | Confidence | Intensity | Extent    | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|-----------|-----------|-------------|
| Archaeology   | Low          | Negative | High       | High      | Local     | Permanent | High        |
| Palaeontology | High?        | Negative | High       | High      | Regional? | Permanent | <b>Low</b>  |

## Proposed Measures of Mitigation

The collection of stone tools within the BP05 study area are not mitigatable. A number of large cobble (and tool) piles lie along the periphery of the field enclosing the study area (refer to Figure 9). These are the results of clearing stone from the ploughed areas and must in part come from the study area field. The tools evident on the ground thus are a residue of the clearance operation and consequently are a distorted representation of the original assemblage composition. Short of collecting all tools from every plough pile and every artefact from each field that could have contributed to the plough piles, there is no way of reconstituting the original assemblage composition.

HWC should inform the developer whether a permit for destruction of the stone tools is required.

Regarding the possible occurrence of fossils, this report cannot recommend proactive measures of mitigation, as the actual negative impacts of the development on such resources is uncertain. The only sensible strategy is a reactive one.

The developer should instruct the contracted machine operators to cease operation immediately in the immediate area in the event that bones or other organic remains are uncovered by the quarrying operations. Work can continue elsewhere within the proven reserve of sediment as long as this in no manner impacts on the occurrence.

In the event that such a discovery is made, the developer should then employ professional archaeologists / palaeontologists to 1) retrieve the **disturbed** (i.e. loosened) fossil materials; 2) permanently **secure** the undisturbed portion of the occurrence against further deterioration by covering it with sand and calcrete rubble (and any other materials deemed necessary by HWC); and 3) demarcate a no-go zone around the occurrence beyond which quarrying can continue. The fossil occurrence can then be conserved and managed by HWC for future study and research.

*Table 7: Potential Impacts of the proposed development on Heritage Resources with Implementation of the Recommended Measures of Mitigation*

| Resource      | Significance | Status   | Confidence | Intensity | Extent | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|--------|-----------|-------------|
| Archaeology   | Low          | Negative | High       | High      | Local  | Permanent | High        |
| Palaeontology | Low          | Negative | High       | High      | Local  | Permanent | High        |

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## Sinkpos (BP06)

### Study Area

A large existing quarry lies south of a flat area that encompasses the proposed quarry (refer to Figure 17 appended). The old quarry exposes a 3 metres and deeper sequence of well calcified sediments - for the most part calcretes that are capped by a relatively even surface of and very dense material. Ferruginisation has occurred within the depth of sediment. In some cases the ferruginisation occurs in the context of cylindrical sub-vertical features within the calcretised sediments (spring activity?). Elsewhere the occurrences appear to be more distributed through the sediments.

Dense bush covers the undisturbed areas - shoulder height and higher limestone fynbos with an under story of grass and bushes. In places where the calcrete surface is at or very near the land surface the vegetation is thinner and there is some visibility of the ground. Overall visibility is poor (but moderate in patches) and this circumstance presents distinct limitations on the survey quality.

Survey proceeded by focusing on the wide track ways left by an excavator whilst making trial holes, as well as the remains of the trial holes (refer to Figure 10). Both provided a means of access not readily available otherwise. Side walks were undertaken from the track ways into clearer areas to attempt a wider coverage.

## Results

A thin and widespread scatter of stone artefacts occurs within the study area. These tools are extremely weathered, often to the point where the attributes marking them as of human manufacture are not readily discernible.

In addition, there are a few spots that could represent infilled solution caverns, which would not be surprising given the heavily calcified substrate and the fact that one can find small dissolution “pipes” penetrating the calcrete surface.

Finally, in a few instances there are occurrences of calcrete blocks that do not seem natural arrangements. Dense undergrowth makes it very difficult to assess these instances.

Specific observations and further details are (refer to Figure 17 and Table 12 appended):

Observation 133 - filled in remains of trial pit. Nothing seen.

Observation 134- filled in remains of trial pit. Nothing seen.

Observation 135- filled in remains of trial pit. Nothing seen.

Observation 136 - clearer area. Nothing seen.

Observation 137 - filled in remains of trial pit. Nothing seen.

Observation 138 – clearer area with calcrete at surface - 2 very weathered pieces of quartzite, not apparently from cobbles and possibly artefactual but this is uncertain.

Observation 139 - clearer area with calcrete at surface - a few very weathered pieces of orange coloured quartzite ( 1 to 2 pieces / 4 m<sup>2</sup>), one has a probable bulb of percussion.

Observation 140 - a further 2 pieces of orange, probably artefactual quartzite. This material thus is ubiquitous but thinly dispersed over quite a wide area.

Observation 141- filled in remains of trial pit. Nothing seen.

Observation 142- filled in remains of trial pit. Nothing seen.

Observation 143 - the infilled mouth of a possible cavern, blocked by bushes. It is unclear whether the hole was made by humans rather than by dissolution (refer to Figure 11). A distinct edge is visible, suggestive of depth below the organic infilling.

Observation 144 - area with loosely packed blocks of calcrete, which do not look natural. Do they represent rubble from an informal quarry; or are they the remnants of walling, and if so, of what era? Thick bush occurs in the area and not possible to tell at this point. (refer to Figure 12)

Observation 145 - clearing with exposed calcrete and a collection of the clearest artefactual quartzite, six in number in an area of 9 m<sup>2</sup> (refer to Figure 13). Best example is a centripetally flaked Levallois core, made on a cobble with a single production face.

Observation 146 - area with loose calcrete blocks, 10 to 40 cm in size range. Could be an ephemeral wall but again, dense bush makes it difficult to evaluate as it could also well be the detritus of an informal quarry pit. There are depressions in the area.

Observation 147 - filled in remains of trial pit. Nothing seen.

Observation 148- filled in remains of trial pit. Nothing seen.

Observation 149- filled in remains of trial pit. Nothing seen.

Observation 150 - filled in remains of trial pit. Nothing seen.

Observation 151- filled in remains of trial pit. Nothing seen.

Observation 152 - another low cliff like concave feature penetrating the calcrete surface that could be the infilled remains of a cavern mouth.

Observation 153 - area with calcrete blocks - least convincing of the so-called features.



*Figure 10: BP06 view of filled rial hole and dense surrounding vegetation*



*Figure 11: vegetation choked infilled hole within the calcretes – note low concave vertical face behind GPS (marked)*



Figure 12.: pile of calcrete blocks – possible walling or informal quarry detritus



Figure 13: quartzite stone tools lying on calcrete surface. Item at top left is a Levallois or prepared core.

## Assessment

The stone artefacts present in the BP06 study area fall into the Early Stone Age sub-stage of early human history and broadly date from 1 million to 300,000 years ago.

The scatter is most likely more extensive than the study area and (possibly richer) collections of similar tools likely will exist in other places.

Given the highly calcified rock beneath the surface this survey highlights the possibility that caverns may have formed (principally by dissolution) and that they could have fossilised contents. Circumstances on site are not conducive to spotting every instance of such occurrences, but at least two emerged from the survey. If a fossil bearing resource does exist then quarrying operations would be highly destructive of the materials and context. The probability of such an occurrence in the BP06 study area still **is low but in our judgement appreciably higher than in the case of the other borrow pit study areas with calcrete.**

The possible stone features are enigmatic at present. At least one of the occurrences is indisputably of human origin and the others may be as well. Heavy bush growth complicates the assessment. The issue is whether or not the features date to the recent or ancient past. If pre-colonial in age then they would be highly significant materials indeed, as walled structures are uncommon. Where they exist, the associations of walling are often with the pastoralist inhabitants of the region and pastoralist history is a greatly undeveloped field of research and knowledge.

*Table 8: Potential Impacts of the proposed development on Heritage Resources without Implementation of Measures of Mitigation*

| Resource       | Significance | Status   | Confidence | Intensity | Extent    | Duration  | Probability   |
|----------------|--------------|----------|------------|-----------|-----------|-----------|---------------|
| Stone tools    | Low          | Negative | High       | High      | Local     | Permanent | High          |
| Stone features | High?        | Negative | High       | High      | Regional? | Permanent | <b>Medium</b> |
| Palaeontology  | High?        | Negative | High       | High      | Regional? | Permanent | <b>Low</b>    |

### Proposed Measures of Mitigation

The collection of stone tools within the BP06 study area are not mitigatable, as they are too dispersed, the numbers too small and the condition of the tools too poor to warrant the time and expense.

HWC should inform the developer whether a permit for destruction of the stone tools is required.

Regarding the possible occurrence of fossils, this report identified at least two possible caverns and thus cannot recommend reactive measures of mitigation alone. The only sensible strategy is a proactive one before development of the borrow pit begins in combination with the reactive approach adopted for the other borrow pits.

Prior to work commencing on the quarry, the developer should appoint a professional archaeologist to clear the two possible caverns of vegetation and remove the organic and recent infilling until the nature of the occurrence becomes clear enough to allow further recommendations regarding the mitigation required, if any. There is no need here for formal and time consuming excavation procedures as the work should cease upon demonstration of a fossiliferous content. Careful application of a spade will suffice.

During operation of the quarry, the developer should instruct the contracted machine operators to cease operation immediately in the immediate area in the event that bones or other organic remains are uncovered by the quarrying operations. Work can continue elsewhere within the proven reserve of sediment as long as this in no manner impacts on the occurrence.

In the event that such a discovery is made, the developer should then employ professional archaeologists / palaeontologists to 1) retrieve the **disturbed** (i.e. loosened) fossil materials; 2) permanently **secure** the undisturbed portion of the occurrence against further deterioration by covering it with sand and calcrete rubble (and any other materials deemed necessary by HWC); and 3) demarcate a no-go zone around the occurrence beyond which quarrying can continue. The fossil occurrence can then be conserved and managed by HWC for future study and research.

The possible stone features also require attention before commencement of work. The developer should employ an archaeologist to further investigate the stone features in order to establish what they represent and to formulate appropriate measures of mitigation, if any are required.

*Table 9: Potential Impacts of the proposed development on Heritage Resources with Implementation of Measures of Mitigation*

| Resource       | Significance | Status   | Confidence | Intensity | Extent | Duration  | Probability |
|----------------|--------------|----------|------------|-----------|--------|-----------|-------------|
| Stone tools    | Low          | Negative | High       | High      | Local  | Permanent | High        |
| Stone features | Low          | Negative | High       | High      | Local  | Permanent | High        |
| Palaeontology  | Low          | Negative | High       | High      | Local  | Permanent | High        |

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## Borrow Pit 08 (Mosselbankfontein)

### Study Area

This study area for BP08 mostly is naturally vegetated, although a fire has burned in the area in the recent past (refer to Figure 17 appended). At present there is low grassy vegetation covering much of ground, but sand is visible between clumps. Burnt bushes are widely interspersed and large, surviving bushes are also dispersed. No real problem with visibility and confidence in the results of the survey are high.

An old quarry exists within the study area but is rather small at about 30 by 30 m extent. This feature provides a good exposure of the calcrete, which well calcified material, with ferruginisation and secondary calcification.

Calcrete forms a distinct elongated mound running SSE to NNW across the study area, with an elevation of around 3 m above the surrounds (refer to Figure 14). On the southern side of the mound there is an abrupt scarp-like fall off from the top whilst on the northern side there is an even, featureless slope.

The top of the mound is relatively flat and very even and in those terms, quite suitable for human occupation. Visibility is good here. The mound however, is not a local high point, as there is higher ground at some distance to the north and at about 200 to 300 m distant on the south side there is a low hilltop.



*Figure 14: BP08 with calcrete ridge*

### Results

The exposed calcrete in the quarry does not contain evident fossil content. The survey encountered no heritage remains in the remainder of the study area (refer to Figure 17 appended).

### Assessment

Given that the scarp of the calcrete on the southern side offers ready access to the calcrete body for wind, water and burrowing animals, this study must consider the possibility that caverns may have formed or been excavated on that side of the ridge and that they could have fossilised contents. Vegetation cover at present is not conducive to spotting this kind of occurrence and equally, the sands covering the slope also preclude the ready identification of any cavern. Quarrying operations would be highly destructive on such a resource.

Whilst there is a distinct chance of a fossil deposit, the probability of such an occurrence is **very low**.

Regarding human heritage remains, one can state with high confidence that they do not occur in any readily detectable form or density in the BP08 study area.

*Table 10: Potential Impacts of the proposed development on Heritage Resources without Implementation of Measures of Mitigation*

| Resource      | Significance | Status   | Confidence | Intensity | Extent    | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|-----------|-----------|-------------|
| Archaeology   | None         | Neutral  | High       | None      | None      | Permanent | High        |
| Palaeontology | High         | Negative | High       | High      | Regional? | Permanent | <b>Low</b>  |

### Proposed Measures of Mitigation

Under the circumstances, this report cannot recommend proactive measures of mitigation, as the actual negative impacts of the development are uncertain. The only sensible strategy is a reactive one.

The developer should instruct the contracted machine operators to cease operation immediately in the immediate area in the event that bones are uncovered by the quarrying operations. Work can continue elsewhere within the proven reserve of sediment as long as this in no manner impacts on the occurrence.

In the event that such a discovery is made, the developer should then employ professional archaeologists / palaeontologists to 1) retrieve the **disturbed** (i.e. loosened) fossil materials; 2) **permanently secure** the undisturbed portion of the occurrence against further deterioration by covering it with sand and calcrete rubble (and any other materials deemed necessary by HWC); and 3) demarcate a no-go zone around the occurrence beyond which quarrying can continue. The fossil occurrence can then be conserved and managed by HWC for future study and research.

*Table 11: Potential Impacts of the proposed development on Heritage Resources with Implementation of Measures of Mitigation*

| Resource      | Significance | Status   | Confidence | Intensity | Extent | Duration  | Probability |
|---------------|--------------|----------|------------|-----------|--------|-----------|-------------|
| Palaeontology | Low          | Negative | High       | High      | Local  | Permanent | High        |

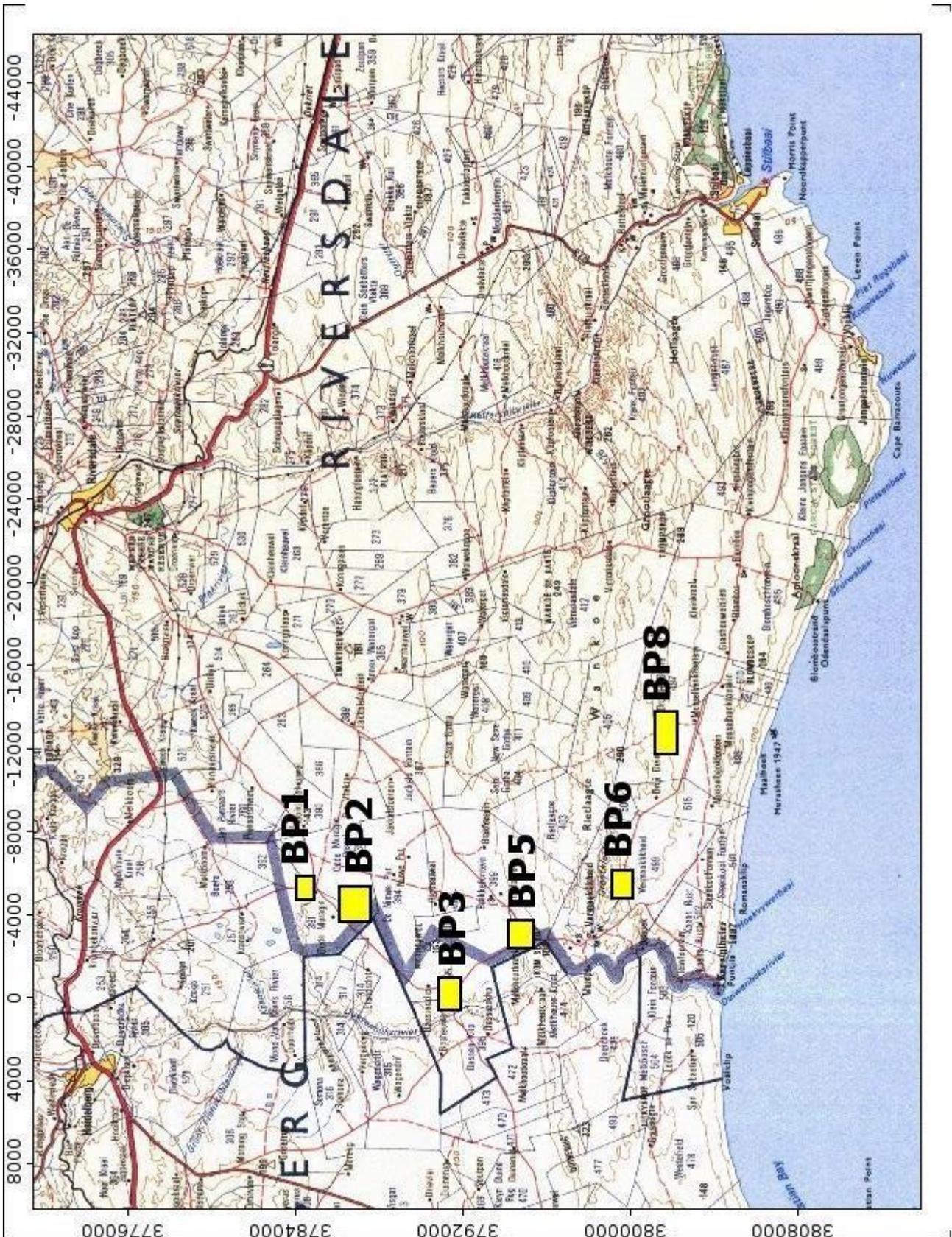


Figure 15: Location of study areas within the local region

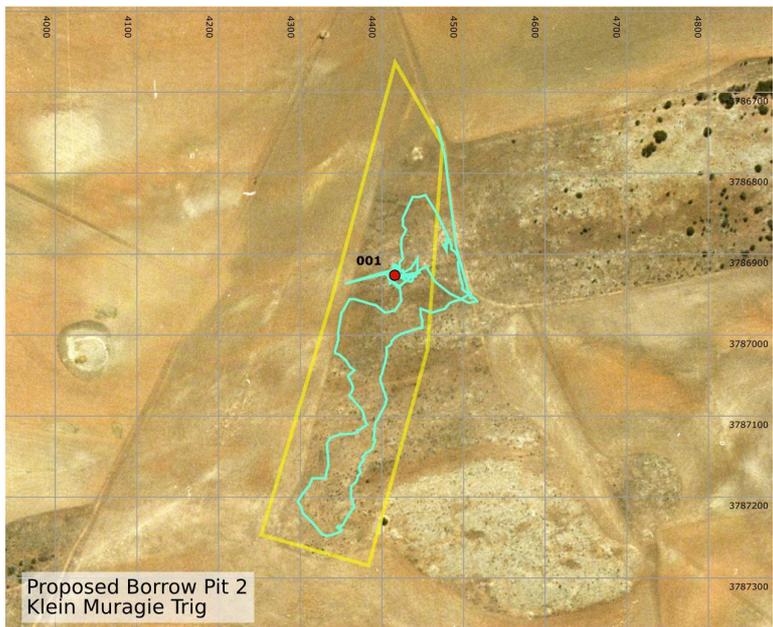


Figure 16: approximate boundaries (yellow), walkpaths (light blue) and observations (red circles) within study areas BP1,2 and 3. Grid intervals = 100 metres

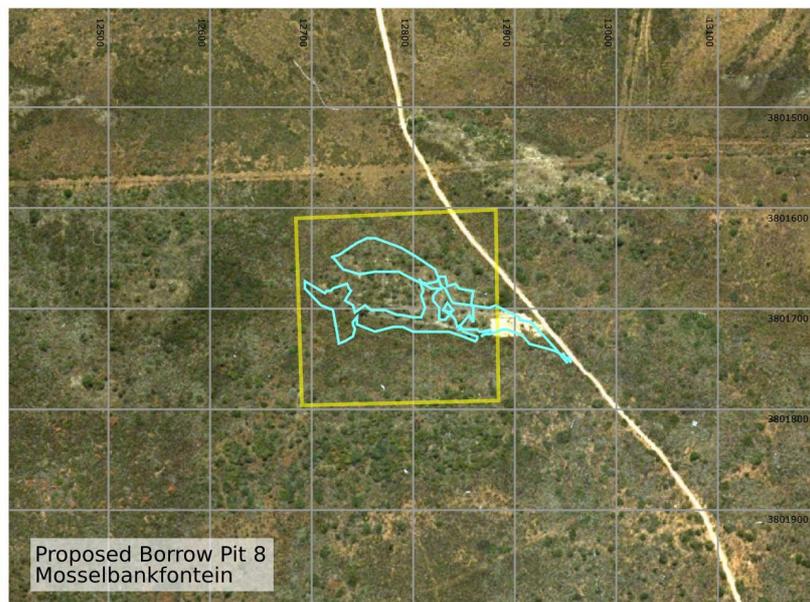
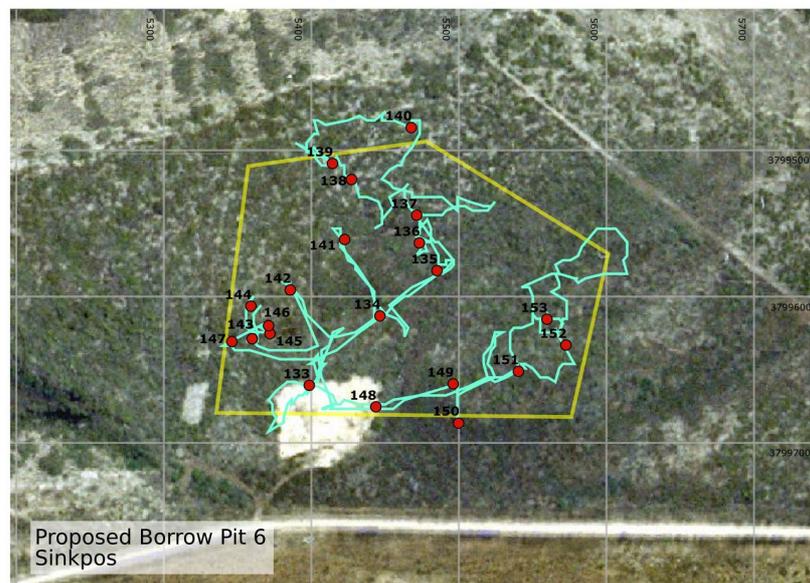
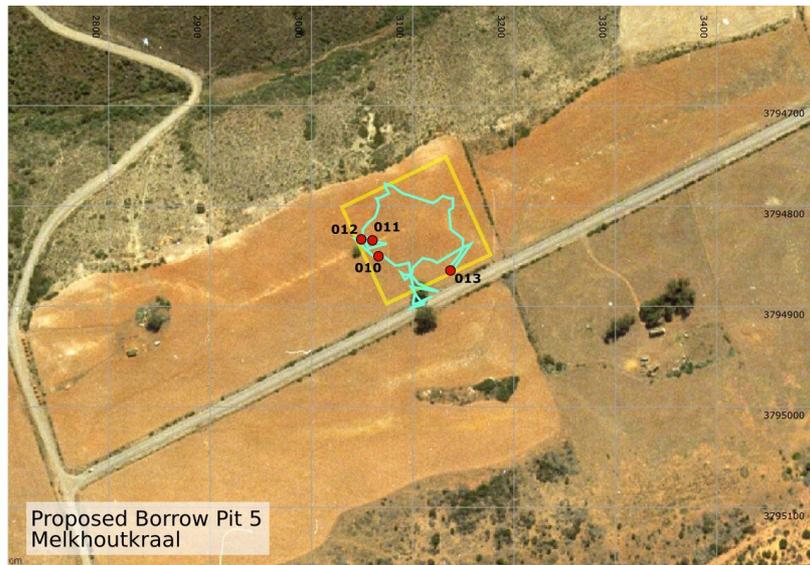


Figure 17: approximate boundaries (yellow), walkpaths (light blue) and observations (red circles) within study areas BP5,6 and 8. Grid intervals = 100 metres

Table 12: Geodetic and Cartesian coordinates of observations

| Observation | Datum: WGS84  |                | Datum: Hartebeesthoek94 Central Meridian 21° |            |
|-------------|---------------|----------------|--|------------|
|             | Latitude (°S) | Longitude (°E) | X (metres)                                   | Y (metres) |
| 001         | 34.209722     | 21.047916      | 3786925.76                                   | -4415.76   |
| 002         | 34.249819     | 21.002215      | 3791372.55                                   | -204.08    |
| 003         | 34.249729     | 21.001944      | 3791362.54                                   | -179.07    |
| 004         | 34.249684     | 21.002031      | 3791357.54                                   | -187.07    |
| 005         | 34.248457     | 21.001531      | 3791221.49                                   | -141.06    |
| 006         | 34.248052     | 21.001032      | 3791176.47                                   | -95.04     |
| 007         | 34.248575     | 21.002498      | 3791234.49                                   | -230.09    |
| 008         | 34.248872     | 21.003562      | 3791267.51                                   | -328.13    |
| 009         | 34.248926     | 21.004507      | 3791273.51                                   | -415.17    |
| 010         | 34.281172     | 21.033300      | 3794850.94                                   | -3066.23   |
| 011         | 34.281028     | 21.033235      | 3794834.93                                   | -3060.22   |
| 012         | 34.281019     | 21.033115      | 3794833.93                                   | -3049.22   |
| 013         | 34.281298     | 21.034071      | 3794864.95                                   | -3137.26   |
| 133         | 34.324530     | 21.058660      | 3799661.6                                    | -5398.6    |
| 134         | 34.324100     | 21.059180      | 3799613.92                                   | -5446.48   |
| 135         | 34.323820     | 21.059600      | 3799582.89                                   | -5485.15   |
| 136         | 34.323650     | 21.059470      | 3799564.02                                   | -5473.2    |
| 137         | 34.323480     | 21.059450      | 3799545.16                                   | -5471.37   |
| 138         | 34.323260     | 21.058970      | 3799520.73                                   | -5427.21   |
| 139         | 34.323160     | 21.058830      | 3799509.63                                   | -5414.33   |
| 140         | 34.322940     | 21.059410      | 3799485.26                                   | -5467.72   |
| 141         | 34.323630     | 21.058920      | 3799561.77                                   | -5422.58   |
| 142         | 34.323940     | 21.058520      | 3799596.14                                   | -5385.75   |
| 143         | 34.324240     | 21.058240      | 3799629.4                                    | -5359.96   |
| 144         | 34.324040     | 21.058230      | 3799607.22                                   | -5359.05   |
| 145         | 34.324210     | 21.058370      | 3799626.08                                   | -5371.93   |
| 146         | 34.324160     | 21.058360      | 3799620.54                                   | -5371.01   |
| 147         | 34.324260     | 21.058090      | 3799631.61                                   | -5346.15   |
| 148         | 34.324660     | 21.059150      | 3799676.04                                   | -5443.68   |
| 149         | 34.324520     | 21.059720      | 3799660.54                                   | -5496.15   |
| 150         | 34.324760     | 21.059760      | 3799687.17                                   | -5499.82   |
| 151         | 34.324440     | 21.060200      | 3799651.69                                   | -5540.33   |
| 152         | 34.324280     | 21.060550      | 3799633.97                                   | -5572.55   |
| 153         | 34.324120     | 21.060410      | 3799616.21                                   | -5559.68   |