1. STORMWATER CROSSINGS FOR OPTION 1, 4 AND 4B

Refer to Annexure A, Fig 21.

1.1 ALTERNATIVE 1 (CROSSINGS D – I)

Crossing G: Main Baakens River crossing on north on-ramp to N2

The catchment area and peak flows passing down the river applicable to crossing are the same as for crossing 3. It is situated about 200m downstream of Crossing F.

Estimated peak 1:100yr flow = 32,0 m³/sec under pre-developed state.

1.1.1 General

There are two options which can be utilized to effect the stream and river crossings, viz bridge crossings or the provision of precast or cast-in-situ box culverts. From a cost benefit evaluation it was found that the use of reinforced concrete culverts would result in significant savings in cost and time. In the case of both precast and in-situ culverts, multi-span configurations are proposed. The final arrangement of the culverts is dependant on the environmental considerations and in particular the impact on wetlands if they are present at the crossing positions. The environmental studies are presently underway. The proposed culverts can accommodate the 1:100yr flow, post-development, but these sizes may be refined at the detailed design stage.

Culvert Descriptions For Main Drainage System

1.1.2 Crossing D

The flow from this catchment takes place over a fairly broad stream width and a wide crossing is indicated. Urban development is envisaged on both the upstream and downstream sides of the crossing and the design of its culvert may have to be tailored to suit these requirements during the detailed design stage.

The proposed configuration is as follows:

- *3 number 2,5 m span x 1,5 m high precast box culvert. Refer to Fig 21.*

1.1.3 Crossing E

This has steep embankment sides and the river invert will be approximately 15 m below the final road level.

The proposed configuration is as follows:

- *2 number 3,6m span x 3,0m high precast box culvert. Refer to Fig 21*

This configuration will allow free flow through the culvert with a minimum backwater effect, reduced flow velocity and minimizing the impact on the environment.

1.1.4 Crossing F

This crossing is over the main Baakens River where a maximum fill height of 10m will be required from river invert to finished road level. The side slopes of the river banks are relatively steep and the watercourse well defined.

The proposed culvert configuration is as follows:

- *3 number 3,6m span x 3,0m height precast box culverts. Refer to Fig 21*

This configuration will allow free flow through the culvert with a minimum backwater effect, reduced flow velocity and minimizing the impact on the environment.

1.1.5 Crossing H

This crossing is over the main Baakens River where a maximum fill height of 8m will be required. The width of valley floor in this area is substantial and in order to obviate the high fills encroaching onto potentially sensitive areas. The use of vertical reinforced earth embankments will be considered during the detailed design phase.

The proposed culvert configuration is as follows:

- *3 number x 3,6m span x 3,0 m high precast box culverts. Refer to Fig 21*

1.1.6 Crossing I

The topography at his crossing is similar to that described in crossing H with a maximum fill height from stream bed to finished road level of 11m.

The proposed culvert configuration is as follows:

- *2 number 3,6 m span x 3,0 m high precast box culvert. Refer to Fig 21*

The same fill constraints as crossing H as described above will be applied to crossing I.

1.1.7 Crossing G

This crossing which is over the main Baakens River will have a maximum fill height from stream bed to finished road level of 11m. The proposed culvert configuration is as follows:
3 number 3,6m span x 3,0m high precast box culverts.

Road Surface and Road Prism Drainage

Stormwater which will flow via a sheet flow pattern up to the road prism will be intercepted by a system of lined side drains on the high side of the road which will eventually discharge into the main natural watercourses under controlled conditions.

Stormwater run-off from the road surface will be by means of a system of grids, side inlets, pipes and concrete chutes.

The design standards adopted will be in accordance with the SANRAL Drainage Manual and SABS 1200. Minimum pipe sizes will be 450mm diameter.

Refer to Annexure A, Fig 21. Also Refer to Dwg. No.: G10/1 – 3 and G12/1 – 2.

1.2 ALTERNATIVE 4 AND 4B (CROSSINGS A – C)

Refer to Annexure A, Fig 21.

The factors that must be considered with respect to the provision of stormwater drainage for the Redhouse Chelsea Arterial and the interchange are as follows:

a) River and watercourse crossings.

b) Stormwater drainage that needs to cross under the roadways where the levels of the road are above the natural ground level.

c) Drainage along the road surface and from cut and fill embankments.

1.2.1 River and Water Courses Crossings

The proposed road system will intersect and cross over two watercourses viz. the main Baakens River and the northern watercourse which is situated to the south of and roughly parallel to the N2 road. These crossings are described here under.

- ***Main Baakens River Crossing (Point C)***

The Redhouse / Chelsea Arterial will cross the Baakens River at chainage 1440 north of the N2. The proposed crossing point has been selected in conjunction with the wetland and vegetation specialist consultants taking into account the engineering, environmental and cost factors.

Two methods of crossing this river have been investigated namely a three span post-tensioned concrete bridge and a two span reinforced concrete box culvert. In both cases the road level above the river bed would remain the same in order to satisfy the geometric requirements of the roadway.

A hydrological analysis of the river catchment has been undertaken to determine the peak flows expected to occur during various storm frequencies including the 1:100 year un-attenuated storm. The effects of both the bridge piers and culvert on the water profile under the resulting 1:100 year flow conditions were analysed. The hydrological report is attached as ***Annexure E****.*

Refer to Table 1 for Bridge vs. Culvert Comparison Table.

- ***Northern Watercourse Crossing (Point A and B)***

The northern watercourse is crossed in two places by the proposed road system and is described as follows:

a) Cyclopia Structure (Point A)

Here the Redhouse Chelsea Arterial crosses the northern watercourse. The structure that is proposed for this crossing comprises a 5.0m x 3.0m reinforced box culvert or alternatively a 20m single span reinforced concrete bridge . The 1:100 year floodline will not be affected by these structures.

Refer to Table 2 for Bridge vs. Culvert Comparison Table.

b) Combined South Off-ramp and South on Loop Ramp Culvert (Point B)

In this case the watercourse will be crossed by the two abovementioned ramps after they have combined as a single two directional ramp. A twin 5,0m x 2,0m box culvert approximately 32m long is proposed for this crossing. The hydraulic capacity of the culvert exceeds the discharge requirements and the 1:100 year floodline will thus be virtually unaffected. A detailed assessment will be made during the detailed design stage.

1.2.2 Road Drainage

- ***Redhouse Chelsea Arterial***

Refer to Dwg. Nos. 002 – 006, Annexure A.

The first section of Redhouse Chelsea Arterial C – E will be situated in a road reserve provided within the Bay West City development. A standard type road drainage system comprising a system of pipes and kerb inlets will be provided along this section with the pipelines discharging into the proposed ponding system to be constructed under the Bay West City Development.

The BKS report entitled "Engineering Services Report, Stormwater Management Masterplan" November 2010 is attached as ***Annexure M****. It shows the proposed stormwater ponding system in proximity to the Redhouse Chelsea Arterial.*

Road drainage will also be provided over the elevated bridges by means of longitudinal pipelines with kerb inlets at spacing depending on road gradient. Road Section F to G will also be provided with longitudinal drainage pipelines and kerb inlets.

From the Cape Road intersection southwards the road will be in cut and will therefore intercept overland stormwater flowing from the open areas on the western side of the road reserve. Side drain channels will be provided along all cut sections of the road to control stormwater from the embankments. These channels will be intercepted by grate inlets and led off to the longitudinal pipeline system. Kerb inlets will be provided along the length of the road at appropriate intervals to intercept the kerb channel flow. In places a berm will be constructed along the top of the cut embankment to control the run-off from the surrounding areas more effectively.

For ease of future maintenance SANRAL type manholes and kerb inlets will be provided within the SANRAL interchange property and standard NMBM manholes and kerb inlets along the remainder of the road.

- ***Interchange Ramps***

Refer to Dwg. Nos. 002 – 006, Annexure A.

The finished road levels along the interchange ramps will generally be situated above existing ground level and will therefore intercept the natural overland sheet flow. Numerous pipes will therefore be provided under these ramps at strategic intervals and natural low points to allow stormwater to pass under these roads.

In addition to this where the ramps are joined to the N2 east and westbound carriageways, the existing pipe culverts under the N2 will have to be extended to accommodate the wider surfaced width of the N2 at these points. The longitudinal N2 side drains will similarly be accommodated.

Refer to Dwg. Nos. 002 – 006, Annexure A.

1.2.3 Stormwater Ponds

Refer to Dwg. No. 003 and 007.

The developers of the Bay West City Development will install a stormwater ponding system adjacent to the northern water course which is situated between the N2 and the proposed South CD road. The southern section of the Redhouse Chelsea Arterial road stormwater will discharge into this ponding system.

Refer to Annexure M. Refer to the DEDEA's approval of this Masterplan.

2. UTOPIA: COMMENTS ON ALTENATIVES 1, 4 AND 4B

a) When Alternative 4 was a Preferred Alignment (21 August 2012)

"I looked at the yellow option (4b), which slices through a large part of the developable land of Anathi (Utopia Estate). This is simply not acceptable, as it has serious consequences for the feasibility of the development and it causes significant additional planning and design work. This will also cause further delays in the consideration of the application of Utopia, which is long overdue.

Breaking further west with the road will also lead to it missing the rocky outcrops, which is the main reason for the alternative to be considered.

The off-ramp options are in an area which was indicated as not suitable for any development due to the environmental sensitivity of the land. It is amazing that the land is not suitable for development, but suitable for road construction, but that must be resolved by the competent authority (DEDEA). Anathi will require compensation for the land, i.e. the option that will use the least land will probably be the most affordable. The value of the land must still be determined and it will definitely not be lower than the current cost of the development land inclusive of the costs incurred in the value enhancement. Anathi is already on record in support of the road access / interchange.

It therefore seems as if the main issue is Option 4b, which cannot be supported. Unless Anathi is fully compensated for its loss of income from the development of the affected land and all costs incurred in the planning and design of alternatives are paid for by the applicant for the road, Option 4b must be scrapped." Dupre Lombaard's e-mail dated 21 August 2012.

b) When Alternative 1 Is a Preferred Alignment

This is pending the outcome of the meeting to be held on 12 October 2012 between Bay West City and Utopia. They will present their agreement to the relevant authorities.

c) When Alternative 4B Is a Preferred Alignment (21 August 2012)

This is pending the outcome of the meeting to be held on 12 October 2012 between Bay West City and Utopia. They will present their agreement to the relevant authorities.

d) LAND AQCUSITION: COMPARISON FOR ALIGNMENT 4 AND 4B

Refer to Fig. 22

DESCRIPTION	***ALTERNATIVE***	
	ALTERNATIVE 4	***ALTERNATIVE 4 B***
Land Required	***200 m2***	***15000m2***

This is pending the outcome of the meeting to be held on 12 October 2012 between Bay West City and Utopia. They will present their agreement to the relevant authorities.

3. MOTIVATION FOR OPTION 4B AS A PREFERRED ALIGNMENT (REVISION)

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 along the proposed route of the road. The boundary of this environmentally sensitive area falls partly within the proposed road reserve for Redhouse Chelsea Arterial section C – E in the vicinity of the Walker Drive intersection.

As a result 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 distance of 70m and is referred to as Option 4B. Refer to FIG **9 *Annexure A***.

A report entitled "*Transportation and Environmental Planning Report: Discussion Document*" dated February 2012 was prepared to describe the processes which were undertaken to determine the location and route of the proposed Redhouse Chelsea Arterial. The report also describes in detail what the impact of Option 4B will be. This report is attached as ***Annexure K*** to this report.

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 to all authorities.

The centre line alignment of Redhouse Chelsea Arterial will be changed from chainage 0m to approximately chainage 700m if Option 4B is implemented and therefore changes to the horizontal and vertical geometrical design of the alignment of Redhouse Chelsea Arterial will be required. Refer to **FIG 22** 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) *Amendments to township layout.*
g) *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.*
h) *New land acquisition agreements with adjacent land owners.*
i) *Amendments to approved township layout and Traffic Impact Assessment of Utopia.*

j) Road access to Utopia will have to pass through environmental sensitive areas and will require Rrevisions to the Utopia environmental report as well as town planning revisions.

k) 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.

a) ADVANTAGES

- *Shortest route*
- *Most economical route*
- *Environmentally sensitive rocky outcrop area is by passed.*
- *Cylopia Buffer Area regarded as sensitive rocky outcrop area is avoided.*
- *Crosses Baakens river at optimum position and crossing angle.*

b) DISADVANTAGES

- *The stacking lengths (for the back to back dedicated right turn lanes) recommended by the TIA cannot be adequately accommodated in section C - E.*
- *Level of Service (LOS) at intersections and the road section will be lowered possibly to congestion. This can be alleviated by synchronising the traffic lights.*
- *Because of the shorter length compared to 4B, the median will not be provided.*
- *As a result of the non provision of the median for section C – E, the street lighting will not be accommodated. i.e. they will be relocated to the sidewalks.*

4. REQUEST FOR THE EXISTING SERVICES FROM THE SERVICE PROVIDES

Refer to Dwg. Nos. 004 – 006, Annexure A.

All engineering services information has been sourced from the Nelson Mandela Bay Municipality database. Telkom indicated that there are existing services both underground and overhead which will be affected by the construction of Redhouse Chelsea Arterial. These services will be relocated by various service departments or the contractor prior to commencement or during the implementation of this project.

A detailed survey was conducted Surplan Engineering Surveyors to picking-up existing road details in the area, erf boundaries, invert and cover levels of existing services together with the necessary spot heights. Unfortunately they could not determine the depth of the water pipes. The survey commences at the northern boundaries of Erf 441 and terminates at its Cape Road intersection.

Refer to Annexure B for correspondences.

The known existing services which will be affected by the road works are as follows:

4.1 Sewerage

There are two major existing sewerage pipelines which run along the banks of the Baakens River which will be affected by the proposed works as well as two 150mm diameter sewers near the Cape Road intersection:

(a) 230 mm diameter sewer on northern bank

Refer to Fig 13.

This sewer basically runs along the top of the escarpment and will be intercepted by the roadwork's. The exact position of this sewer crossing was not initially determined due to difficulties in locating the manholes and further survey is underway. It is likely however that a diversion of this sewer will be required to ensure that there are no bends or manholes that will be positioned in the road reserve and that it is located at a suitable depth in the road fill. A pipe duct or culvert to accommodate this sewer will be installed to NMBM requirements.

(b) 300 mm diameter Sewer on Southern Bank

Refer to Fig 12

This sewer is situated fairly low down along the southern bank of the Baakens River. At the point where it crosses the Redhouse Chelsea Arterial, the sewer is approximately 4,5m deep and also has a manhole situated on a bend which will fall within the road reserve. The depth of fill above existing ground level to the future road level will be approximately 6m which will result in a total depth of sewer of 10,5m below future road level. It will thus be impossible to access this sewer once the road is built or to construct a future additional sewer and it will therefore be inserted into large diameter pipe sleeve of approximately 1 050mm diameter to enable repairs, maintenance or upgrading to be carried out. This sewer will have to be relocated on a new alignment to avoid the bend and manhole which falls within the road reserve. A rectangular box culvert could also be provided in place of the proposed 1050mm diameter pipe sleeve, but this would be considerably more expensive. Discussions have already taken place with NMBM Wastewater Conveyancing Division on this issue and their requirements will be incorporated into the final designs.

(c) 2 No. 150 mm diameter Sewers near Cape Road Intersection

Refer to Dwg. No: 007, Annexure A.

Both of these crossings will occur in sections of Redhouse Chelsea where the road level will be marginally above ground. Those pipes are in straight lines and no manholes or bends will be situated within the road reserve. The pipelines will be installed in 250mm diameter sleeves under the road width of Redhouse Chelsea.

A 150mm diameter sewerage pipeline is also situated along a section of the Redhouse Chelsea Arterial Road Reserve adjacent to Rowallan Park. This sewer will also have to be located and protected during construction.

4.2 Water Supply Pipelines

Refer to Fig. 11 and Dwg. No: 007, Annexure A.

Existing water supply pipelines are situated in the Cape Road / Redhouse Chelsea Arterial intersection and will have to be located and determine whether lowering and / or protection will be required.

The proposed Redhouse Chelsea Arterial Road will intersect an existing 750mm dia Nelson Mandela Bay Municipality (NMBM) watermain in the vicinity of the Baakens River. Fig 11 and Fig 14 are attached for clarification.

Fig 14 shows the approximate position of where the existing watermain will cross the centreline of the Redhouse Chelsea Arterial at chainage 1 360m. The crossing point is also approximately 80m south of the

Baakens River measured along the centreline of the road. Fig 14 also shows the existing pipeline maintenance track situated within the pipeline servitude as well as where the pipeline crosses the Baakens River.

4.3 Telkom Services

An existing Telkom cable crosses the Redhouse Chelsea Arterial at the north side of the Baakens River. This cable appears to terminate on the western side of the road reserve. This cable will be intersected by the road cut and will have to be lowered and inserted through an appropriate sleeve.

Existing Telkom cables are also situated in the Cape Road intersection area which will be investigated prior the detailed design stage. An optic fibre cable is situated in the N2 road reserve which will be precisely located prior to core drilling for the N2 Overpass Bridge structure.

4.4 Electrical Cables

No existing cables are situated in the road reserve except at the Cape Road intersection. The design of this intersection has not yet been finalised as the ultimate design forms part of a commission handled by other consultants. The implication of the proposed designs has not yet been ascertained. However as the final road levels will not be substantially below existing ground levels protection of cables in sleeves under the future roads will probably suffice.

5. BLASTING METHODOLOGY (REVISION)

5.1 GENERAL

Refer to Fig 20

There are three sections of the Redhouse Chelsea Arterial Road where it is anticipated that blasting will be required because of the rocky nature of the subsoils. Blasting will be required to form the road bed and also in the pipe trenches.

All blasting activities in the Republic of South Africa are strictly controlled by the authorities and blasting activities in the Nelson Mandela Bay area fall under Captains H.S Erasmus of the Explosive Unit South African Police. We have consulted both Captain Erasmus and a blasting Specialist Mr. C. Matheuss in the preparation of this report. Captain Erasmus has undertaken to provide a representative from his office to monitor all blasting activities on the project.

5.2 BLASTING TECHNIQUE

5.2.1 For Roadbed

These excavations will involve the removal of a considerable volume of rock. In general it is standard practise to remove overburden and soft material to expose the hard material and then remove as much material as possible by mechanical means, e.g. by ripping with large bulldozer plant or by rock-breakers if only isolated strata of rock are encountered.
Drilling for blasting holes will be done on a grid spacing determined by the nature of the rock exposed and the charge load of dynamite will then be determined accordingly.

In the case of Redhouse Chelsea Arterial a trial blast section will be specified in order to determine the appropriate charges to be used. In all cases time delay charges will be utilised which will set off the charges progressively thus reducing both shock and sound to the intensity of the single charge but over a longer period.
Prior to blasting the area will be covered with suitable soil material to a depth of about 1m which will effectively absorb sound and also reduce shock.

During the trial blast and also on all subsequent blasts a seismograph will be at a predetermined distance from the blast area to determine the intensity of the shockwave generated and blasting procedures will be adjusted accordingly.

Using the above techniques blasting can be carried out with safety up to a distance of 2m from any structure and surrounding the in-situ materials will not affected at all.

5.2.2 For Services Trenches

If rock is expected to be encountered in the trenches, blasting will be done by drilling blast holes from the surface to the required trench depth. A log is kept of depth of rock drilled through and each hole is charged with the correct mass of explosive required to shatter the rock.
With this method the overlying softer cover material deadens the sound, absorbs the shock and prevents rock-fly. Delay blasting will also be utilised.

5.3 SECTIONS OF ROAD REQUIRING BLASTING

5.3.1 Along Section C-E

This section is approximately 250m long and maximum depth of excavation will be approximately 1m, and is situated adjacent to the rocky outcrop. The eastern section of the outcrop will be approximately 5m from the

nearest blasting activities and the centroid of the majority of the outcrop will 50m from the nearest blasting activity. It is possible that no blasting will be undertaken in proximity to the outcrop but this can only be determined during construction.

Blasting along the western road reserve boundary will be undertaken utilising limited blasts. Utilising the blasting methods described above will guarantee that no damage is done to the adjacent rocky outcrop. It is common practise to undertake controlled blasting to within 2m of existing without damage to structures. The nearest buildings to this section of blasting are situated approximately 1000m away.

5.3.2 Along Section F-G; South of Baakens River

Blasting is expected to take place along a length of approximately 220m. A large volume of this excavation will be moved by mechanical means prior to drilling and blasting. The maximum depth of excavation is 4m. Blasting will therefore be carried out an excavated platform below ground level and this will reduce horizontal sound transmission.

Materials expected to be uncounted in these excavations are likely to be Table Mountain sandstone and laterite. Nearest buildings are 300m away from blast area.

5.3.3 Along Section F-G; North of Baakens River

Blasting is expected to take place along the length of approximately 180m with a maximum depth of about 3m. A large volume of material is expected to be removed by mechanical means prior to blasting.

Blasting will only be required in the lower levels of the excavations and horizontal sound transmission will be deflected upwards thus reducing the noise level.

Certain volumes of builders rubble will be encountered along the top layers of the excavation which will otherwise will be mainly in Table Mountain sandstone. Nearest buildings are 70m away from blast area.

5.4 CONCLUSION

The blasting techniques which will be undertaken during Redhouse Chelsea Road construction will ensure that no damage will occur to buildings, or other surrounding rocky outcrops or other environmentally sensitive areas. Noise levels will also be kept to a minimum.

6 40m ROAD RESERVE CONFIRMATION

Refer to typical cross sections shown on Drawing No.: J00488-00-10-701-P-00 (Annexure A). Refer to Fig 8.

The 40m wide road reserve will cater for the ultimate six lane scheme. The attached bridge and road cross section drawings and approvals further illustrate this point.

Refer to Annexure C for approvals.

7 BRIDGE OR CULVERT STRUCTURES

Refer to section 1.2 above.

Refer to Fig 11, 12 and 13. Also refer to Dwg. No.: J00488-00-11-2004 and 4002 on Annexure A.

8 REDHOUSE CHELSEA ARTERIAL: BRIEF REPORT ON ADEQUACY ROAD DRAINAGE

The stormwater run-off from the Redhouse Chelsea Road will drain to two watercourses as follows:

8.1 Section of Road: Walker Drive Intersection to N2 Overpass (Section C-E) Refer Drawing J00488-00-10-002-D-00 Annexure A

Stormwater from this section will discharge directly into stormwater attenuation pond P12 and will then enter the northern watercourse under controlled conditions through small diameter outlet pipes. Velocity breakers will be provided at these outlets to prevent scour. This pond will be constructed as part of the Redhouse Chelsea Arterial.

This section of road is approximately 700m long and a stormwater pipeline will be provided along the eastern verge of the road. This pipeline has been designed to accommodate the stormwater from the road itself and also a certain amount of stormwater from the eastern section of the mall. The stormwater will be picked-up by side-inlet catchpits spaced at approximately 50m intervals along the road.

8.3 Section of Road: N2 Overpass to Cape Road (Section E-F and F-G)

Refer to Annexure A Dwg.No.s.: J00488-00-10-003-D-00, J00488-00-10-004-D-00 and J00488-00-10-005-00

Stormwater from this section will discharge directly into the Baakens River from the high point of the N2 overpass bridge. The road will drain northwards for a distance of approximately 560m the Baakens River. Approximately half of this road will be in fill and half will be in cut. In the fill sections a stormwater pipeline will be provided along the length of the road with side inlet catchpits. When in cut side drains will also be provided to accommodate run-off from the embankments and adjacent areas external to the road reserve.

From Cape Road the road will drain southwards the Baakens River and most of the length of this road will be in cut where both a longitudinal drain with catchpits will be provided together with a side drains.

Provision will also be made along all embankments and cut sections to accommodate the natural flow of run-off from the surrounding areas.

8.3 Conclusion

Stormwater from southern section of the Redhouse Chelsea Arterial will be accommodated into the Bay West City stormwater system. Pond 12 will be constructed as part of Redhouse Chelsea Arterial contract.

The section north of the overpass will drain to the Baakens River and an adequately designed system constructed. The stormwater run-off flows are not significantly large and normal road drainage infrastructure is appropriate.

Embankment protection will also be provided in both cuts and fills and through drainage under the road embankments have been included where necessary.