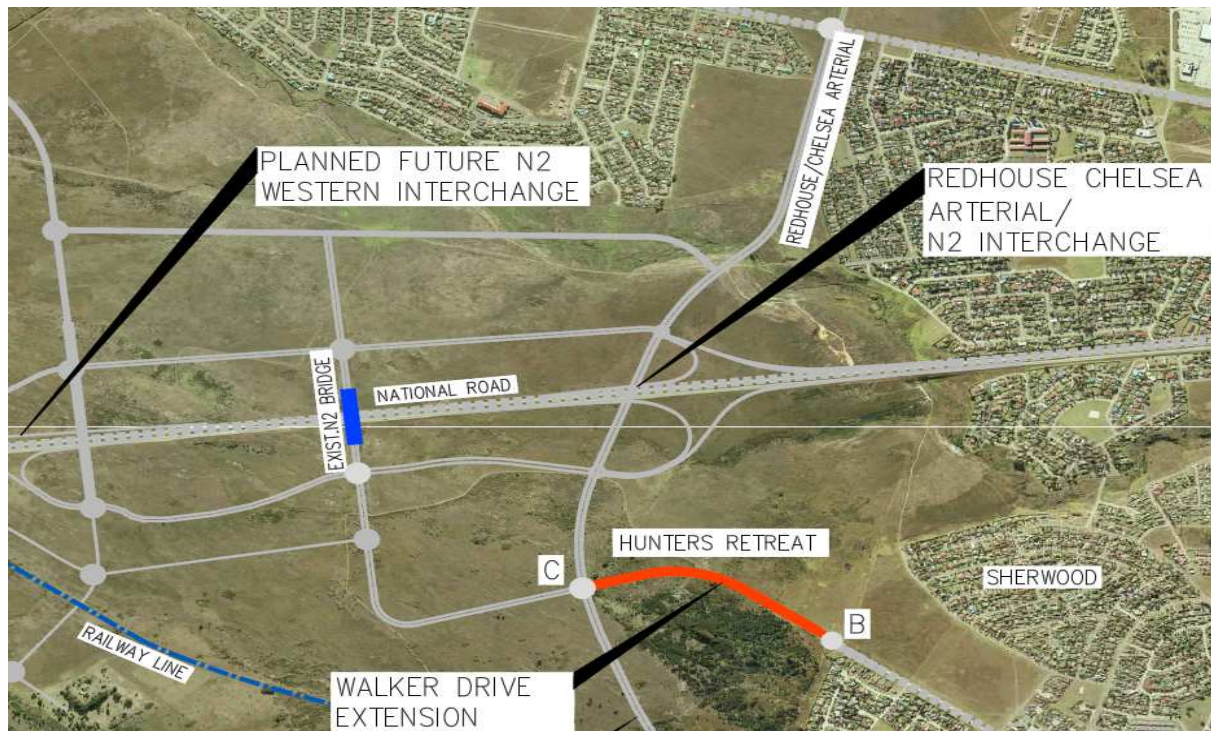


NELSON MANDELA BAY MUNICIPALITY



EXTENSION OF WALKER DRIVE TO THE PROPOSED REDHOUSE CHELSEA ARTERIAL ROAD

Final Preliminary Design Report

August 2012

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EXECUTIVE SUMMARY

1. NMBM resolved in 2004 to appoint BKS to carry out the drawings, tender and construction monitoring of the Redhouse Chelsea Arterial from the present end of construction of Walker Drive to Cape Road. This included the proposed interchange with the N2 at the existing Rowallan Park Bridge and the upgrading of Kabega Road between Kragga Kamma and Frikkie Kotze Drive to Linton interchange (**Ref: NMBM No. 902**).
2. In February 2008, the NMBM informed BKS (Pty) Ltd. that the abovementioned appointments of 2004 has been amended to include the Redhouse Chelsea Arterial link from the present end of construction to Cape Road traversing through the existing Redhouse Chelsea Arterial reserve and to incorporate an overpass over N2 and its associates ramps. (**Ref: NMBM No. 902**).
3. In September 2008, based on the abovementioned assignments BKS (Pty) Ltd submitted a preliminary design report entitled "Extension of Walker Drive to Cape Road: Redhouse Chelsea Arterial Phase e1 – Preliminary Design Report: September 2008" for the Redhouse Chelsea Arterial Road which was situated in the municipal road reserve provided. **Refer to Option, Figure 6, Annexure A.**
4. On submission it was found that this municipal reserve was environmentally unsuitable and the scheme along this route was abandoned when the Local Spatial Development Framework (LSDF) for the Western Suburbs was commissioned during the last quarter of year. **Refer to Fig 6, Annexure A.**
5. The transportation study entitled the "Transportation Study for the Western Suburbs Local Spatial Development Framework (LSDF) dated March 27 March 2009 prepared by Engineering Advice and Services (Pty) Ltd (EAS) determined the proposed optimum road network which includes both the Walker Drive Extension and Redhouse Chelsea Arterial in the Western Suburbs LSDF area. This road network was designed to cater for the traffic generated by the land-use proposals as contained in the LSDF study. **Refer to Annexure D.**
6. After an evolutionary process taking into account environmental, aspects, road geometric requirements, hydrological aspects of crossing the Baakens River, the South African National Roads Agency (SANRAL) requirements and the town planners requirements for the adjacent future residential and commercial developments, the Redhouse Chelsea Arterial road was fixed in the position. **Refer to Fig. 2, Annexure A.**
7. The abovementioned transport plan (CITP) also envisaged the extension of Walker Drive and the linking of the existing un-used overpass bridge over the N2 to form an integral roadway system with the Redhouse Chelsea Arterial.

8. *The new position of Redhouse Chelsea Arterial would mean that Walker Drive would have to be extended by approximately 980m to form an intersection with the Redhouse Chelsea Arterial. Refer to Fig. 2, Annexure A.*
9. *In terms of the proposed funding arrangements for the Redhouse Chelsea Arterial and Walker Drive Extension, the construction of Walker Drive would be entirely the responsibility of the Nelson Mandela Bay Municipality (NMBM). The Municipality thus instructed BKS in July 2010 to prepare a separate Preliminary Design Report for the Walker Drive Extension section of the project, instead of combining it with the Redhouse Chelsea Arterial Preliminary Design Report. Refer to Annexure B.*
10. *This preliminary design report as set out hereunder, for Walker Drive is submitted with the knowledge that there are certain town planning and environmental issues pertaining to the construction of Walker Drive Extension that have not yet been resolved and are thus on-going. These issues could considerably delay the implementation of the project.*
11. *Various transportation planning reports were developed to motivate the Redhouse Chelsea Arterial and the associated road network which includes the extension of Walker Drive to the Redhouse Chelsea Arterial. The transportation study entitled the "Transportation Study for the Western Suburbs Local Spatial Development Framework (LSDF) dated March 27 March 2009 prepared by Engineering Advice and Services (Pty) Ltd (EAS) determined the proposed road network which includes both Walker Drive Extension and Redhouse Chelsea Arterial in the Western Suburbs LSDF area. This road network was designed to cater for the traffic generated by the land-use proposals as contained in the LSDF study. The March 2009 EAS report also determined the cross sections of the various components of the LSDF road network including the required cross sections for both Walker Drive Extension and Redhouse Chelsea Arterial. The Traffic Impact Assessment (TIA) report dated 15 October 2009 prepared by SSI Engineering Consultants for Bay West City entitled "Revised Traffic Impact Assessment for proposed mixed use Development on Erf 426 Hunters Retreat and Portion 131 Farm Little Chelsea No. 10" determines the required road carriageway and lane widths along Walker Drive extension. Refer to Annexure D and E.*
12. *The traffic impact studies carried out by SSI for Bay West City and Aurecon supporting the LSDF transportation study (Refer to Annexure D) and the availability of funding for the implementation, recommended that the Redhouse Chelsea Arterial road be implemented in the following phases:
 - a) **Phase 1A (Two lane scheme):** *This phase comprises the construction of one carriageway from Walker Drive Extension to Cape Road, two overpass bridge structures as well as on and off ramps of the interchange together with the earthworks for the second carriageway.**

- b) **Phase 1 (Four lane scheme):** This phase comprises the construction of the second carriageway layerworks from Walker Drive extension to Cape Road to complete the construction of Phase 1A to comply with Phase 1 as indicated in the transportation and traffic studies. **Refer to Annexure D and E.**
- c) **Phase 2 (Six lane scheme or Four lane scheme with BRT lanes):** This phase will entail the conversion of the non-motorized facilities into a third vehicular traffic lane or BRT lane. Separate non-motorized lanes will be provided at this phase. **Refer to Annexure D and E.**
- d) **Phase 3:** This phase comprises the future extension of the Redhouse Chelsea Arterial from Walker Drive Extension to Kragga Kamma Road and to Montmedy Road / Fairview Arterial. *i.e. if future transportation planning studies will warrant such a need.*
13. Terratest (Pty) Ltd. were appointed together with wetland and vegetation specialists to conduct a full Environmental Impact Assessment (EIA) for the Redhouse Chelsea Arterial and Walker Drive Extension. The final Environmental Impact Report (EIR) was submitted in May 2012 to Department of Economic Development and Environmental Affairs (DEDEA). The Environmental department of NMBM and comments received from DEDEA indicated that there are some items that must be revised and be included in the EIR and the report must be re-submitted. The final amended EIR incorporating the comments from the interested and affected parties will be submitted on the 05 October 2012. The environmental authorisation is now anticipated to be obtained during November 2012 the latest. **Refer to Annexure J and K.**
14. The major unresolved issue is the finalisation of the alignment of Redhouse Chelsea Arterial between Walker Drive and the interchange, section C – E. As designed at present this section of the Redhouse Chelsea Arterial meets the technical and safety aspects/requirements but crosses a rocky outcrop in the vicinity of the Redhouse Chelsea Arterial / Walker Drive intersection. The possibility exists therefore that the Redhouse Chelsea Arterial road will have to be relocated eastwards to avoid this outcrop for environmental reasons. **Refer to Fig. 6, Annexure A.**
15. The estimated relocation of Redhouse Chelsea Arterial to avoid the rocky outcrop will inter alia have the following consequences:
- a) To keep the minimum required distance between the access to Utopia and the Redhouse Chelsea Arterial/Walker drive intersecting the access will also need to be moved eastwards resulting in further environmental problems in this township as the access will then be situated in an environmental sensitive area.
- b) Amendments to Utopia township layout and revised traffic impact reports.
- c) Revised turning circle designs for Redhouse Chelsea Arterial, Walker Drive intersection. *i.e. Point C*

- d) *Revised land acquisition requirements, surveys and agreements.*
- e) *Revised design at section of Redhouse Chelsea Arterial i.e. C - E.*

Refer to Fig. 6, Annexure A.

16. *The proposed Walker Drive Extension will ultimately consist of approximately 980m of dual carriageway roadway, each carriageway having a 10,5m tarmac surfaced width or 11,4m between kerb faces separated by a 5,0m wide median.*

Initially the north carriageway will only be constructed and will operate with two 4,0m wide lanes (one in each direction) with a 1,25m shoulder on both sides. For Phase 1, the lane configuration would be two 3.7m wide lanes and two 1.55m wide shoulders that will be converted to 3.1m wide turning lanes.

The southern carriageway will be constructed as the final phase as and when traffic conditions warrant its construction. This will be after 2020 when NMBM carries out a review of all its transportation studies. Refer to Dwg. No.: 500, Annexure H.

17. *The road reserve has been fixed and surveyed and the diagrams forwarded to NMBM for registration. Refer to Fig. 5, Annexure A.*

18. *The road reserve registration process will also require the road closure of the original Utopia Road reserve and consolidation of adjacent properties. Refer to Fig. 5, Annexure A.*

19. *In order to accommodate the 40m road reserve a certain area of land will be required through properties owned by others. This land requirement is as follows:*

- a) *Approximately 2,5ha from Anathi Property Investments who hold rights through a land availability agreement with Department of Housing and Local Government and Traditional Affairs.*
- b) *Approximately 0,22ha from Engen Petroleum Limited.*

Refer to Fig. 5, Annexure A.

20. *This land acquisition has been agreed to in principle by Anathi Property Investments and Engen. The land survey diagrams for Walker Drive Extension road reserve have also been approved by NMBM and Anathi. The road reserve will only be registered with the Surveyor General when the ROD for Walker Drive is obtained, estimated to be during July 2012. Refer to Fig. 5, Annexure A.*

21. *An intersection to Utopia Township north (i.e. the area to the north of Walker Drive) will be required on Walker Drive. The layout and position of the Utopia access is according to the recommendations of the traffic impact assessment report for the Utopia Township. Refer to Dwg. No.: 510, Annexure H.*

22. *Walker Drive extension has been designed in accordance with the publication "Draft UTG 1: Guidelines for the Geometric Design of Urban Arterial Roads". The road is approximately 980m in length and comprising two (i.e. one per carriageway) large radius horizontal curves joined by straights. The angles of deflection are small. The road will end at the proposed Redhouse Chelsea Arterial road where a traffic turning circle will be provided. This traffic circle is required to enable the Bus Rapid Transport buses (BRT) to turn around after the bus station which in future will be constructed in the median of the future dual carriageway Redhouse Chelsea Arterial road, opposite the eastern side of Bay West City Shopping Mall. Refer to Dwg. No.: 006, Annexure H.*
23. *During the construction of the Redhouse Chelsea and the adjacent Bay West Development a temporary haul road will be constructed along the alignment of the future southern carriageway. Refer to Dwg. No.: 004, 005 and 500, Annexure H.*
24. *The earthworks for the haul road will be to the final future southern carriageway levels. This will allow services to be installed in the southern verge to final levels from the outset and avoid future major earthworks when the second carriageway is constructed. Refer to Dwg. No.: 004, 005 and 500, Annexure H.*
25. *Six vertical curves have been provided to achieve the best fit into the topography and allow for effective drainage. The change in grade between the tangents is small and the curves satisfy all geometric requirements. Refer to Dwg. No.: 002 and 003, Annexure H.*
26. *The E80 traffic determination has been based on the Traffic Impact Assessment data contained in the TIA report described in item 9 above. This report shows that the most heavily loaded lane on Walker Drive Extension B – C may be expected to have to accommodate $7,3 \times 10^6$ E80 axles during a 20 year life. Refer to section 12 of this report.*
27. *A geotechnical investigation has been undertaken which shows that the whole area is generally underlain by table mountain sandstone rock at depths between 0,7m – 1,5m overlain by sands and silts. A selected subgrade will generally be required below the pavement layerworks to provide the necessary CBR to carry the pavement design described above. Refer to Annexure F.*
28. *Groundwater may be expected to be found fairly extensively and subsoil drains will be required. These subsoil drains will connect into the stormwater pipe system. Refer to Annexure F.*
29. *The recommended pavement design is based on the Catalogue Method applicable to the traffic class and expected E80 axles. The design comprises the following:*
 - **40mm Asphalt:** *Type 4a Mix, Compacted to Min. 95% Marshal*

- **150mm Base Course:** G1 crushed stone max. size 37mm compacted to 88% of apparent relative density.
- **125mm Subbase:** C3 cemented natural gravel (G5 before treatment) UCS 3Mpa at 100% Mod AASHTO. Max size 63mm.
- **125mm Lower Subbase:** C4 Cemented natural gravel (G5 before treatment) UCS 1,5Mpa at 100% Mod AASHTO).

Refer to section 13 of this report.

30. *Due to the more complex operations employed in constructing the proposed cement stabilised subbase alternative designs omitting the use of the stabilised subbase and replacing with unstabilised layerworks has been investigated.*

*For this purpose the Cyrano Pavement Analysis program was utilised to predict the long term performance of the road using unstabilised subbase layers as opposed to the recommended cement stabilised subbase. The results show that it is not feasible to construct an unstabilised flexible pavement which can carry the design 7.3×10^6 E80s traffic loading without the riding surface deteriorating below the acceptable levels within about 12 years. **Refer to section 12 and 13 of this report.***

31. *Walker Drive Extension will pass through the proposed Utopia Township and the stormwater management proposals for this township have been incorporated into the Walker Drive designs. These proposals have been prepared by Utopia's Consulting engineer. **Refer to Annexure L.***

32. *A suitably sized stormwater pipeline will be situated in the future Walker Drive median. This pipeline will initially have to accommodate run-off from the undeveloped township north of the road and eventually when the township to the north of the road is developed from a series of attenuation ponds situated on the southern side of the road. These ponds will attenuate the peak post development flows to the predevelopment flow. **Refer to Dwg. No.: 002 and 003, Annexure H. Also refer to Annexure L.***

33. *The stormwater pipeline will discharge into the natural watercourse situated at approximately chainage 310m. A special outlet structure will be provided to ensure that the pipe-flow is discharged under slow flow condition with $Fr < 1.0$, which will prevent scour in the natural drainage watercourse. **Refer to Dwg. No.: 002 and 007, Annexure H.***

34. *A number of existing services are present in the eastern section of the road reserve in the vicinity of the existing townhouse development. Excepting for a water pipeline these services are*

not major, however certain relocations will be required to avoid clashing with the proposed new roadworks and to correctly position the services in the future road reserve.

Refer to Dwg. No.: 004, Annexure H.

35. *Certain future services will also have to be located in the Walker Drive Extension road reserve. These services will be required to serve both the Utopia and Bay West City townships. The responsibility of providing these services rests with the abovementioned developers. In order to avoid having numerous contractors working within the Walker Drive road reserve simultaneously it is recommended that these services be included in the municipal contract for Walker Drive construction and that a payment guarantee be provided by the developers to the municipality for the payment of these services through the contract. A 315mm diameter water pipeline is required to service both the Bay West and Utopia developments along the road reserve and the designs have been approved by NMBM Water Division. **Refer to Annexure L.***
36. *The present access to the construction site will be along the existing Walker Drive westwards from Kabega Road. This is an undesirable arrangement due to the traffic congestion on the road at peak hours and the Walker Drive heavy construction vehicles will have a detrimental effect on the structure of the existing road pavement. A pavement condition analysis report for the existing section of Walker Drive will be undertaken both before and after construction. This will be done in order to ascertain the damage caused by heavy vehicles during construction. **Refer to Dwg. No.: 004 and 005, Annexure H.***
37. *Consideration should therefore be given to re-combining the Walker Drive Extension contract with the Redhouse Chelsea Arterial contract to be undertaken by SANRAL. If this is done it would be possible to access the site directly from the N2 National Road thus avoiding the problems described in the item above. The method of implementing this access is set out in Section 17 of this report.*
38. *The estimated cost of constructing Walker Drive Extension from the present end of construction to the intersection with the proposed Redhouse Chelsea Arterial road is R 21,9 million. It is recommended that an additional R2,15 million value of work be added to the contract in order to install services required for adjacent private townships provided payment guarantees can be obtained from the relevant parties. The estimated cost of Walker Drive is as follows:*
- a) *Walker Drive, north carriageway*
 - b) *Haul Road, south carriageway*

Refer to Annexure B.

a)

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Fig 1: Locality Plan

Fig 2: Proposed Redhouse Chelsea Arterial / Walker Drive Layout

Fig 3: Phasing Layout

Fig 4: Site Layout

Fig 5: Land Expropriation Layout

Fig 6: Alternative Alignment of Redhouse Chelsea Arterial Option 4B

Annexure B: Agreed Funding Responsibilities and Breakdown of Cost Estimates

Annexure C: Land Acquisition Data and Road Reserve Registration

Annexure D: Transportation Study for the Western Suburbs Local Spatial Development Framework, March 2009

Annexure E: Traffic impact Assessment Bay West (October 2009)

Annexure F: Geotechnical Investigation Report (Terratest)

Annexure G: Preliminary Implementation Programme

Annexure H: Preliminary Drawings

J01415-00-10-001-P-00 – General Layout

J01415-00-10-002-P-00 – Walker Drive Extension Layout and Longitudinal Section

CH0 – CH500

J01415-00-10-003-P-00 – Walker Drive Extension Layout and Longitudinal Section

CH500 – CH1000

J01415-00-10-004-P-00 – Position and Route of the Temporary Construction (Gravel)

Road Option 1

J01415-00-10-005-P-00 – Position and Route of the Temporary Construction (Gravel)

Road Option 2

J01415-00-10-006-P-00 – Details of Turning Circle at Intersection of Redhouse

Chelsea and Walker Drive

J01415-00-10-007-P-00 – Services Crossing Layout CH0 – CH1000

J01415-00-10-500-P-00 – Typical Details: Walker Drive – Cross sections

J01415-00-10-501-P-00 – Typical Details: Turning Circle – Cross section

*J01415-00-10-510-P-00 – Paint Markings and Signage Layout: Northern Carriageway:
CH0 – CH1000*

- Annexure J:** Environmental Authorisation in Respect of the Anathi Developers
Development Erven 442 – 448 Inclusive, Hunters Retreat
- Annexure K:** Environmental Authorisation in Respect of Gateway Development
Company (Pty) Ltd (Bay West City). Erf 426 Hunters Retreat and Portion 131 of Farm
Little Chelsea
- Annexure L:** Utopia / KV3 Engineering Report
- Annexure M:** Minutes of the Meeting held on 1 July 2010, 9th Floor Lillian Diederick Building

LIST OF ABBREVIATIONS

BRT	Bus Rapid Transit
CETT	Co-operate EIA Task Team of NMBM
DEDEA	Department of Economic Development and Environmental Affairs
DWAF	Department of Water Affairs and Forestry
EAS	Engineering Advice and Services Consultants
EIA	Environmental Impact Assessment
LSDF	Local Spatial Development Framework
MDTTT	Multi Disciplinary Technical Task Team
NMBM	Nelson Mandela Bay Municipality
ROD	Record of Decision
TIA	Traffic Impact Assessment
SANRAL	South African National Roads Agency Limited
LOS	Level of Service
BWC	Bay West City

1. INTRODUCTION AND TERMS OF REFERENCE

The Municipal Manager resolved on 5 August 2004, to appoint BKS (Pty) Ltd to carry out preliminary design, detail design, tender process and construction monitoring of the Redhouse Chelsea Arterial from the present end of construction of Walker Drive to Cape Road. This included the proposed interchange with the N2, and the upgrading of Kabega Road between Kragga Kamma and Frikkie Kotze Drive, the Linton interchange, Frikkie Kotze Drive and Samantha Way from Frikkie Kotze Drive to the Linton interchange. (**Refer: NMBM reference B902**).

The Executive Director: Infrastructure and Engineering, informed BKS (Pty) Ltd on 1 February 2008 that the previous appointment to design and prepare contract documentation for the portions of Redhouse Chelsea Arterial from the present end of construction of Walker Drive to Cape Road had been amended to include the link from Walker Drive to Cape Road traversing through the existing Redhouse Chelsea Arterial reserve and to incorporate an overpass over the N2 and its associated ramps. (**Refer: NMBM reference B902**).

Based on the assignment described above, on 13 October 2008 BKS submitted a report to NMBM (entitled "**Extension of Walker Drive to Cape Road: Redhouse Chelsea Arterial (Phase 1) Preliminary Design Report: Final Draft**" dated September 2008) on the proposed Redhouse Chelsea Arterial Road. This design was based on locating the proposed road within the originally allocated road reserve provided for the facility. This reserve was situated immediately to the west of the Sherwood urban area passing through Rowallan Park to the Cape Road / Bishops Road intersection. The construction of this road was to be Phase 1 of the road network implementation programme for the area which was approved by both NMBM and SANRAL.

Subsequently Setplan Town Planners were appointed by the NMBM to prepare a Local Spatial Development Framework (LSDF) for the Greater Hunters Retreat and Engineering Advice and Services (EAS) were appointed as sub-consultants to Setplan to undertake the transportation planning for the greater area. This study indicated a new road network for the area with the proposed Redhouse Chelsea Arterial and its interchange with the N2 in a new position. (**Refer EAS report entitled "Transportation Study for the Western Suburbs Local Spatial Development Plan" dated 27 March 2009**). **Refer to Annexure D**

On submission of the draft Redhouse Chelsea Arterial Preliminary Design Report dated October 2008 (in terms 1 February 2008 appointment) to the environmental consultants for comment, the location of the proposed road was found to traverse environmentally sensitive riverine areas. The construction of the road in this location was therefore not

recommended and a new position for the road reserve needed to be investigated. After discussions with the officials of the municipality BKS were requested to investigate a new route for the Redhouse Chelsea Arterial and Walker Drive.

After an evolutionary process, taking into account the now available EAS transportation report and other factors such as the optimum position for the Redhouse Chelsea Arterial to cross the Baakens River, SANRAL requirements regarding the spacing of interchanges, geometric and environmental considerations such as avoiding rocky outcrops where possible, and the proposed Bay West City and Utopia developments the final alignment of the Redhouse Chelsea Arterial, and the location of the Walker Drive Extension as well the configuration of the associated major roads was fixed and agreed upon. These roads are shown on **Fig 2, Annexure A**.

Discussions between NMBM and the Bay West City developers resulted in proposals being considered by NMBM regarding the funding responsibility of the Redhouse Chelsea Arterial and N2 Interchange, Walker Drive Extension and associated roads. **Annexure A Fig 3** shows the proposed phasing layout from which it is seen that the first phase of Walker Drive extension **B – C** will be funded and constructed by NMBM.

In a meeting held on 1 July 2010 the NMBM decided to proceed with the construction of this section of Walker Drive extension during the current 2010/2011 municipal financial year. The NMBM requested that BKS prepare the necessary preliminary design reports (dual carriageway), documentation, estimates and detailed drawings (single carriageway) so that this section of Walker Drive could be constructed and completed before end June 2011 financial year. This however could not be accomplished because of the ongoing EIA process for this section and problems associated with obtaining an exemption from Utopia and Bay West RODs. **Refer to Annexures J, K and M**.

The first draft of this report was submitted to NMBM in February 2011 whereafter changes were made to the *Transportation Planning and Environmental sections* on request of the NMBM. In October 2011 the revised and the final preliminary report entitled **“Extension of Walker Drive to Proposed Redhouse Chelsea Arterial Preliminary Design Report”** dated October 2011 was submitted to NMBM.

DEDEAT requested that an alternative alignment for Redhouse Chelsea Arterial be considered, where the impact on an environmentally sensitive rocky outcrop area would be further reduced. This resulted in the Option 4B alignment being presented at a bi-lateral meeting with NMBM. Refer to **FIG 6 in Annexure A**. NMBM therefore requested BKS to revise the Preliminary Design Report for Walker Drive Extension to incorporate the effect the alignment of Option 4B would have on the extension of Walker Drive and its intersection

with Redhouse Chelsea Arterial. Option 4B shows the realignment of section C – E required to avoid the rocky outcrop.

The preliminary engineering report as set-out hereunder therefore encompasses inter alia, the route location and selection, possible Option 4B relocation, land acquisition, town planning, geotechnical investigation, pavement design, stormwater management. Considerations and cost estimates applicable to this section of Walker Drive extension, which forms a component of the proposed future major road configuration in the area. This report is therefore submitted with the knowledge of NMBM that there are town planning issues and environmental authorisation that are currently being resolved and are ongoing which could require that this report be re-amended.

2. PURPOSE OF REPORT

The purpose of this report is therefore to describe the technical considerations and land issues taking into account in the preparation of the preliminary design of the extension of Walker Drive from its present end of construction (**B**) to its intersection with the proposed Redhouse Chelsea Arterial road (**C**) (*Fig 3, Annexure A*).

3. ROUTE LOCATION AND DESCRIPTION

The original location of the Redhouse Chelsea Arterial road reserve as selected some number of years ago was found to be unsuitable because of environmental constraints where it crossed the Baakens River. The cost of the engineering works would also be excessively high in this location. These aspects have been discussed in full in the report entitled *“Proposed Redhouse Chelsea Arterial Road from Proposed Extension of Walker Drive to Cape Road – Preliminary Design Report”* dated August 2012.

As a result of this the Redhouse Chelsea Arterial road reserve was relocated and in addition to this, the location of the extension of Walker Drive from its present end of construction up to its intersection with proposed Redhouse Chelsea Arterial had to be amended to accommodate this new location and the required road geometrics of the Walker Drive carriageways.

The new Walker Drive Extension road reserve (shown **B – C** in *Annexure A Fig 3*) now curves more to the south to form an intersection with the proposed Redhouse Chelsea Arterial approximately 980m from its present end of construction.

The agreed Walker Drive road reserve position is shown on the Survey Diagrams prepared by VPM Surveyors Port Elizabeth cc. Refer *Annexure C*.

4. REGISTRATION OF ROAD RESERVE AND LAND ACQUISITION

The present road reserve for the extension of Walker Drive is 18,89m. However, there is a requirement for acquisition on land to be set aside on the following Erven for Walker Drive Extension:

- Erf 442 is currently held by Anathi Property Investments who hold the rights through a Service Level and Land Availability Agreement with the Department of Housing, Local Government and Traditional Affairs. It is affected by Walker Drive Extension. The required acquisition is 0,15ha.
- Erf 443 is currently held by Anathi Property Investments who hold the rights through a Service Level and Land Availability Agreement with the Department of Housing, Local Government and Traditional Affairs. It is affected by Walker Drive Extension. The required acquisition is 1,49ha.
- Erf 444 is currently held by Anathi Property Investments who hold the rights through a Service Level and Land Availability Agreement with the Department of Housing, Local Government and Traditional Affairs. It is affected by Walker Drive Extension. The required acquisition is 0,0065ha.
- Erf 445 is currently held by Anathi Property Investments who hold the rights through a Service Level and Land Availability Agreement with the Department of Housing, Local Government and Traditional Affairs. It is affected by Walker Drive Extension. The required acquisition is 0,80ha.
- Erf 437 is currently owned by Engen Petroleum Limited. It is affected by the intersection of Walker Drive and Redhouse Chelsea Arterial (traffic circle). The required acquisition is 0,22ha.

Walker Drive extension from its present end of construction to its intersection with the proposed Redhouse Chelsea Arterial will be located in Hunters Retreat Erven No's 442, 443, 444, 445 and 437. The road reserve has been accommodated in the proposed Utopia development layout. The General Plan for this township has not yet been submitted and therefore the Walker Drive road reserve has not yet been registered. Utopia must still consolidate the abovementioned erven before making the land available for the required road reserve.

The existing section of Walker Drive is situated in a 35m wide road reserve from Kabega Road to current end. The new road reserve width for Walker Drive Extension has been fixed as 40m. The road reserve width varies in order to obtain the correct alignment between the different carriageway widths.

This will mean that the northern boundary of the existing Thriftwood townhouse complex will coincide with the southern side of the Walker Drive Extension road reserve and the services installed for this development will remain within the road reserve.

The Bay West developer agreed to have this road reserve surveyed on behalf of the NMBM to assist the NMBM in the road reserve registration. This will enable construction of the road to be proceeded with by the NMBM. The Bay West City development also requires that this section of Walker Drive be constructed as it will form one of the access points to their development and have thus undertaken to assist with the implementation of the registration process.

The co-ordinates of the road reserve have been fixed by BKS to suit the road geometrics and VPM Surveyors Port Elizabeth cc have prepared the necessary survey diagrams which are attached as **Annexure C**. These diagrams, (refer **Annexure C**), have been forwarded to the NMBM so that the registration can be proceeded with, subject to the consolidation and road closure process carried out for the Utopia development by Anathi Property Developments (Pty) Ltd.

The anticipated time required for the registration is approximately six weeks, so in terms of the implementation programme (**Annexure G**); no delays in construction should therefore be encountered due to the road reserve not being registered. The process will also require the road closure of the original Utopia road reserve and the consolidation of the adjacent properties to include the new Walker Drive road reserve.

5. TRANSPORTATION PLANNING

Engineering Advice and Services (Pty) Ltd (EAS) was commissioned by Nelson Mandela Bay Municipality (NMBM) during October 2008 to provide transportation planning input into the Western Suburbs Local Spatial Development Framework (LSDF) carried out by Settlement Planning Services (SETPLAN).

Before the compilation of the abovementioned LSDF for the Western Suburbs report, road network and land-use proposals for the LSDF study were assessed and documented in the report entitled *“Transportation Study for the Western Suburbs Local Spatial Development Framework, December 2008”* prepared by EAS with network demand modelling input carried out by Africon Pty Ltd (now Aurecon).

The EAS report of 2008 investigated a number of road networks (including both Walker Drive Extension and Redhouse Chelsea Arterial road) and land-use options which included provision for both the proposed Westpoint and Mandela Bay Precinct developments. These two developments were later combined to form one development called N2 Gateway Development project (now Bay West City Development).

During March 2009 a report entitled *“Transportation Study for the Western Suburbs Local Spatial Development Framework”* was prepared by EAS. The purpose of this study was to refine the final proposed road network as determined in the 2008, study and in consultation with SANRAL. The report also took into consideration the land-use proposal contained in the *“Rezoning Application for the N2 Gateway Development Proposal”* (now Bay West City) as submitted to NMBM during December 2008 after completion of the transportation study dated December 2008. The Bay West City’s rezoning application was submitted subsequent to the EAS 2008 report hence the March 2009 report was also required to take into account the rezoning.

The EAS *“Transportation Study for the Western Suburbs Local Spatial Development Framework”* March 2009 report determined the appropriate road network (which includes both Walker Drive Extension and Redhouse Chelsea Arterial) in the Western Suburbs LSDF area. This road network was designed to cater for the traffic generated by the land-use proposals as contained in the LSDF study. The March 2009 EAS report determined the cross sections of the various components of the LSDF road network. The report includes the required cross sections for both Walker Drive Extension and Redhouse Chelsea Arterial.

The EAS report of March 2009 also made the following recommendations relevant to Walker Drive and Redhouse Chelsea Arterial:

- a) When considering the escalated existing traffic situation (i.e. excluding the Bay West City Development and other developments as indicated in the LSDF) then the NMBM will be required to provide a lane configuration of one lane in each direction for both the Walker Drive and Redhouse Chelsea Arterial.
- b) That the road network Option D as defined in the EAS report of March 2009 be adopted as the preferred road network for both the Comprehensive Integrated Public Transport Plan (CITP) and Western Suburbs LSDF of NMBM.
- c) That the optimum route alignments for both Redhouse Chelsea Arterial and Walker Drive Extension be determined as a matter of urgency.

- d) That the ultimate road cross sections which will be required for the road network Option D as depicted in the LSDF study, would be three lanes per direction. The third lane would be converted to function as a public transport route in the future.
- e) That a detailed Traffic Impact Assessment be prepared for certain proposed developments within the LSDF area such as Bay West City Development. This TIA would be required to determine the required cross sections of roads immediately adjacent to these developments and also taking into account the impact of the proposed development on peak hour traffic.

As a result of the above, Bay West City appointed consulting engineers SSI to prepare a traffic impact assessment, the amended version of which was submitted to NMBM. This subject TIA was initially submitted to NMBM on the 30 April 2009 and was amended based on the comments received from NMBM in letters dated 11 August and 05 October 2009 respectively.

The TIA also examined the access requirements for the proposed developments in relation to the surrounding road network, determined the amount of traffic that will be generated by the development and analysis the impact on the capacity of the affected roads and intersections. This took into consideration the cumulative effect of traffic which will be generated by other proposed developments in the area as modelled in the *“Transportation Study for the Western Suburbs Local Spatial Development Framework”* (27 March 2009 by EAS). The traffic model which was developed for this Transportation Study by Aurecon/EAS was used to test alternative road networks and to determine the number of lanes required for each road for the full development scenario.

The TIA also considered the need for public transport to serve the adjacent developments and made recommendations to ensure pedestrian and traffic safety. The TIA investigated and determined the cross-sections for the roads immediately adjacent to their development as per the recommendations contained in the *“Transportation Study for the Western Suburbs Local Spatial Development Framework”* dated March 2009.

Both TIA content and the recommendations contained in the Bay West City TIA were *“approved in –principle”* by the South African Road Agency (SANRAL) and Eastern Cape Department of Roads and Public Works (ECDRPW) on the 25 January and 02 February 2010 respectively. It was then approved by the NMBM on the 03 March 2010.

In terms of the revised NMBM appointment issued to BKS during February 2008, BKS were instructed to proceed with the determination of the routes for Walker Drive and Redhouse Chelsea Arterial taking into account the recommendations contained in the *“Transportation*

Study for the Western Suburbs Local Spatial Development Framework” dated March 2009. Refer to (c) above.

From the above it can be seen that, various transportation reports were developed to motivate the Redhouse Chelsea Arterial road and interchange with the N2 as well as the associated major roads which, includes the extension of Walker Drive and also to assess the impact of the proposed land-use on the proposed road layout.

SSI representing Bay West City were requested by the NMBM to amend their TIA to take into account the results of the Aurecon September 2009 report “*Network Demand Modelling In Support of the Western Suburbs LSDF: Bay West City Modelling*” to determine the number of lanes required on each road link in the proposed network for two scenarios, namely:

- a) Full development of Bay West City but assuming no other development occurs in the Western Suburbs LSDF area. (*Scenario 1*)
- b) 75% Development of all developable land in the Western Suburbs LSDF area, including the Bay West City development. (*Scenario 2*)

The following is a brief summary of the amended Traffic Impact Assessment entitled “*Revised Traffic Impact Assessment for Proposed Mixed Use Development on Erf 426 Hunters Retreat and Portion 131 Farm Little Chelsea No. 10*” dated 15 October 2009 refer **Annexure E** in so far as it impacts on the extension of Walker Drive.

- Walker Drive (B – C) will ultimately consist of two carriageways, each comprising a 10,5m tarmac surfaced width or an 11,4m width between kerb faces.
- North carriageway should be constructed as Phase 1 which will initially operate as two 3.7m wide lanes (one in each direction) with a 1,55m shoulder on both sides. A section of this shoulder will in the interim be utilized as turning lanes at intersections. The turning lane will be 3.1m wide at intersections.
- The Southern carriageway will be constructed as Phase 2. With this carriageway completed Walker Drive will consist of two carriageways, both with two 4m wide lanes and a 2,5m lane for parking bays / shoulders adjacent to both the southern and northern verges. (*Scenario 1*)
- Scenario 2 requires three 3,5m lanes in both directions with no parking to both northern and southern verges.

In terms of the traffic impact assessment requirements the northern carriageway will therefore be constructed to its full width initially and widening to accommodate a future BRT lane, if required, will therefore not be necessary. The proposed Walker Drive cross

sections are shown on *Drawing No. J01415-00-10-500-P-00* attached as part of **Annexure H** Preliminary Drawings.

Access to the Utopia development will be from an intersection on this Walker Drive Extension (**B – C**). The position of this intersection is defined in the Utopia TIA entitled **“Traffic Impact assessment for Utopia Estate Erf 442-448 Port Elizabeth”** dated August 2011. Approval of this TIA was obtained during April 2012. The bellmouths of this intersection will be incorporated into the Walker Drive Extension (**B – C**) designs and construction as part of the roadworks.

6. TOPOGRAPHICAL SURVEY

A topographical strip survey of Walker Drive Extension was carried out by Surplan Engineering Surveyors together with the proposed Redhouse Chelsea Arterial road and associated interchange survey.

The topographical survey was completed by Surplan Engineering Surveyors on 23 April 2010 and the designs have been based on this information.

7. ENVIRONMENTAL ASPECTS

On 25 March 2010 Terratest was re-appointed by NMBM as consultants to conduct a full Environmental Impact Assessment (EIA) for the Redhouse Chelsea Arterial including the N2 interchange and the Walker Drive Extension.

Table 1: EIA Progress to date

Item	Process Description	% to Complete
1.	Project Application and Registration	100%
2.	Registration of I & APs, as prescribed by the EIA Regulations	100%
3.	Preparation of Draft Scoping Report (DSR)	100%
4.	Public Review of the DSR	100%
5.	Authority Review of the DSR	100%
6.	Consolidate comments and submit a Final Scoping Report with a Plan of Study for EIA	100%
7.	Authority Review of the Final Scoping Report and approval of the Plan of Study for EIA	100% and Approved

8.	Specialist Studies (Mr. Jamie Pote and Dr. Pete Illgner)	100%
9.	Preparation of the Draft EIR	100%
10.	Presentation of Draft EIR to NMBM CETT	100%
11.	Release of the Draft EIR for Public Review	100%
12.	40 – day Public Participation Period (Including DEDEA Review of Draft EIR)	100%
13.	Consolidate comments, Preparation and submit a Final EIR to DEDEA on May 18 2012	100%
15.	Authority review of the Final EIR	Depends on DEDEA timeframes (Ongoing)
16.	Authority Decision – dependent on information availability and final recommendations.	October 2012 (Expected)

The overall EIA progress is approximately 90% complete. The Environmental Authorisation is now anticipated to be obtained during October 2012.

8. GEOTECHNICAL INVESTIGATION

NMBM approved a quotation submitted by Terratest Geotechnical Environmental and Earth Science Consultants on 25 March 2010 to carry out the geotechnical investigation for the Redhouse Chelsea Arterial road which included the Extension of Walker Drive. The geotechnical report was received by BKS on 17 May 2010.

The geotechnical investigation was carried out along the Redhouse Chelsea Arterial road route and the associated interchange ramps, including the extension of Walker Drive. The findings of this survey are elucidated in their report entitled ***“Geotechnical Investigation for Redhouse Chelsea Arterial and Walker Drive Extension, Port Elizabeth Eastern Cape”*** dated May 2010. This geotechnical report is included as ***Annexure F***.

The geotechnical study which was carried out approximately along the Walker Drive road centreline and otherwise generally in the area of the Redhouse Chelsea Arterial road, indicates that bedrock comprising quartzitic sandstone underlines the whole of the road route. This bedrock can be expected to be found at varying depths averaging approximately 0,7m – 1,5m in depth. The bedrock is overlain by residual weathered sandstone and other variously deposited colluvial and fluvial sands and silts.

The design CBR value used for the subgrade is tested at a depth of 1000mm for the road category UA, according to Table 9 of UTG 3 – Structural Design of Urban Roads. The design CBR value used for the subgrade is 3 to 7. Allowance is made in the preliminary design for the preparation of the subgrade to import two selected layers to bring the subgrade to the required CBR value according to Table 13 of UTG3. A final decision regarding the necessity of these layers will be made on site when the subgrade is exposed. Material excavated from the road box cut could be stockpiled for use in the Redhouse Chelsea Arterial road bridge embankments depending on the quality of the material.

Due to the highly folded and weathered nature of the bedrock the type and nature of the materials which will be intercepted by the road can be expected to vary considerably along its length. Experience of the area shows that ground water will also be intercepted in the road excavations. The use of subsoil drains and also the utilization of the stormwater drainage pipes to generally lower the water table will be a necessity. Clay material may also be intercepted in places.

9. THE EFFECT OF THE POSSIBLE RE-ALIGNMENT OF REDHOUSE CHELSEA ARTERIAL (OPTION 4B) ON THE WALKER DRIVE PROJECT

During the review process of the Environmental Impact Report for the Bay West City Development an environmentally sensitive area was identified in the form of a rocky outcrop. The boundary of this environmentally sensitive area falls partly within the proposed road reserve for Redhouse Chelsea Arterial section C - E. DEDEA requested that an alternative alignment for Redhouse Chelsea arterial should be considered that would minimise the impact on this sensitive area. The alternative alignment considered moves the intersection point of Redhouse Chelsea Arterial with Walker Drive eastwards by an approximate amount of 60m and is referred to in the Redhouse Chelsea Arterial Preliminary Design Report as Option 4B. See **FIG 6 Annexure A**

This re-alignment will result in the distance between the entrance to the Utopia north development and the intersection with Redhouse Chelsea Arterial being reduced to less than what is recommended for a signalised intersection. This will be the only entrance to the Utopia north development and the reduced distance between the two intersections will cause traffic congestion on Walker Drive in future and an unacceptable level of service (LOS) with regard to the expected traffic along Walker Drive will occur. Traffic safety along this section will also be compromised.

The TIA for the Utopia development was based on the currently recommended alignment Option 4 and intersection position of Walker Drive and Redhouse Chelsea Arterial. Should the intersection move, then the Utopia TIA, will have to be revised accordingly and re-submitted for approval.

The centre line alignment of Walker Drive will not be changed or altered if Option 4B is implemented and therefore no changes to the horizontal geometrical design of the alignment of Walker Drive will be required. However the traffic circle intersection of Redhouse Chelsea Arterial and Walker Drive and a section of Walker Drive in the vicinity of the intersection will have to be redesigned. Refer to **FIG 6** attached as part of **Annexure A** Figures. As Walker Drive and Redhouse Chelsea Arterial projects form one interrelated project there will be a significant delay due to other aspects as follows:

- a) A topographical survey along the revised route together with new environmental survey will be required.
- b) An amendment to the Environmental Impact Report

- c) New geotechnical survey along road centreline.
- d) Redesign of Redhouse Chelsea Arterial (C – E), redesign of the Redhouse Chelsea Arterial / Walker Drive turning circle and eastern access into the mall. Redesign of section of Walker Drive.
- e) Revised Preliminary Design Report for Redhouse Chelsea Arterial and Walker Drive.
- f) Survey diagrams would have to be amended and resubmitted to Surveyor General for the removal of existing survey beacons, resurveying and pegging of the area.
- g) New land acquisition agreements with adjacent land owners.
- h) Amendments to approved township layout and Traffic Impact Assessment of Utopia.
- i) Road access to Utopia will have to pass through environmental sensitive areas and will require revisions to the Utopia environmental report as well as town planning revisions.
- j) Revised services design along Bay West City Ring Roads, Walker Drive and Redhouse Chelsea Arterial.

For these reasons the existing alignment is the preferred alignment.

10. ROAD GEOMETRICS

The Guidelines for Human Settlement planning and design and the *Urban Transport Guidelines 1 (UTG 1)* have been used for the vertical and horizontal design of Walker Drive extension. The following is a summary of the road geometrics.

10.1 HORIZONTAL ALIGNMENT

The Existing Walker Drive road has been constructed from Kabega Road in a westward direction up to its present end of construction which is approximately 980m from the proposed Redhouse Chelsea Arterial. The road consists of a single 7.4m width carriageway (two 3,7m lanes) in a 35m road reserve.

This section of road was initially planned as a double carriageway road consisting of two 7.4m carriageways with a median in between. Only the northern carriageway of this section of road has been constructed to date. Chainage zero for the new section of Walker Drive starts approximately 100m before the end of the present construction. This is to ensure that the two alignments of the existing Walker Drive and the Extension of Walker Drive lines-up with one another.

It is the intention to extend Walker Drive from the present end of construction up to its future intersection with the Redhouse Chelsea Arterial. This extended section of Walker Drive will consist of a different road carriageway configuration to the existing Walker Drive

road cross section. The new extended section will consist of 2 carriageways each comprising two lanes of 4m wide each with a 2,5m shoulder (Scenario 1-Bay West City development 100%) or 3 lanes of 3.5m wide with no shoulder (Scenario 2 – 75% LSDF). A median of 5m will separate the carriageways. The extended roadway will be situated in a 40m wide road reserve.

The existing Walker Drive carriageway and its position in its road reserve will have to tie into the proposed extension of Walker Drive with its different road reserve width and alignment to obtain a geometrically suitable and acceptable arrangement. Two (2 No.) large radius horizontal curves have been incorporated into the design. In addition to this, Walker Drive is required to curve to the left in order to provide a suitable future right angled intersection with the proposed Redhouse Chelsea Arterial road and also fit into both the Utopia and Bay West City township layouts.

The design speed of the road is 80km/h and the horizontal curve data as from the centre of the median is as follows:

Table 2: Horizontal Curves Data

Curve No.	Direction To	Radius (m)	BC (m)	EC (m)	Length (m)	Deflection (Degrees)
1.	Right	1 000	64,753	119,263	54,5	3,12
2.	Left	2 500	245,225	380,227	135,0	3,09
3.	Left	400	448,638	796,917	348,279	49,88

It will be noted from the drawings that the road crossfall on the northern carriageway has been reversed over the length of Curve No. 3 in order to improve riding comfort. This reversal is not required on Curves 1 and 2 due to their large radii and small angles of deflection.

A traffic circle is to be provided at the intersection of Walker Drive Extension with the Redhouse Chelsea Arterial road.

10.2 VERTICAL ALIGNMENT

Six vertical curves have been provided along this section of road in order to achieve the best fit into the topography, allow for effective drainage and economical earthworks.

These vertical curves are listed below with their relevant required and attained lengths, and K values.

Table 3: Vertical Curves Data

Item	Vertical Curve at Chainage (m)	K Required (80kmph)	K Provided	Length Required (m)	Length Provided (m)
1.	160	33 (Crest)	18,2*	100	20
2.	360	26 (Sag)	31	100	40
3.	490	26 (Sag)	212	100	140
4.	640	26 (Sag)	52	100	120
5.	760	26 (Sag)	83	100	120
6.	930	33 (Crest)	42	100	180

- * The algebraic difference (A) of the gradients for this curve is 1,09% and this vertical crest is situated on a very flat section of the road. The provision of a longer curve to satisfy the K value requirement would cause drainage problems along the length due to flat areas being developed.

From the above it is seen that all vertical curves satisfy design standards for both vertical sight distance over crest curve and headlight stopping sight distances in sag curves, with the exception of the vertical curve at chainage 160m as indicated.

11. STORMWATER MANAGEMENT

A low point occurs on Walker Drive at approximately chainage 360m and an outlet from the road stormwater management system will be constructed to discharge stormwater into the

natural watercourse situated in the public open space which has been provided for this purpose in the Utopia town planning layout. Refer to **Drawing No. J01415-00-10-001-P-00** attached as part of **Annexure H** Preliminary Drawings.

The section of Walker Drive to be constructed will be situated within the future Utopia Township and the development of the township will result in increased stormwater run-off from the area. A report entitled "**Utopia Estate, Hunters Retreat Erven 442 – 448, Bulk Services**" Report dated August 2008 prepared by Kwezi V3 Engineers has been attached as **Annexure L**. This report was prepared as a part of the Environmental Authorisation for Utopia Township.

The Kwezi V3 report deals with the increased stormwater run-off from the township and proposes the use of a system of attenuation ponds. Reference to **Fig 3** contained in the Kwezi V3 report (**Annexure L**) shows that two catchment areas drain from the south and are intercepted by the Walker Drive Extension roadway. Two ponds **SWDP1** and **SWDP2** have been provided in the designs to intercept the stormwater and attenuate it to pre-development flow prior to the stormwater flowing onto the road and eventually discharging into the natural drainage system. From **table 2** (Kwezi V3 report) it is seen that **SWDP1** and **SWDP2** will discharge $0,14\text{m}^3/\text{sec}$ and $0,73\text{m}^3/\text{sec}$ as 1:100 year pre-development flow respectively from their outlet pipes.

12. E80 DETERMINATION

The expected accumulated normal e80 traffic expected during the design life of walker drive extension, the Redhouse Chelsea Arterial and various connecting and associated roads has been estimated from the information contained in the bay west city traffic impact assessment entitled "**Revised Traffic Impact Assessment for Proposed Mixed Use Development on Erf 426 Hunters Retreat and Portion 131 Farm Little Chelsea no. 10**" dated 15 October 2009 Refer **Annexure E**

The E80 estimates have been based on the following assumptions:

- Ratio E80 / heavy vehicle = 1,8
- Lane distributions factor = 0,95
- Growth factor = 1,1
- Growth rate = 3% pa
- % Heavy vehicles = 5%
- Structural design period = 20 years

The result of the analysis shows that the most heavily loaded lane of Walker Drive may be expected to have to accommodate **7.3 X 10⁶ E80s** axles moving from Section **B - C** in an easterly direction during its assumed life of 20 years. The west bound carriageway lane will have to accommodate approximately **4.4 x 10⁶ E80s**.

13. PAVEMENT DESIGN AND SUBGRADE PREPARATION

In terms of the “**Urban Transport Guidelines, UTG 3 Structural Design of Urban Roads**” the following pavement design is proposed for the road which falls in the Traffic Class E3 range **3,0 – 12,0 x 10⁶ E80s**. The maximum E80s of **7,3 x 10⁶** is well within this range but considerably in excess of the Traffic Class E2 with a maximum of **8,0 - 3,0 x 10⁶ E80s**.

The applicable Road Category would be UA Primary and Distributor road, which encompasses the range **0,8 – 50 x 10⁶ E80s / lane**.

An appropriate pavement design would comprise the following layerworks:

- a) **40mm Asphalt:** Type 4a Mix, Compacted to Min. 95% Marshal
- b) **150mm Base Course:** G1 crushed stone maximum size 37mm compacted to 88% of apparent relative density.
- c) **125mm Subbase: C3** cemented natural gravel (G2 before treatment) UCS 3Mpa at 100% Mod AASHTO. Max size 63mm.
- d) **125mm Upper selected subgrade: C4** Cemented natural gravel (G5 before treatment) UCS 1,5Mpa at 100% Mod AASHTO).

The above pavement design assumes that the required in-situ subgrade CBR of 15% will be achieved at 93% Mod AASHTO density. The Geotechnical investigation shows that with the exception of where Walker Drive is situated in cut in the residual weathered sandstones or ferricrete materials the insitu subgrade materials will generally not satisfy this condition. Two additional selected layers will therefore be required. The extent of the areas will be determined with detail soil sampling along the centreline of the road once the ROD have been obtained. The in-situ subgrade materials can however be utilised in places provided adequate compaction can be obtained to achieve the required CBRs.

Due to the more complex operations employed in constructing the proposed cement stabilised subbase alternative designs omitting the use of the stabilised subbase and replacing with unstabilised layerworks has been investigated.

For this purpose the Cyrano Pavement Analysis program was utilised to predict the long term performance of the road using unstabilised subbase layers as opposed to the recommended

cement stabilised subbase. The results show that it is not feasible to construct an unstabilised flexible pavement which can carry the design 7.3×10^6 E80s traffic loading without the riding surface deteriorating below the acceptable levels within about 12 years. The performance of the road is highly dependent on the stiffness of the subgrade and increasing the thickness of the alternative unstabilised subbase layerworks has very little effect. The stiffened subbase has superior load distribution characteristics which impacts on the lower subgrade layerworks and also ensures the production of a strong basecourse layer which is also of high importance.

The results of the analysis confirm the Catalogue Method that requires the use of stabilised subbases for this particular traffic class. The use of the cemented stabilised subbase layers is therefore recommended.

A detailed report on results of the Cyrano Pavement Analysis is available on request.

Past experience in road construction in the area and the geotechnical investigation indicates that the in-situ materials are highly variable and that pockets of very weak materials may be encountered in between the fractured and folded underlying sandstone formations. This means that fairly extensive areas of unsuitable subgrade material may have to be removed and replaced with suitable material. Precise decisions on subgrade treatment can therefore not be made prior to excavating and opening up the road bed.

Groundwater will also be a problem due to the fairly shallow underlying quartzitic sandstone formations and subsoil drainage will be required fairly extensively. A stormwater pipeline will be provided longitudinally along the future median. This stormwater pipeline will be utilised to intercept the groundwater drainage system.

Where the roadways are in deeper cut, solid quartzitic sandstones rock ribs may be encountered and blasting may be required. Depending on the rock surface profile, the layerworks design will be adjusted accordingly.

14. EXISTING SERVICES

Refer to **Drawing No. J01415-00-10-007-P-00** attached as part of **Annexure H** Preliminary Drawings. The construction of Walker Drive Extension comprises a length of new road of approximately 980m. Construction will commence basically from the end of the existing constructed section of Walker Drive. Certain temporarily roadworks and services have previously been extended along the previous alignments and first section of Walker Drive to service the Thriftwood townhouse development which has an entrance off Walker Drive

Extension at approximately chainage 340m. These roadworks and services are described hereunder.

14.1 ROADWORKS

The temporary road has been extended from the end of present construction along the southern verge of the existing road reserve. This road will be scrapped and replaced when the new permanent northern carriageway of Walker Drive is completed. It will however remain in use for a limited time during construction to provide proper access to the existing Thriftwood townhouse complex. A new bellmouth entrance will be provided as a permanent entrance. Temporary access will be provided during the construction period by making use of the haul road which will be situated in the southern half of the Walker Drive road reserve.

14.2 WATER SUPPLY PIPELINES

An existing 315mm diameter water pipeline is situated in the northern verge of the section of Walker Drive from chainage 0m to approximately 140m. This section of pipeline is in the correct position relative to the road reserve boundary. From approximately chainage 140m to 340m the pipeline followed the old Utopia Road Reserve and is therefore positioned incorrectly relative to the future road reserve boundary of Walker Drive over this section (**refer to Section 4 above**). Most of this section of pipeline will run longitudinally under the proposed future northern carriageway and it will have to be relocated in the northern verge in the correct position relative to the revised road reserve.

Due to the high materials cost of the pipes it is recommended that as many pipes as possible from the existing pipeline be recovered for later re-use when the pipeline is extended.

An existing 450mm diameter water pipeline crosses the road reserve at approximately chainage 160m. It is likely that this pipeline will have to be lowered to provide sufficient cover over the pipeline to accommodate the road layerworks. Alternative protection methods may be considered and agreed to in conjunction with NMBM Engineering and Infrastructure Department.

A 160mm diameter pipeline providing a connection point for the existing Thriftwood townhouse development is also in the proposed road reserve at approximately chainage 330m. Depending on the pipelines depth it may also have to be lowered.

14.3 SEWERAGE

Existing 150mm diameter sewerage pipeline is situated along the southern verge of Walker Drive serving erven numbers 2147 – 2152 (inclusive). These sewers will not be affected but should be protected during construction when taking place in close proximity.

The existing Thriftwood townhouse development sewerage system drains northwards with a 150mm diameter pipe and crosses Walker Drive at approximately chainage 350m. This sewer will be protected during construction but should not require lowering or any adjustments.

14.4 STORMWATER SERVICES

An existing 300mm diameter stormwater pipeline is situated in the southern verge of the existing section of Walker Drive between Chainage 0m and 90m. As this pipeline will fall under the carriageways of the future extended Walker Drive, it will have to be lifted and relocated to the standard position behind the back of kerb of the future road.

A 350mm diameter outlet from the Thriftwood townhouse development internal stormwater system crosses Walker Drive Extension at approximately chainage 350m to where it discharges into the natural watercourse situated in the public open space which has been provided for this purpose in the Utopia town planning layout (**Annexure L**). This pipeline will be connected into the proposed new stormwater management system.

14.5 TELKOM SERVICES

An existing Telkom cable crosses the road at approximately chainage 160m. This cable is located in a duct under the existing roadway. This cable duct will be extended if necessary and further protection provided if necessary in accordance with Telkom requirements. Remaining Telkom services are above ground.

14.6 ELECTRICAL CABLES

Electrical cables cross the Walker Drive in the vicinity of chainage 200m. Cables are also present along the southern verges between chainage 0m and chainage 350m. These cables are situated close to the road reserve boundaries and should not be affected by the proposed roadworks.

15. FUTURE SERVICES AND DUCTS

Certain future underground services will have to be located within the Walker Drive Extension Road reserve to serve both the future Utopia Estate townships which will be situated both to the north and south of Walker Drive as well as services taken along the length of the road to serve the Bay West City development. In order to obviate the breaking up of the constructed Walker Drive at some future date, it is essential that any services that may be required to cross the road be installed during the construction of Walker Drive. These services requirements are as listed hereunder.

15.1 WATERMAINS

A 315mm diameter watermain which presently terminates at Ch 0m (present end existing Walker Drive) will have to be extended through to the Bay West City boundary at the Redhouse Chelsea intersection. The installation of this pipeline which will be situated in the northern verge of Walker Drive forms part of the bulk water supply system to serve Bay West City and adjoining areas. Bay West City will be responsible for its installation.

The pipelines required to serve the proposed Utopia development have not been finalised however a number of pipes will have to connect into the 315mm diameter watermain and will be required to cross Walker Drive. These pipes will have to be installed at the cost of the Utopia townships developers. The Utopia planning programme lags behind the Walker Drive programme and it may therefore be necessary to install these crossings in their approximate future positions.

15.2 SEWERAGE

The general fall of the land in the area is to the north which means that the section of Utopia situated to the south of Walker Drive Extension will have to drain to the future and existing sewerage system located in the Baakens River. One or two sewer pipeline crossings will be required and we have requested Utopia to supply the positions and levels of these pipes so that they may be pre-installed. A sewer may also be required along the northern verge of Walker Drive; however this may be installed by the developers of Utopia as it will not affect the finished Walker Drive Road construction. These pipes will have to be installed at the cost of the Utopia developers.

15.3 STORMWATER

The stormwater pipelines which are required to cross the northern carriageway of Walker Drive will be installed during the construction of the road. The cost of these stormwater pipes will be borne by the municipality. The reason for this is that the municipality would have to accommodate the peak un-attenuated predevelopment flow into the system as part of the design requirements. When Utopia is developed the developers have undertaken to install two ponds in the southern section of Utopia to attenuate the post development 1:100 storm run-off to a 1:2 year predevelopment run-off rate. (Refer **Annexure L**)

15.4 ELECTRICAL AND TELKOM SERVICES, DUCTS

Worley Parsons Consulting Engineers have been requested to communicate with both Telkom and the municipal electrical departments to obtain the positions of the ducts

required for Utopia development. These ducts will be installed as part of the Walker Drive contract at the expense of the Utopia developers.

16. HAUL ROAD

It is the intention of the developers of Bay West City to construct a temporary surfaced haul road along the alignment of the future southern carriageway to be situated within the Walker Drive road reserve. The haul road will be utilised by vehicles accessing the proposed Bay West City shopping precinct during its construction phase as well for construction vehicles accessing the section of the Redhouse Chelsea Arterial road situated to the south of the N2 and Walker Drive itself during their construction phases. As the Bay West City development and the Redhouse Chelsea Arterial construction phases are likely to be carried out simultaneously, the repair and maintenance of the haul road will have to be jointly undertaken by both Bay West City and the NMBM. The roadworks for the haul road will be carried out to the design of the future southern carriageway such that the finished level of the haul road will approximate the finished top of kerb level of the future road. The earthworks therefore will be carried out to final levels over the whole width of the southern carriageway including the verges. This will mean that if services are required to be installed in the southern verge they may be constructed from the outset to the future final verge level. Road drainage requirements will also be satisfied by adopting the above proposal.

In a MDTTT meeting held 1 July 2010 it has been agreed between NMBM and Bay West City developers that the earthworks along the second or future southern carriageway will be completed by the Municipality during the construction of northern carriageway Walker Drive Extension. The haul road layerworks construction and surfacing will then be undertaken by Bay West City developers at their cost. ***Refer to Annexure M***

The alignment of the proposed haul road is shown on the relevant drawings. The designs accommodate allowance for normal traffic movements and operations on a completed Walker Drive Extension north carriageway together with the haul road.

The provision of the haul road will thus save the newly constructed Walker Drive from an excessive number E80 construction traffic loading during the early part of its life.

17. ACCESS TO CONSTRUCTION SITE AND TRAFFIC ACCOMODATION

At present the only access to the extension of Walker Drive is westwards along the existing Walker Drive from its intersection with Kabega Road. Walker Drive also serves as the main access to all of the proposed developments situated on both sides of it and is a heavily trafficked road with severe congestion the peak hours.

In addition the commercial development at Bay West City (BWC) will be simultaneously under construction resulting in numerous heavy vehicles using the road and aggravating the present traffic congestion along the existing Walker Drive. Considerable delays in construction vehicle traffic movements can be expected.

A proposal was made that Walker Drive be constructed as a separate contract to the Redhouse Chelsea Arterial road contract. This was originally done in order to speed up the access to the Bay West City development which is an important investment for the municipal area. It was also anticipated that Walker Drive extension would be ready to be implemented ahead of the Redhouse Chelsea Arterial contract. In the event these two projects are now running simultaneously and if the construction of Walker Drive system is included in the Redhouse Chelsea Arterial contract, a further access to the site could be obtained directly from the N2, National Road. This is now the current preferred option.

SANRAL have approved the concept that access for construction vehicles to and from the Redhouse Chelsea Arterial will be allowed from the N2 making use of the proposed interchange south-off and north -on ramps.

The construction of the south off-ramp to subgrade standards would allow construction vehicles to directly access the Walker Drive site making use of the section C – E of Redhouse Chelsea Arterial. If Redhouse Chelsea Arterial is constructed under a separate contract to Walker Drive then access would mean crossing another contractor's site which could create logistical and programming problems with possible resultant claims for delays. If the contracts are combined then the single contractor could plan and programme his access activities accordingly. Such an arrangement would provide access to Walker Drive and vehicles leaving the site could utilise existing Walker Drive.

Vehicles leaving the site could however also access the N2 by utilising the north on-ramp provided the contractor effectively programmes his operations (assuming a combined contract). The section of the Redhouse Chelsea Arterial south of the N2 requires large volumes of fill to be obtained from the northern section of the road. In order to move this material from the northern to the southern side of the N2 it will be necessary to construct a haul road along the alignment of North CD road from Redhouse Chelsea Arterial to the existing N2 overpass bridge, across the existing N2 bridge and then utilise the road reserve which forms part of the Ring Road around the Bay West City Mall. This road will be constructed by the Bay West City mall contractor and permission to use the South CD road will have to be negotiated. In terms of current planning the South CD road will only be constructed towards the end of the BWC contract and a temporary haul road will therefore

be required along this section. SANRAL have approved the use of the existing bridge for construction traffic.

There are many contractual and financial advantages to construct Walker Drive as part of Redhouse Chelsea Arterial and these are inter alia as follows:

- Relative ease of access to Walker Drive for construction vehicles using the uncongested N2 directly to the point of entry to the site.
- More efficient use of contractors transport and earthmoving equipment.
- Use of one contractor's camp for the southern section of the Redhouse Chelsea Arterial and Walker Drive construction.
- Saving in duplicating Preliminary and General items.
- Saving in wear and tear of the existing Walker Drive pavement layers.

Savings in foreign exchange fuel and carbon emissions

To summarise it can be seen that if Walker Drive is constructed under a separate contract to Redhouse Chelsea Arterial, access to and from site will have to be along the existing Walker Drive. Alternatively if the construction of both Redhouse Chelsea Arterial and Walker Drive are implemented as one contract then access to and from Walker Drive can be directly from the N2 National Road.

This concept was discussed and approved at the meeting held on 15 June 2012.

18. CONSTRUCTION PROGRAMME

An Implementation programme for Walker Drive Extension has been prepared and is attached as **Annexure G**.

The programme shows that construction could commence during January 2013 assuming that environmental approval is obtained during October 2012. According to the progress made to date on the environmental process this should be achievable.

This will require a spend rate of approximately **R 1,83 million** per month and should be easily achievable by a competent contractor. The attached basic implementation programme shows this proposal. It is anticipated that the detailed designs and contract documentation could be completed by end August 2012 resulting in a tender award early November 2012.

19. CONTRACTURAL MATTERS

The funding of the Extension of Walker Drive section **B-C** forms part of the Redhouse Chelsea Arterial road system and is the responsibility of the NMBM and public tenders will have to be called for. As explained in **Section 14** of this report certain services will have to be installed in the Walker Drive road reserve during the construction of the road. The cost of these services are however not the responsibility of the NMBM. It will not be practical and desirable to have two or more contractors operating on the road reserve site simultaneously i.e. a road contractor and other contractors installing services on behalf of the township developers.

It is therefore recommended that a single contract be awarded for all of the civil works to be carried out within the Walker Drive road reserve and that the developers of Bay West City and Utopia Estates provide the necessary funds for the same contractor to install the water pipelines, sewer crossings and haul road simultaneously. This will obviate conflicts from arising between having two contractors on the same site simultaneously.

Table 4: Funding Responsibilities

	A description of the work to be carried out:	Responsibility
1.	Walker Drive road construction (B – C) including earthworks for future southern carriageway, stormwater drainage, ducts and services relocations	NMBM
2.	Haul road layerworks and surfacing	Bay West City
3.	Sewer and water pipeline crossings	Anathi
4.	Extension of 315mm diameter watermain	Bay West City

For the above reasons and those mentioned in section 17 above, both the NMBM and SANRAL have agreed that SANRAL will undertake the construction of Walker Drive Extension as part of the Redhouse Chelsea Arterial road project.

20. PRELIMINARY COST ESTIMATES

The breakdowns of the cost estimate are included as **Annexure B** in this report. The table below shows that the estimated cost of construction for Walker Drive is **R 21, 90 million**. These estimates only include 12% for Preliminary and General Items, 5% Contingencies and 14% VAT.

Table 5: Cost Estimate Summary

Item No.	Description	Responsibility			Total
		NMBM (R million)	Bay West City (R million)	Utopia Estates (R million)	
1	Walker Drive road construction and associated stormwater drainage, ducts, earthworks for future southern carriageway and services relocations	21,90	Nil	Nil	21,90
2	Extension of 315mm diameter watermain from end of existing pipeline to Redhouse / Chelsea Arterial	Nil	1,50	Nil	1,50
3	Haul road layerworks and surfacing	Nil	1,22	Nil	1,22
4	Water and sewer road crossings required for Utopia township	Nil	Nil	0,25	0,25
	TOTAL (R millions)	21,90	2,72	0,25	24,87

Guarantees from both Bay West City and Anathi Property Investments should be obtained for their respective contributions.

21. CONCLUSION AND RECOMMENDATION

- Walker Drive Extension forms an integral part of the future road network requirements in the western areas of the city and will connect directly into the Redhouse Chelsea Arterial with links to Cape Road and the N2 National Road.
- Traffic Impact Assessments show that portion of this road network which includes Walker Drive Extension is already required in order to relieve existing traffic congestions in the western areas. It is also required to provide road access to the proposed Bay West Development.
- It is recommended that the road construction be commenced as soon as the funds are available, the environmental approval is in place and the road reserve registered. The estimated start date for construction according to the current programme indicating that environmental approvals will be obtained during October 2012 is mid January 2013.
- The estimated cost of the road and services is R24,87 million which includes for 12% Preliminary & General Items, 5% Contingencies, 10% Professional Fees and 14% Value Added Tax
- It is recommended that certain services to be situated in the Walker Drive Extension road reserve which are required to service adjacent townships are also included in the contract at the cost of the relevant developers.
- It is recommended that Walker Drive Extension be included as a part of the Redhouse Chelsea Arterial road contract.
- That the implementation of the Redhouse Chelsea Arterial road contract be undertaken by SANRAL.
- It is recommended that the necessary agreements between the NMBM and SANRAL be finalised so that SANRAL can undertake the simultaneous construction of both Walker Drive and Redhouse Chelsea Arterial.

22. REFERENCES

- a) Engineering Advice and Services. March 2009. *Transportation Study for the Western Suburbs Local Spatial Development Framework*. Port Elizabeth: Engineering Advice and Services.
- b) Aurecon. September 2009. *Network Demand Modelling in Support of Western Suburbs LSDF: Bay West City Modelling*. Port Elizabeth: Aurecon.
- c) SSI. October 2009. *Revised Traffic Impact Assessment for Proposed Mixed Use Development on Erf 426 Hunters Retreat and Portion 131 from Little Chelsea No. 10*. Port Elizabeth: SSI.
- d) Terratest. May 2010. *Geotechnical Investigation for Redhouse Arterial and Walker Drive Extension, Port Elizabeth, Eastern Cape*. Port Elizabeth: Terratest.
- e) South Africa. Department of Transport. 1992. *Urban Transport Guidelines, UTG 3, Structural Design of Urban Roads*. Pretoria: V & R Printing Works (Pty) Ltd.
- f) South Africa. Department of Transport. 1986. *Urban Transport Guidelines, UTG 1, Guidelines for the Geometric Design of Urban Arterial Roads*. Pretoria: Graphic Arts, CSIR.
- g) CSIR Building and Construction Technology. 2005. *Guidelines for Human Settlement Planning and Design*. Pretoria: Capture Press.
- h) BKS (Pty) Ltd. December 2010. *Proposed Redhouse Chelsea Arterial Road from proposed Extension of Walker Drive to Cape Road, Preliminary Design Report*. Port Elizabeth: BKS (Pty) Ltd.

ANNEXURE A:

FIGURES

ANNEXURE B:

BREAKDOWN OF COST ESTIMATES AND AGREED FUNDING

ANNEXURE C:

**LAND ACQUISITION DATA AND
ROAD RESERVE REGISTRATION
(SETPLAN AND VPM DIAGRAMS)**

ANNEXURE D:

**TRANSPORTATION STUDY FOR THE
WESTERN SUBURBS LOCAL SPATIAL
DEVELOPMENT FRAMEWORK**

MARCH 2009

ANNEXURE E:

BAY WEST CITY'S

TRAFFIC IMPACT ASSESSMENT,

OCTOBER 2009

ANNEXURE F:

GEOTECHNICAL INVESTIGATION

REPORT BY TERRATEST,

DATED MAY 2010

ANNEXURE G:

PRELIMINARY

IMPLEMENTATION PROGRAMME

ANNEXURE H:

PRELIMINARY DRAWINGS

ANNEXURE J:

UTOPIA'S

ENVIRONMENTAL AUTHORISATION

ANNEXURE K:

BAY WEST CITY'S

ENVIRONMENTAL AUTHORISATOIN

ANNEXURE L:

UTOPIA'S

ENGINEERING SERVICES

REPORT

ANNEXURE M:

MINUTES OF THE MEETING HELD ON

1 JULY 2010, 9TH FLOOR LILLIAN

DIEDERICK BUILDING