P WMA 12/T30/00/5212/8

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

DIRECTORATE: OPTIONS ANALYSIS

FEASIBILITY STUDY FOR THE MZIMVUBU WATER PROJECT

LAND MATTERS

OCTOBER 2014

FEASIBILITY STUDY FOR THE MZIMVUBU WATER PROJECT APPROVAL

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LIST OF REPORTS

REPORT TITLE	DWS REPORT NUMBER
Inception Report	P WMA 12/T30/00/5212/1
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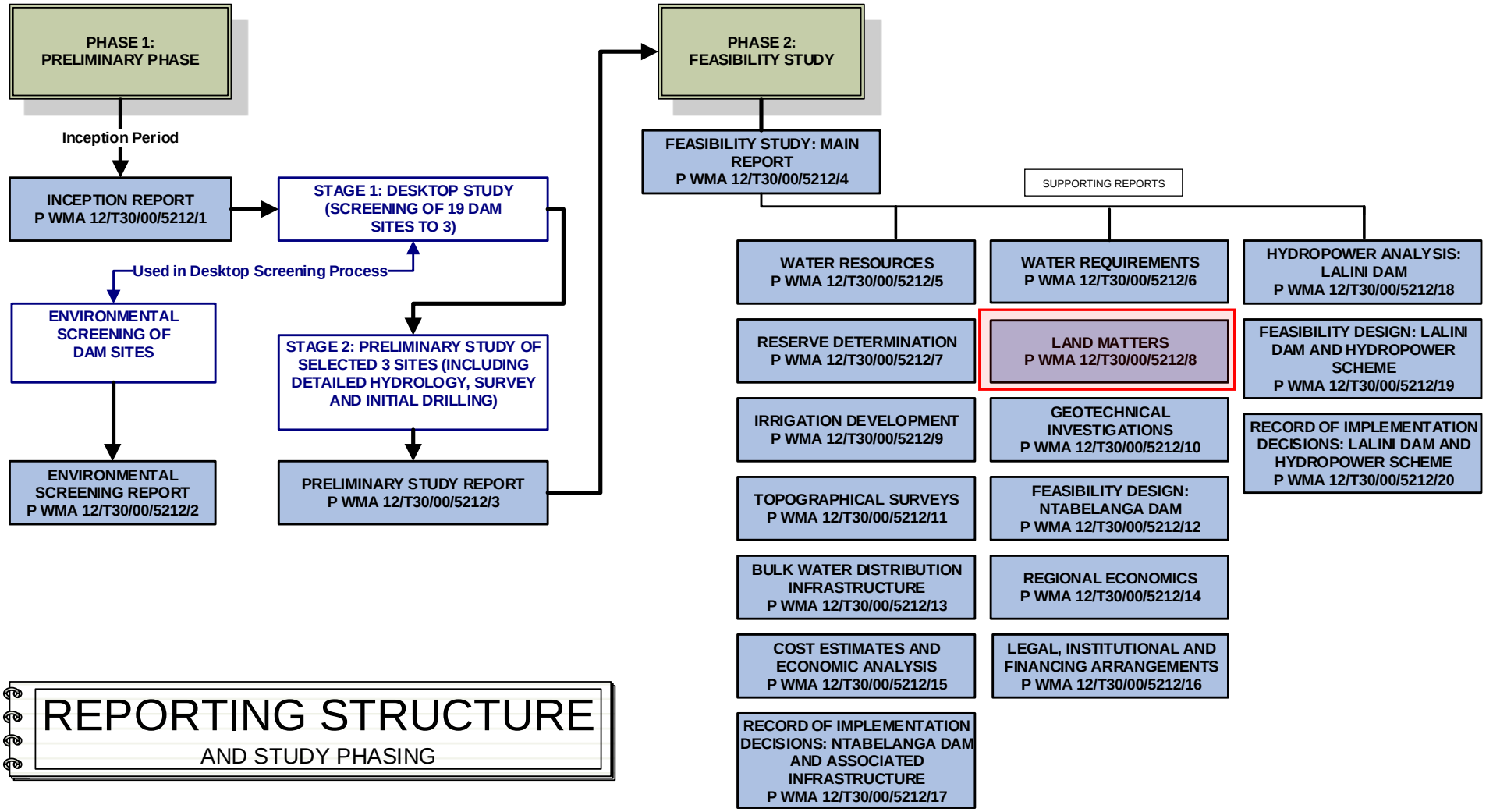

REPORTING STRUCTURE
AND STUDY PHASING

REFERENCE

This report is to be referred to in bibliographies as:

Department of Water and Sanitation, South Africa (2014). ***Feasibility Study for the Mzimvubu Water Project: Land Matters***

DWS Report No: P WMA 12/T30/00/5212/8

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Note on Departmental Name Change:
In 2014, the Department of Water Affairs changed its name to the Department of Water and Sanitation, which happened during the course of this study. In some cases this was after some of the study reports had been finalized. The reader should therefore kindly note that references to the Department of Water Affairs and the Department of Water and Sanitation herein should be considered to be one and the same.

Note on Spelling of Laleni:
The settlement named Laleni on maps issued by the Surveyor General is locally known as Lalini and both names therefore refer to the same settlement.

EXECUTIVE SUMMARY

INTRODUCTION

Following the completion of the above feasibility study stages it was agreed that the sizing and modus operandi of the Ntabelanga Dam and its associated works would take into account its multi-purpose role, namely:

i) to supply potable water to some 726 616 people and other water consumers in the region;
ii) to supply raw water for irrigation of some 2 868 ha of high potential agricultural land;
iii) to generate hydropower locally at the dam wall to reduce the cost of energy consumption when pumping water;
iv) to provide sufficient flow of water downstream of the Ntabelanga Dam to meet environmental water requirements for an ecological Class C; and
v) to provide additional balancing storage volume and consistent downstream flow releases to enable a second, smaller dam at Lalini (located on the Tsitsa River some 3.5 km above the Tsitsa Falls) to generate significant hydropower for supply into the national grid.

The suite of study reports describe the development of solutions for these multi-purposes, and the resulting project infrastructure, which comprises the following:

- *A new dam on the Tsitsa River at Ntabelanga, with capacity to reliably supply the raw and potable water requirements for i) and ii) above;*
- *A water treatment works at the Ntabelanga dam to supply the potable water requirements;*
- *Primary and secondary bulk water distribution systems the deliver potable water to the whole supply area. Tertiary distribution systems to the consumers will be implemented by the District Municipalities;*
- *A bulk raw water distribution system to supply irrigation water to some 2 868 ha of high potential land; and*
- *A mini hydropower plant at Ntabelanga Dam to generate up to 5 MW of power.*

The Ntabelanga scheme is also expected to work conjunctively with a second hydropower scheme at the proposed Lalini Dam, which is located on the same river and downstream of the Ntabelanga Dam, and which could produce an average of 23 MW of power on a continuous basis.

PURPOSE OF REPORT

The construction and operation of the proposed Ntabelanga Dam, water treatment works, bulk potable and raw water distribution systems, and its hydropower scheme infrastructure, as well as the Lalini Dam and its hydropower scheme, will impact on the existing land use in this region.

The Terms of Reference for the Land Matters task of the Feasibility Study were as follows:

- *Provide suggested temporary and permanent servitude routes, with lengths and widths and duration of temporary servitudes, for all roadways needed to construct and operate the scheme;*
- *Provide all pipeline and canal routes and recommend whether the areas should be acquiredby the developer or whether servitudes should be arranged;*
- *Set out proposed area of buying out for dam wall and appurtenant structures and dam basin;*

- *Set out proposed sub-divisions of farms of existing commercial farmers who are prepared to sub-divide so that emerging commercial or small-scale farmers can settle on land and start farming operations;*
- *Set out and suggest a means of allocating farms to emerging farmers and suggest what sort of land tenure they should hold, for what period, and at what cost to the prospective emerging farmer; and*
- *Determine cost estimates for the servitudes and land to be acquired for the above purposes.*

The independent EIA study for the conjunctive Ntabelanga - Lalini scheme has undertaken a more detailed analysis of the land issues, including relocation, land expropriation, establishment of temporary and permanent servitudes and other mitigation activities. Therefore whilst this report describes these land matters at a feasibility level of detail, the DWS EIA Report No. P WMA 12/T30/00/5314/1 to 17 should be consulted for more detail.

Once the project moves into the detailed design and implementation stage, it is probable that some of the feasibility designs will be revised which will require changes in the boundaries and extents of the expropriation and servitudes described herein.

The Feasibility Study findings and recommendations are summarised in the Main Report No. P WMA 12/T30/00/5212/4 and its accompanying Book of Drawings.

IMPACTS ON LAND USERS

The new infrastructure that will be built such as the dam, pipelines, waterworks, pump stations, hydroelectric plants and any associated infrastructure will traverse both urban and rural areas resulting in unavoidable impacts to both the environment and communities.

Part of this land will need to be permanently expropriated in order to expand the service provision of bulk water and to generate hydropower. This may negatively impact on the current land use and business activities resulting in the need for compensation of the current land owner/user.

Currently there is no national resettlement and compensation policy in South Africa. The Expropriation Act (63 of 75) provides for the expropriation of land for public use, and the compensation thereof, but this relates to private land only. State-owned land is a complex issue that is not covered, and, instead international and national best practice should guide the process. The relevant legal framework is discussed in the report.

Much of the land in the affected project area is State-owned land managed through the tribal authorities, and as a result the process is not governed by law, but by best practice. The process tends to be drawn out, and complex. Outside of the community negotiations, and if the cadastral information is available for all the affected land, the process can take up to 18 months for acquiring the land.

ROADWAYS TO CONSTRUCT AND OPERATE THE SCHEMES

Some major road works will be required for the construction and long-term operation of the schemes.

In general, road designs, realignments and upgrades have been designed in accordance with the South African Technical Recommendation for Highways (TRH) standards for such work as detailed in the following documents;

1. *TRH 4 : Structural design of Flexible Pavements*
2. *TRH 17: Geometric Design of Rural Roads*
3. *TRH 20: The Structural Design Construction and Rehabilitation of Unpaved Roads*

ROADS AND BRIDGES AT NTABELANGA DAM AND ASSOCIATED WORKS

The local gravel roads on the north and south banks of the Ntabelanga basin (shown in purple on Figure 1) are existing low quality access roads to the local settlements, and are normally affected by inclement weather. Some sections of the existing tracks will be inundated by the reservoir water level and will need to be realigned. The main bridge across the river linking the two sides will also be inundated and a new bridge will be constructed just downstream of the dam wall, to restore this main crossing route.

All of these tracks and drainage structures will be upgraded to all-weather gravel roads so that the affected settlements will have improved transport links which are unaffected by the raised water level. These particular upgrades will total some 32 km of road, which will have a servitude width of some 10 m. As all of these improvements will be aligned along existing tracks, or on currently unoccupied areas, this should have only limited or no resettlement or compensation implications.

The two existing gravel access roads shown in yellow and green are currently low quality roads albeit wider than the above existing gravel roads. It is proposed that both these roads are upgraded to secondary surfaced standards, in order to provide all-weather access to heavy vehicles during construction, as well as leaving behind upgraded transport routes to the larger centres of Maclear, Tsolo, and beyond, for those most affected by the project. These two route upgrades will also contribute to improvement of the economy in the area by improving speed and ease of access for business and private travel as well as opening up tourism in the area. Better road quality also reduces wear, tear and maintenance to vehicles using the road.

These upgrades will be to a higher standard than the other roads above, and will be two lane carriageways (one each way) with and servitude width of between 20 m and 30 m (depending on terrain). The Maclear route would be some 18.9 km long and the Tsolo link some 12.9 km long. Once again, these improvements will be primarily aligned along existing routes, and this should have only limited or no resettlement or compensation implications.

Figure 2 shows new roads that will have to be constructed at the dam wall itself, and its appurtenant outlet works, hydropower plant, water treatment works and offices, staff housing, and pumping station site.

A new dam site access road will be required which will connect with the above upgraded road in from the Tsolo direction, and will run through the new operational works as shown. This road will have service roads branching off it to the temporary water works, the staff housing, the hydropower plant, the water and wastewater treatment plants, the pumping stations, accesses to the dam wall and outlet works, and then across the new river bridge to link with the upgraded existing roads on the north bank of the scheme.

The length of this new road will be approximately 5 km, and will have a servitude width of approximately 20 m. The existing land use features some subsistence agriculture which fields are fenced, but no habitable structures.

The site (as bounded in light blue) as a whole would need to be expropriated in its entirety, and the boundaries of this land required are given below. This will include a site for a proposed visitor's centre, which will required resettlement involving two or three existing dwellings that can be seen on the figure.

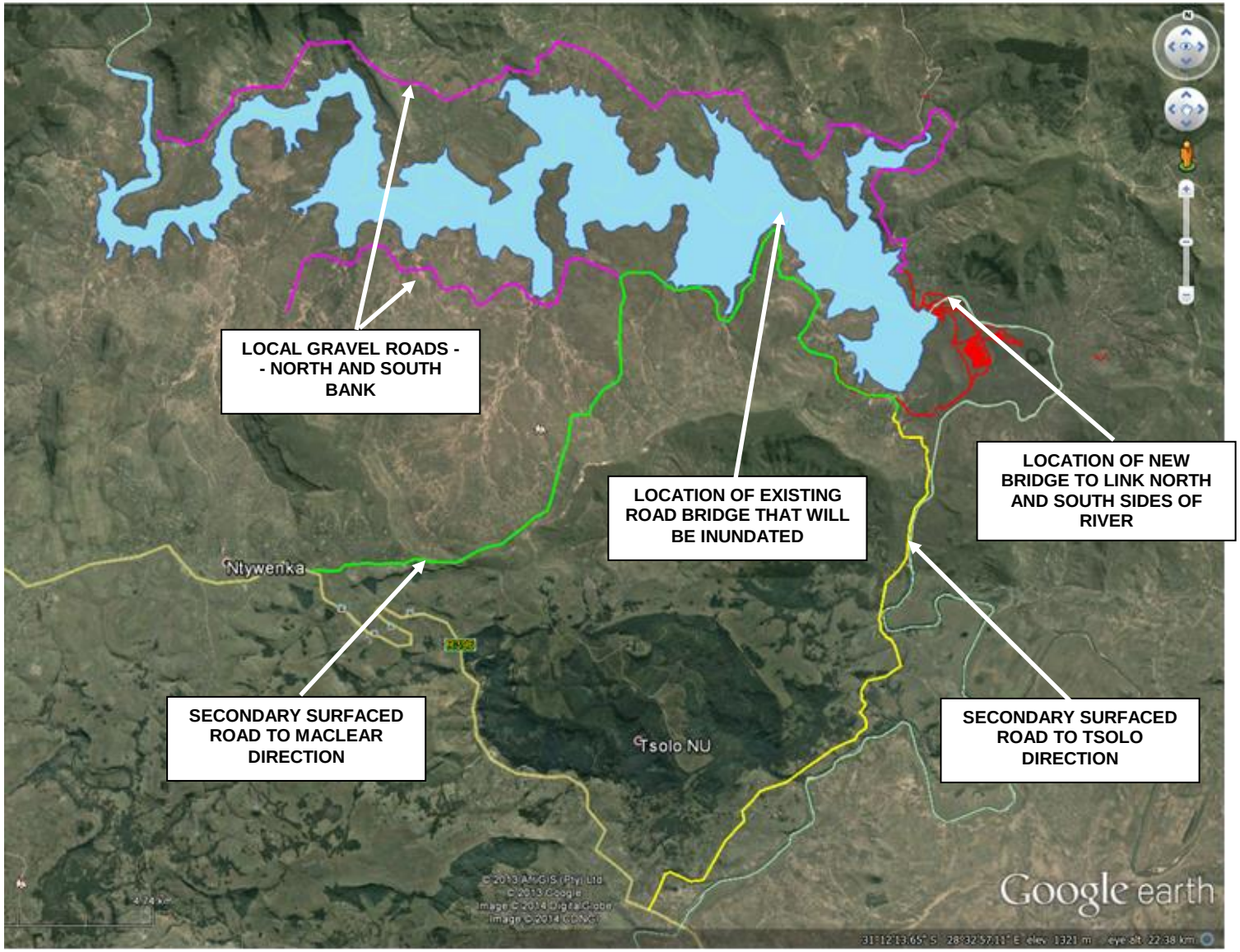
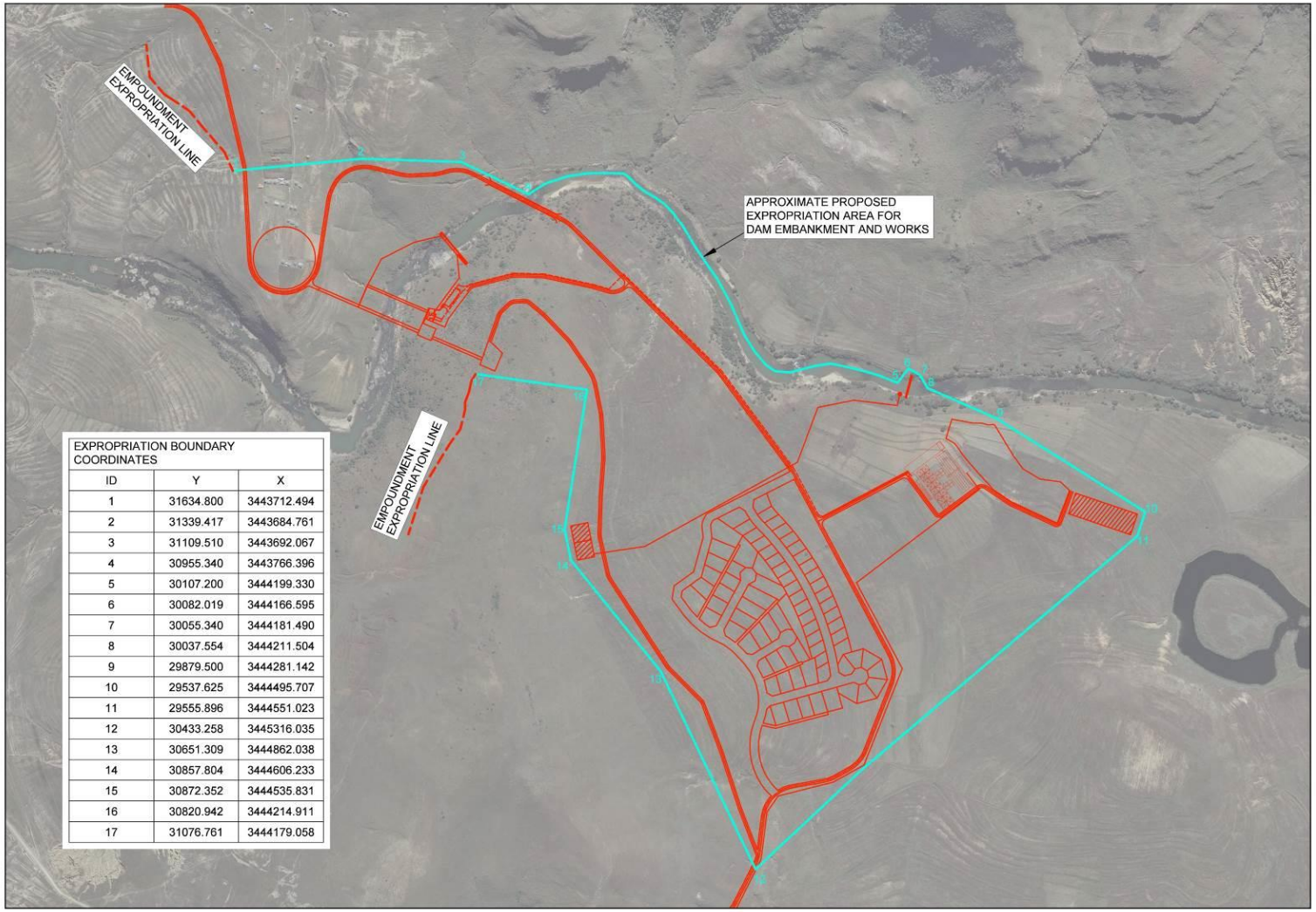


Figure 1: Roadways to be Permanently Upgraded Before and During Ntabelanga Scheme Construction



EXPROPRIATION BOUNDARY COORDINATES

ID	Y	X
1	31634.800	3443712.494
2	31339.417	3443684.761
3	31109.510	3443692.067
4	30955.340	3443766.396
5	30107.200	3444199.330
6	30082.019	3444166.595
7	30055.340	3444181.490
8	30037.554	3444211.504
9	29879.500	3444281.142
10	29537.625	3444495.707
11	29555.896	3444551.023
12	30433.258	3445316.035
13	30651.309	3444862.038
14	30857.804	3444606.233
15	30872.352	3444535.831
16	30820.942	3444214.911
17	31076.761	3444179.058

Figure 2: Expropriation Area (light blue) and Boundary Co-ordinates for Ntabelanga Dam Wall and Appurtenant Works

ROADS AND BRIDGES AT LALINI DAM AND ASSOCIATED WORKS

Main Access Road

Figure 3 shows the existing District Road DR 08170 linking the N2 national road near to the Tsolo to Maclear road junction with the villages of Lotana and Lalini in the vicinity of the dam and hydropower infrastructure locations.

This existing gravel road also services the settlements of Madadeni, Gwali, Upper Lotana, Cingcosdwadeni, Ngcolorha, Manzimabi, Mahoyana, and Mbutho.

This 17.4 km "Main Access Road" provides the best access to the dam and tunnel construction sites from the main road and does not have any major bridge crossings to contend with. Some donga crossing would need to be widened and upgraded to carry heavy loads.

In addition to construction traffic, this road would be the main route used for the delivery of the heavy electromechanical components of the HEP, which will require abnormal load vehicles able to transport loads of up to 100 tonnes.

Thus it is proposed that this road be upgraded geometrically and structurally to cater for heavy construction traffic and abnormal vehicles that are anticipated to be used in the construction activities. This district road would, however, remain a gravel surfaced road. Provision has been made in the costing to refurbish the upper base courses to a high standard gravel road once construction has been completed in order to ensure that the road is handed back to the Provincial Roads Department in an acceptable state.

From this main access road, several new roads will need to be constructed for both construction and permanent access purposes. These are shown on Figure 4.

Dam and Pipeline Access Roads

The 4.2 km roads shown in blue will be new roads. These roads will be initially established as gravel haul roads for use by normal construction vehicles. However as this will be the main permanent access route to the Lalini Dam and mini-hydropower plant, the road would be upgraded to a double sealed surface, once main construction activities have ceased.

Tunnel Entrance Portal Access Road

This 1.3 km road shown in dark green will be a new road to the upper entrance to the tunnel. The road would be constructed as a gravel haul road for use by normal construction vehicles. It will mainly be used during the construction of the tunnel portal section, and during the delivery and installation of the pipeline section within the tunnel. As frequent access to the tunnel in the future would not be required, this could remain a gravel road.

However, as this section of road is relatively short it is recommended that this also be upgraded to a double sealed surface, once main construction activities have ceased.

Access to the Main HEP and Tunnel Exit Portal

The access road to the main HEP building and outlet portal of the tunnel is the highest priority road. This road has exacting requirements in terms of gradients and load carrying capacity, and yet has to traverse the most difficult terrain on the whole project.

This road will be used as the main construction haul link for the tunnel and HEP building construction. It will also be the route along which the abnormal loads (greater than 70 tons) travel when delivering the hydropower electro-mechanical and transformer components, and for servicing and replacement of such plant in the future.

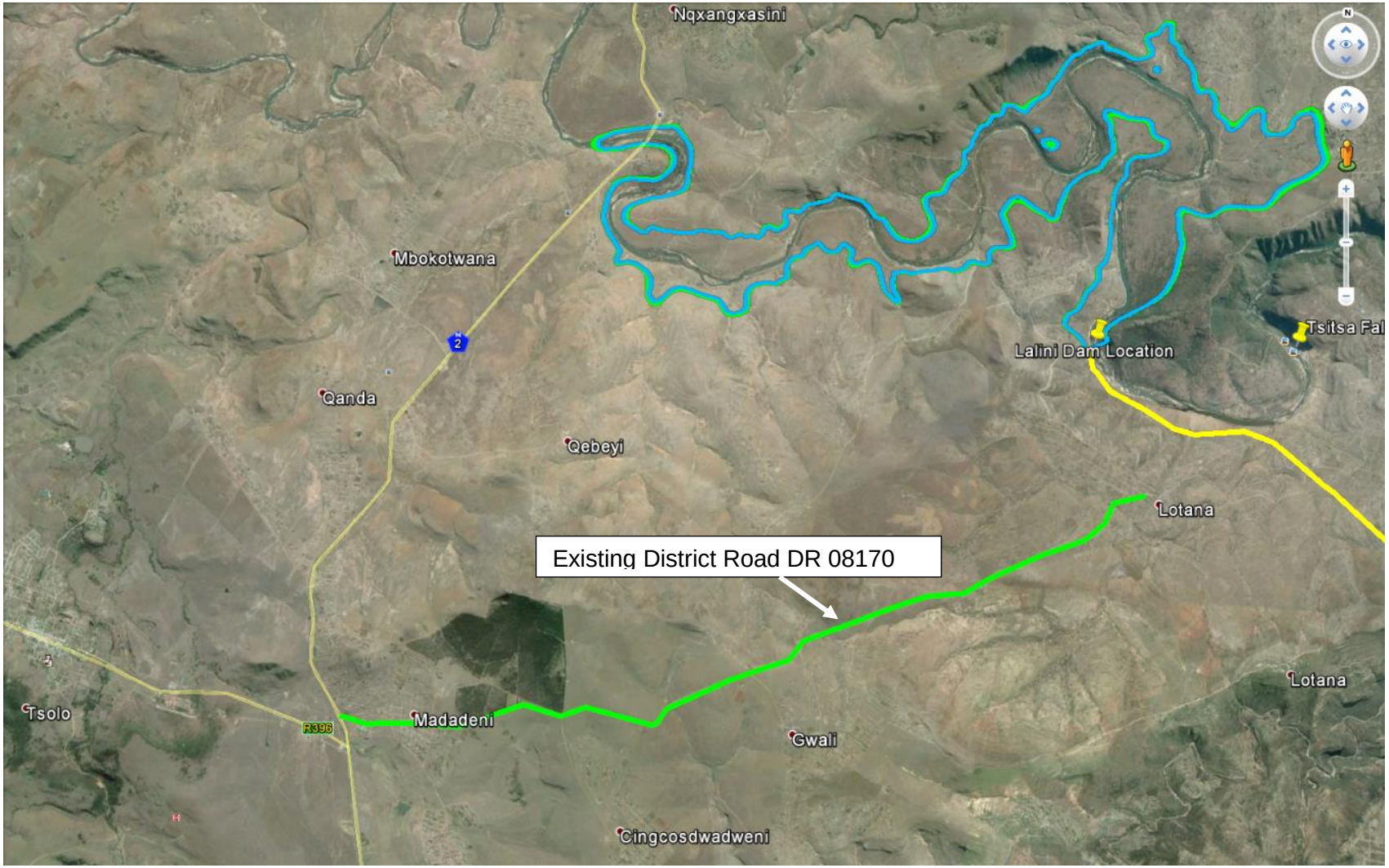


Figure 3: Main Access Road to Lalini Infrastructure Construction Locations

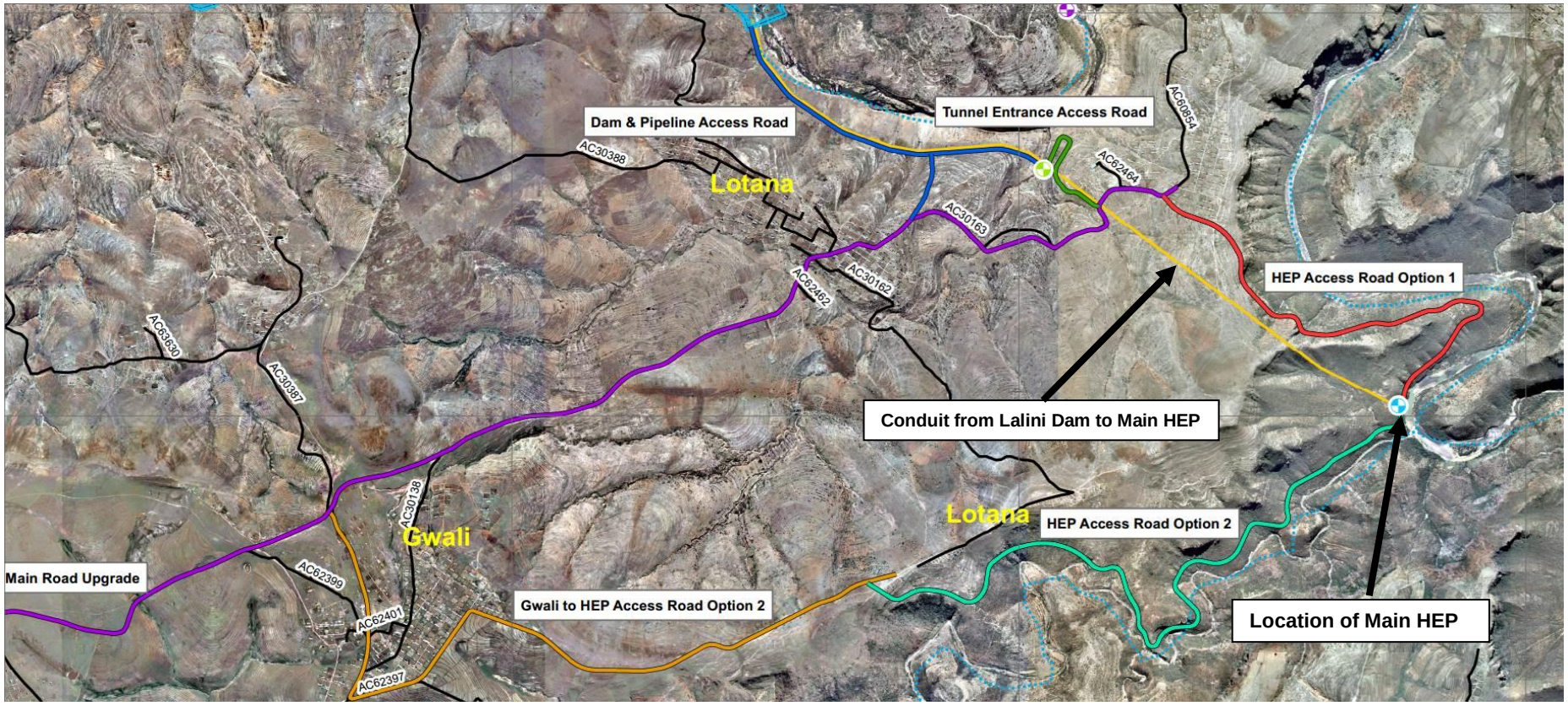


Figure 4: Main Access Road and Other Roads to Lalini Scheme Construction Sites

Two options were investigated, and these are shown as HEP Access Road Option 1 (red) and HEP Access Road Option 2 (light green) in Figure 4.

Option 1 provides serious challenges in that it requires large cuts and fills to be constructed at significant costs. Therefore Option 2 was also investigated. Option 2 follows the valley wall of a south west tributary of the Tsitsa River flowing from Gwali to the HEP location.

The geometric design criteria for Option 2 were the same as for Option 1, and it was easier to achieve vertical alignment grades ranging between 1.5% and 10%, with the requirement of retaining walls reduced proportionally to that of Option 1.

Whilst this access road provides more suitable operational conditions for the abnormal vehicles, it would be, at 8.1 km long, significantly more expensive to construct than Option 1, which is 5.3 km long.

In addition, Option 2 also requires the upgrading of a further 8.2 km of the existing roads from the main access road at Gwali to the start of the new Option 2 HEP Access Road. Technically Option 2 will be easier to construct, but it will be significantly longer and more expensive, and will also impact a larger area of sensitive vegetation.

Whilst option 1 is the recommendation from the feasibility study, both options should be revisited at detailed design stage in the light of further geotechnical investigations, detailed Environmental Impact studies and more detailed technical and financial optimisation.

Gwali to HEP Option 2 Existing Road Upgrade
This 8.2 km long section of road would need to be upgraded if Option 2 were to be adopted. The geometric standards and layer works would be the same as for the Main Access Road.

At this feasibility design level of study, Option 1 has been adopted as being the preferred option, but it is recommended that further detailed investigation and optimisation of the HEP Access Road route be undertaken at the detailed design stage. This optimisation should take all relevant factors into consideration, such as technical aspects, construction difficulty, cost and permanent impact on the environment.

Roads and Bridges: Upgrades and Realignment
Other major road works will be required to undertake the realignment of infrastructure that will become inundated once the Lalini Dam has been commissioned. The layouts of these roads are shown on Figure 5.

Mtshazi Main Road
The impoundment of Lalini Dam will inundate some existing roads as well as drowning an existing river crossing vehicular bridge. The latter connects the village of Lalini with the settlements of Mtshazi, Shawbury, and the main N2 national road to Qumbu and Mthatha.

District Road DR 08167 shown in pink is a tarred road, is the main access from these villages to the N2, and is also a main tourist route for visitors to the Thina and Tsitsa Falls.

This 10.4 km road is currently in a pot-holed state, and some 40% of the existing route will need to be realigned to ensure that it passes outside of the future inundated area.

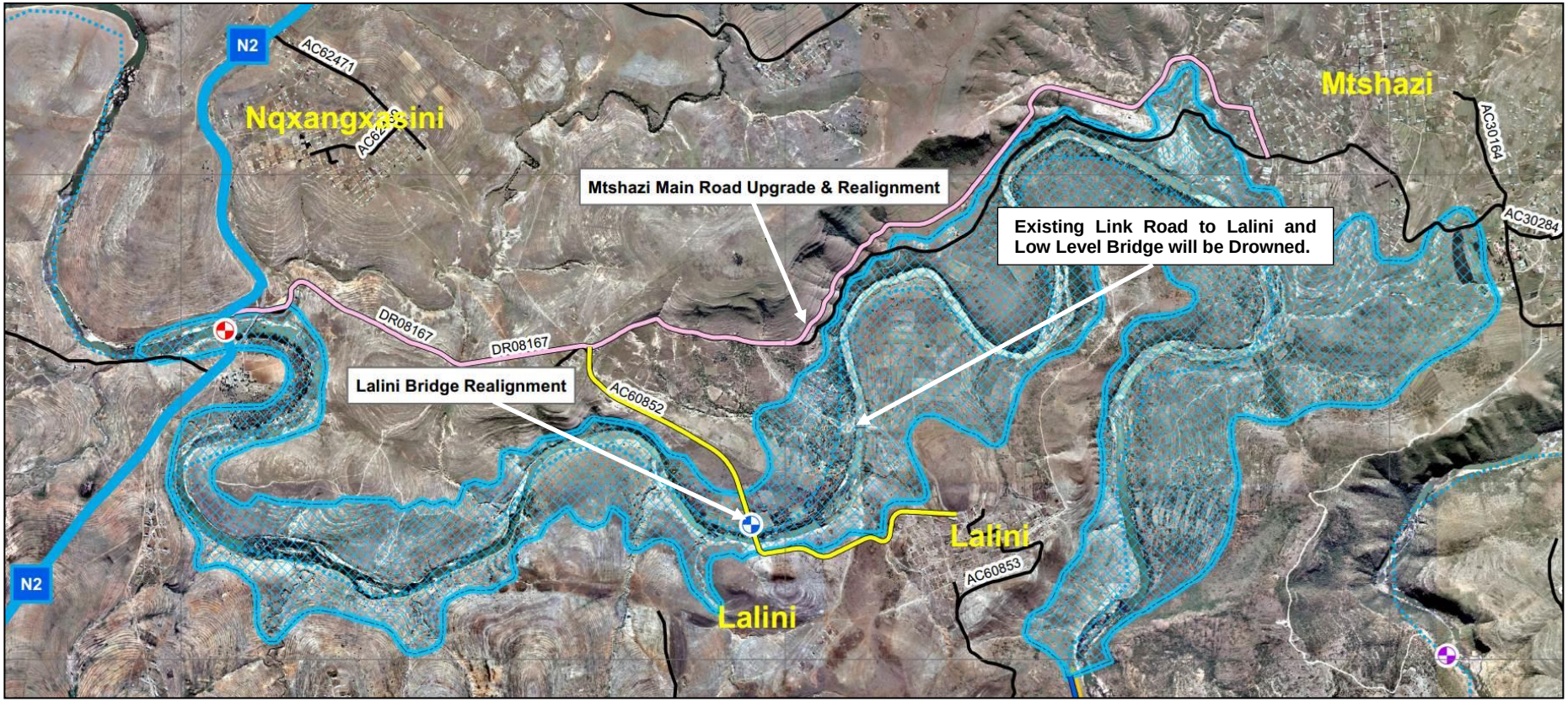


Figure 5: Roads and Bridges to be Permanently Upgraded and Realigned Before and During Lalini Works Construction

Lalini Bridge Relocation

The existing link road from the above Mtshazi road to Lalini village crosses the Tsitsa River via a low level single track vehicular bridge, which was constructed by SANRAL. This carries both vehicular and pedestrian traffic and is the main route for Lalini residents to travel to Mtshazi, Shawbury and the main N2 national road.

This existing low level bridge and its section of road will be permanently drowned by the impoundment of Lalini Dam.

Alternative routes were sought to replace this route, which included a new road from Lalini along the south bank of the river and connecting to the N2. Unfortunately this would increase the travelling distance for journeys from Lalini to Mtshazi and Shawbury by 15 km. This would be highly unacceptable for pedestrians which include children going to school. If this option were adopted, then a high level footbridge would also be required to cater for the pedestrian users. This option would however still not be an acceptable solution as far as additional travel distance and time required by the vehicular road users.

The EIA study team were consulted and it was suggested that in such circumstances the solution should follow the principles of a "like-for-like" replacement. In order to meet the SANRAL standards, the bridge deck soffit would be required to be at an elevation providing 1.4 m freeboard above the 1 in 100 year flood level. This results in a bridge deck length of 450 m.

The alignment of the new link road and bridge is shown in yellow on Figure 5. A general arrangement of the proposed bridge is given in Figure 6.

A multi-purpose bridge was therefore designed which has a single track vehicular way and a barrier-protected pedestrian walkway. Given the long length of the bridge, the vehicular carriageway has two widened waiting bays for vehicles to pass each other. The bridge must meet SANRAL design standards.

The 4.4 km new link road connecting the bridge to the existing Mtshazi road and to the existing main road into Lalini, would be designed to the same standards and have the same layer works as for the district road DR 08167 above, and would therefore be a tarred surface road.

ROAD SERVITUDES AT NTABELANGA AND LALINI SCHEMES

Many of the works to be undertaken would be upgrades to existing road alignments for which servitudes have already been allocated. Where new roads or road realignments are required, the servitude width will be between 20 and 30 m depending upon the standard of the road and the terrain through which it is passing. This will be confirmed during the detailed design stage of implementation.

NTABELANGA AND LALINI DAM WALLS AND APPURTENANT STRUCTURES

The Ntabelanga Dam wall and appurtenant structures are those that are shown on Figure 2. This also includes the area of land that will be required to accommodate the proposed visitor's centre on the left flank of the dam wall. Apart from the visitor's centre, no habitable structures or buildings are present, but there is currently some crop growing activity and some fencing in the area where the access road and housing would be located. All of this land would need to be expropriated as Government Water Works.

The Lalini Dam wall and appurtenant structures are those that are shown on Figure 7. This also includes the area of land that will be required to accommodate the proposed visitor's centre on the right flank of the dam wall and the operations offices and accommodation village. Whilst one or two dwellings the lie close to the accommodation village might be affected, no other habitable structures or buildings are present, and there is apparently no crop growing activity within the works area boundary. All of this land would need to be expropriated as Government Water Works.

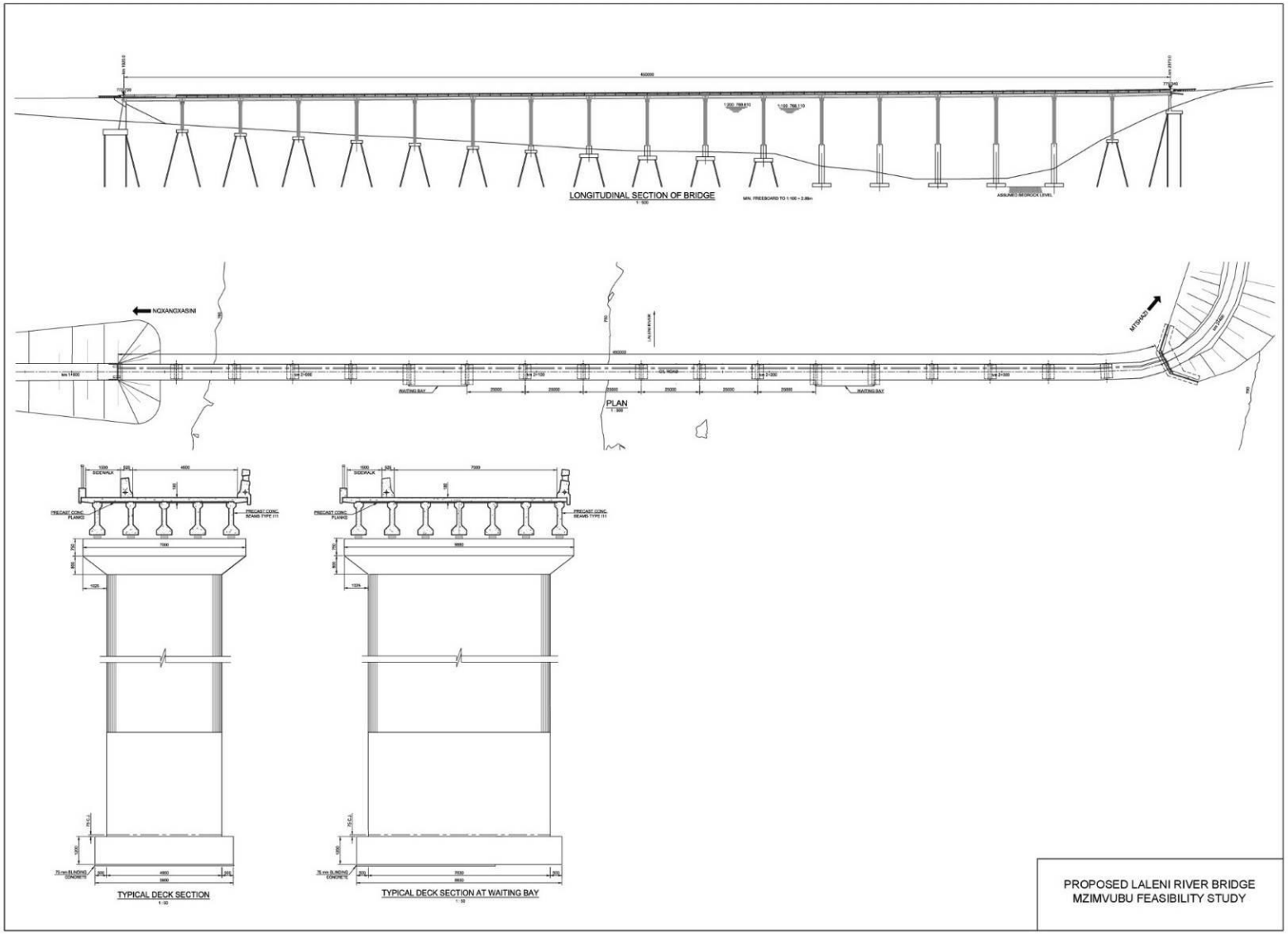
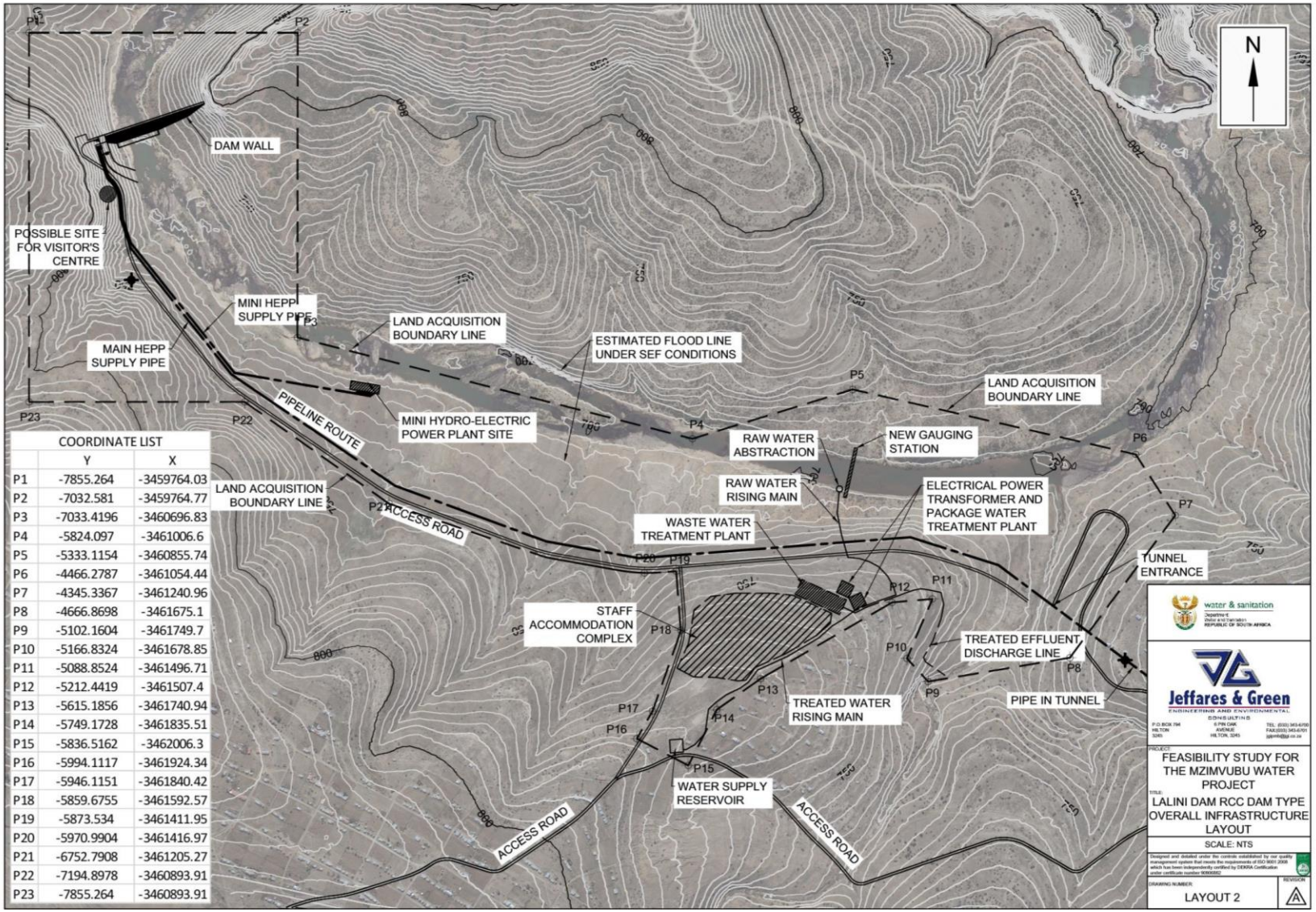


Figure 6: Proposed Lalini Bridge over Inundated River Section



COORDINATE LIST		
	Y	X
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P2	-7032.581	-3459764.77
P3	-7033.4196	-3460696.83
P4	-5824.097	-3461006.6
P5	-5333.1154	-3460855.74
P6	-4466.2787	-3461054.44
P7	-4345.3367	-3461240.96
P8	-4666.8698	-3461675.1
P9	-5102.1604	-3461749.7
P10	-5166.8324	-3461678.85
P11	-5088.8524	-3461496.71
P12	-5212.4419	-3461507.4
P13	-5615.1856	-3461740.94
P14	-5749.1728	-3461835.51
P15	-5836.5162	-3462006.3
P16	-5994.1117	-3461924.34
P17	-5946.1151	-3461840.42
P18	-5859.6755	-3461592.57
P19	-5873.534	-3461411.95
P20	-5970.9904	-3461416.97
P21	-6752.7908	-3461205.27
P22	-7194.8978	-3460893.91
P23	-7855.264	-3460893.91

Figure 7: Land Acquisition for Lalini Dam and Associated Infrastructure

LALINI MAIN HYDROPOWER PLANT

The main hydropower plant (HEP) at Lalini will be located in the Tsitsa River valley downstream of the Tsitsa Falls as shown on Figure 4. This will be serviced from the access road described above, and will initially comprise a platform cut into the hillside to form a construction working area at the tunnel exit portal.

This platform will also be excavated deeper to construct the hydroelectric plant building and to lay the steel conduit from it exit point at the tunnel portal into the HEP building. Figure 8 shows the layout of these works and the co-ordinates of the land that would need to be expropriated.

NTABELANGA PIPELINE ROUTES, BULK STORAGE AND PUMPING STATION SITES

The primary and secondary bulk potable water distribution system including pipelines, pumping stations and storage reservoirs would be implemented under this DWS project. Preliminary routes of these pipelines are shown in Figure 9. Tertiary pipelines which would supply water from the primary and secondary system to the consumers would be implemented by the District Municipalities and be subject to a separate consideration of land matters.

All of these routes are planned at a feasibility study level of detail only, and further detailed planning and will be further reviewed by others during the detailed design stage. Some of the secondary pipelines have recently been constructed and EIA and servitude issues are therefore already dealt with[1].

Many of the existing storage sites will need to be expanded in the longer term and this may require permanent land acquisition for the increased site footprint. The new Command Reservoir sites will each required permanent land acquisition as well as servitudes for access roads, to be finalized during the detailed design stages.

On average, these sites will be approximately 80 m x 60 m in extent (i.e. approximately 0.5 ha). Two of these sites will also include new booster pumping stations and will therefore require a larger footprint, say 100 m x 80 m).

Three other small booster pumping stations will also be required, each of which will also require permanent land acquisition, with an average footprint of 40 m x 30 m.

All of the above sites will require low to medium voltage power supplies. The process followed would be to make application to ESKOM for a connection to each site, and ESKOM then undertake the planning and installation process.

ESKOM would therefore deal with land matters and EIA with regard to these power line routings. As is shown on Table 1, some 250 km of pipelines will be constructed, ranging in diameter from 50 to 900 mm. These will be in PVC, HDPE, and steel materials, depending in diameters and pressure classes required. These pipes will normally be laid with a minimum crown cover depth of between 900 and 1 500 mm below existing ground level.

The pipeline routes will also feature other structures such as valve, air valve, and scour valve chambers (normally made of brick, concrete rings, or reinforced concrete), which will protrude above ground surface level when completed and need to be accessible by the operational staff at all times. Most of these pipelines are routed along existing tracks and roads, and can normally be aligned to avoid property, graves and other structures as much as possible, although sometimes conflicts are unavoidable and some relocation or compensation will be required.

[1] *Details can be obtained from the Implementing Agent - Amatola Water, East London*

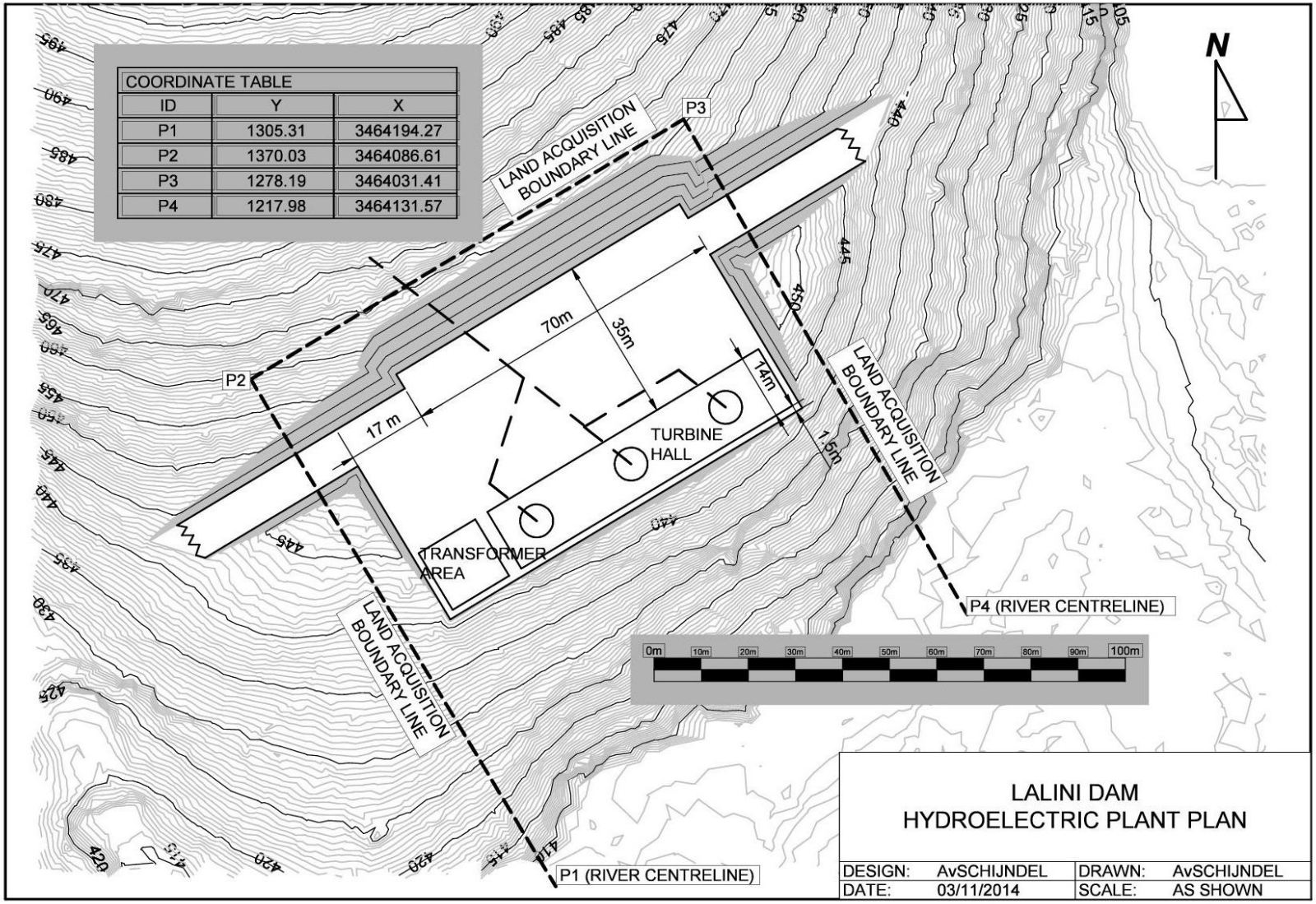

Figure 8: Expropriation Area Boundary for Lalini Main Hydropower Plant and Tunnel Portal

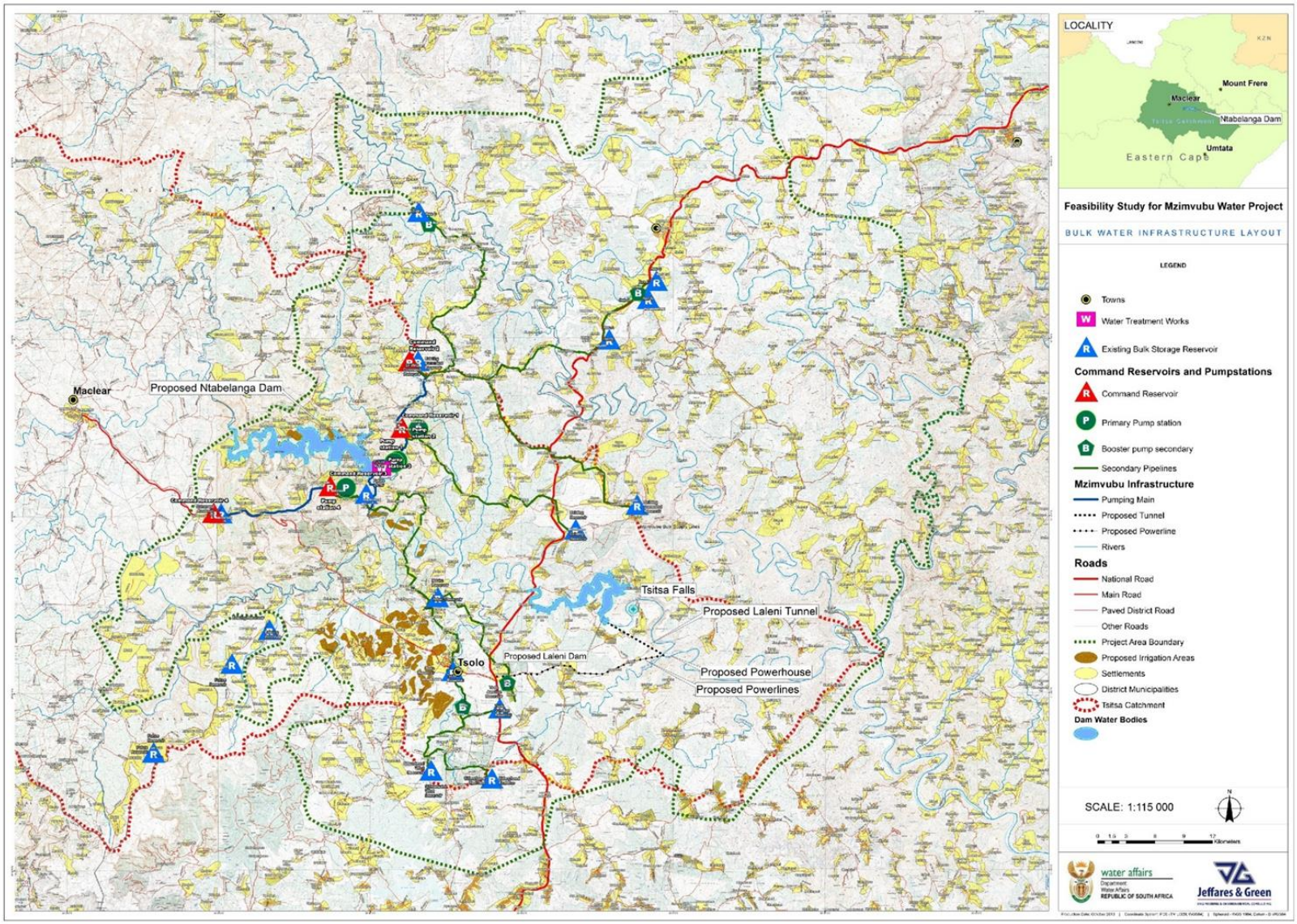

Figure 9: Ntabelanga Primary and Secondary Bulk Potable Water Distribution Pipelines

The pipeline routes will all need a temporary servitude typically of width 20 m during construction, to allow space for the works to take place, and stock-piling of excavated material etc. During the operational phase a permanent servitude of width of between 6 and 10 m would be required (depending on pipeline size and terrain) to allow for operational access to the line at all times.

Where routes unavoidably pass through arable land, permission can often be granted for land-users to continue to grow crops over the alignment, provided deep ploughing or use of heavy plant and equipment is not employed.

It is reiterated that the alignments and operation arrangement of this infrastructure may change during the detailed planning and design stage.

The primary and secondary pipelines will comprise the following:

Table 1: Total Quantities and Sizes of Primary and Secondary Pipelines

Primary and Secondary Bulk Pipelines			
Item	***Description***	***Unit***	***Quantity***
1	*Pipelines – supply, lay, joint, test, disinfect*		
1.1	*Bulk Pipelines*		
1.1.1	*40 HDPE Class 12*	*m*	
1.1.2	*50 HDPE Class 12*	*m*	*34 103*
1.1.3	*63 uPVC Class 12*	*m*	*2 633*
1.1.4	*75 uPVC Class 12*	*m*	*6 725*
1.1.5	*90 uPVC Class 12*	*m*	*86*
1.1.6	*110 uPVC Class 12*	*m*	*8 925*
1.1.7	*160 uPVC Class 12*	*m*	*10 326*
1.1.8	*200 uPVC Class 12*	*m*	*8 742*
1.1.9	*250 uPVC Class 12*	*m*	*12 100*
1.1.10	*315 uPVC Class 12*	*m*	*17 565*
1.1.11	*355 uPVC Class 12*	*m*	*12 085*
1.1.12	*400 uPVC Class 12*	*m*	*28 044*
1.1.13	*450 uPVC Class 12*	*m*	*4 917*
1.1.14	*500 steel*	*m*	*45 437*
1.1.16	*600 steel*	*m*	*29 261*
1.1.17	*700 steel*	*m*	*11 692*
1.1.19	*900 steel*	*m*	*15 691*
		Total	***248 332***

LALINI HYDROPOWER CONDUIT ROUTE AND HYDROELECTRIC PLANT SITE

As shown on Figure 4, the route of the Lalini hydropower water transfer conduit from the dam to the main hydroelectric plant (HEP) initially runs roughly parallel to the Tsitsa river downstream of the dam wall and will be constructed as a 2 500 mm diameter welded steel pipeline laid in an excavated trench with a normal depth of cover to the crown of the pipe of 1 000 mm. This conduit would be twinned from the Lalini Dam outlet works to the mini-hydropower plant, then continue as a single 2 500 mm diameter pipeline to the main HEP, which is some 7.95 km from the Lalini Dam. At a point 3.5 km from the dam, the pipeline enters a tunnel section within which it will be laid to emerge close to the main HEP.

Given the large diameter of this conduit, a temporary servitude of 30 m width would be required during construction, whence a permanent servitude of 10 m would be required. The entrance and exit portals of the tunnel will require significant temporary servitudes for working areas during construction but only limited permanent land expropriation at each location to allow access to the tunnel and its pipeline for maintenance purposes.

DAM BASIN EXPROPRIATION BOUNDARY

Figure 10 and Figure 11 show the probable land expropriation area boundaries for the Ntabelanga and Lalini dam basin areas which will be inundated. This is based upon the greater of the 1 in 100 year flood water level, or 15 m horizontally from the full supply water level. The settlements that might be impacted by this expropriation requirement are indicated on the figures. The co-ordinates of these preliminary expropriation boundaries are given in Appendices A and B.

The expropriation line will need to be reviewed during the detailed design and a survey carried out to install permanent beacons defining the expropriated land. This will involve some "smoothing" of the boundary of the expropriated land into straight lines between beacons, and DWS will acquire that land in terms of the surveyed lines.

Given that this project will impact upon the river and its basin upstream of the dam wall, there will be a need to address the relocation and compensation issues for affected persons living near to, or using land within, the river's riparian zone. Refer to DWS EIA Report Nos. P WMA 12/T30/00/5314/1 to 17

In the case of the dam basins, the impact on those people that will be affected by the permanently raised water level is difficult to accurately quantify for compensation purposes at this feasibility stage. The land in question will need to be valued by a professional valuator, and the affected parties will be compensated in accordance with the valuator's report, in accordance with normal DWS practice.

Whilst land use of the riparian zone would not normally have been permitted, it is probable that no actions would have been taken if people had previously made use of this land, and a precedent would thus have been set. Best practice would typically recommend that affected people should be compensated for the loss of land lying within the current riparian zone, although this is not necessarily compulsory.

In this area, the affected land will have been allocated to a Kgosi, Chief or CPA, and with rural development land, the Chief as well as the affected parties are compensated for different reasons. It will be important to consult with the correct Chief in each area.

As these works are to be Gazetted as Government Water Works, and given the expropriation powers likely to become available to Government as provided for under the Infrastructure Development Bill, there would not be a legal requirement to compensate affected people for the particular usage of riparian land. However, given the emotive nature of resettlement and the potential disagreement and unrest that might be caused by an insensitive consultation and compensation policy, great discretion is recommended in this case

DWS have legal powers to expropriate land, and used both the Water Act and the Constitution in doing so. It is therefore reiterated that it is a legal requirement to compensate all affected parties and this means that different kinds of compensation are often required for different people on the same portion of land.

Provided sufficient cadastral information, etcetera are available, the legally prescribed procedures to be followed in order to acquire portions of such land normally take at least 12 (twelve) to 18 (eighteen) months to get through. The less formalised land allocation and ownership issue that will prevail in this case could easily prolong this acquisition process.

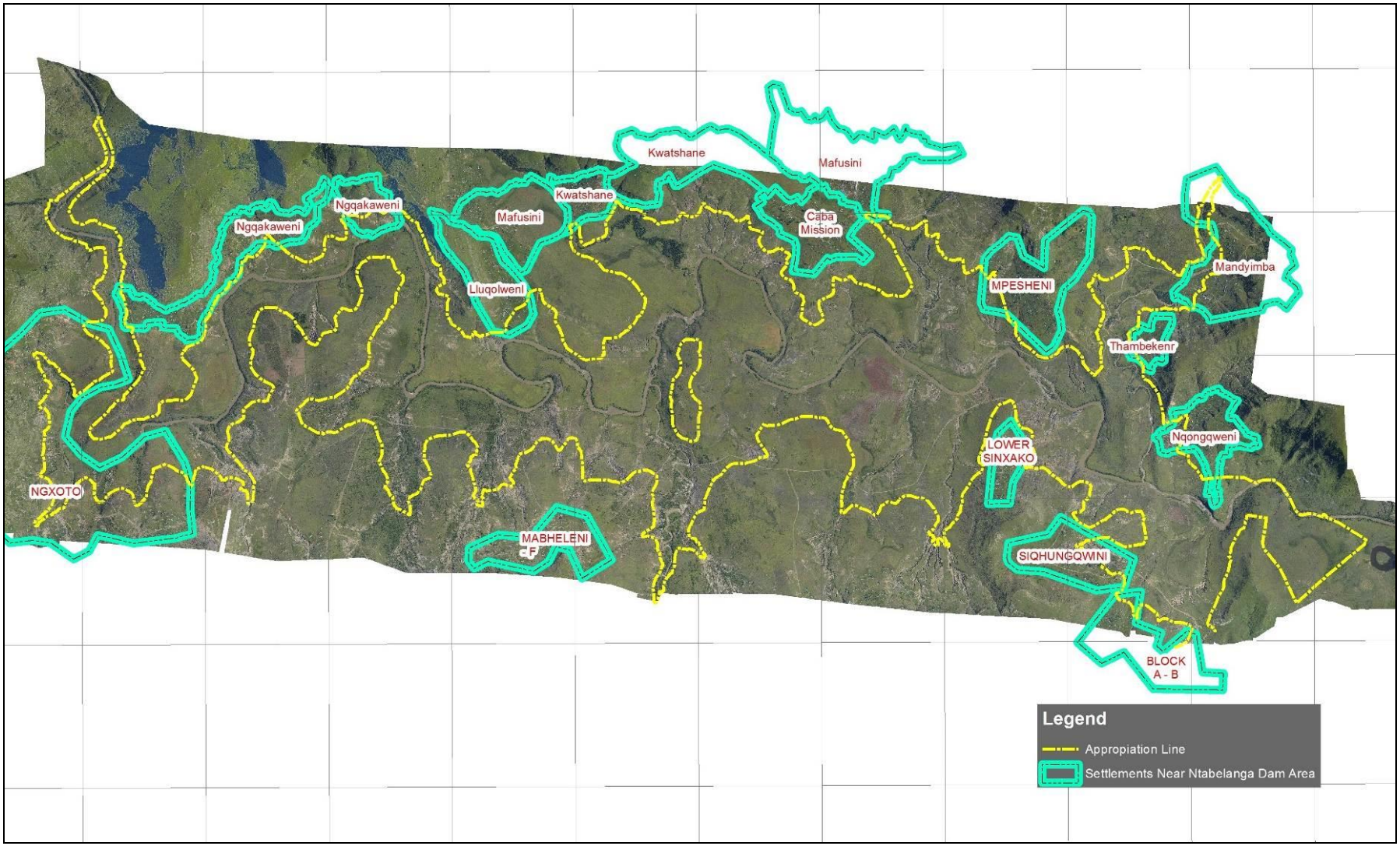

Figure 10: Ntabelanga Dam Basin Preliminary Expropriation Area

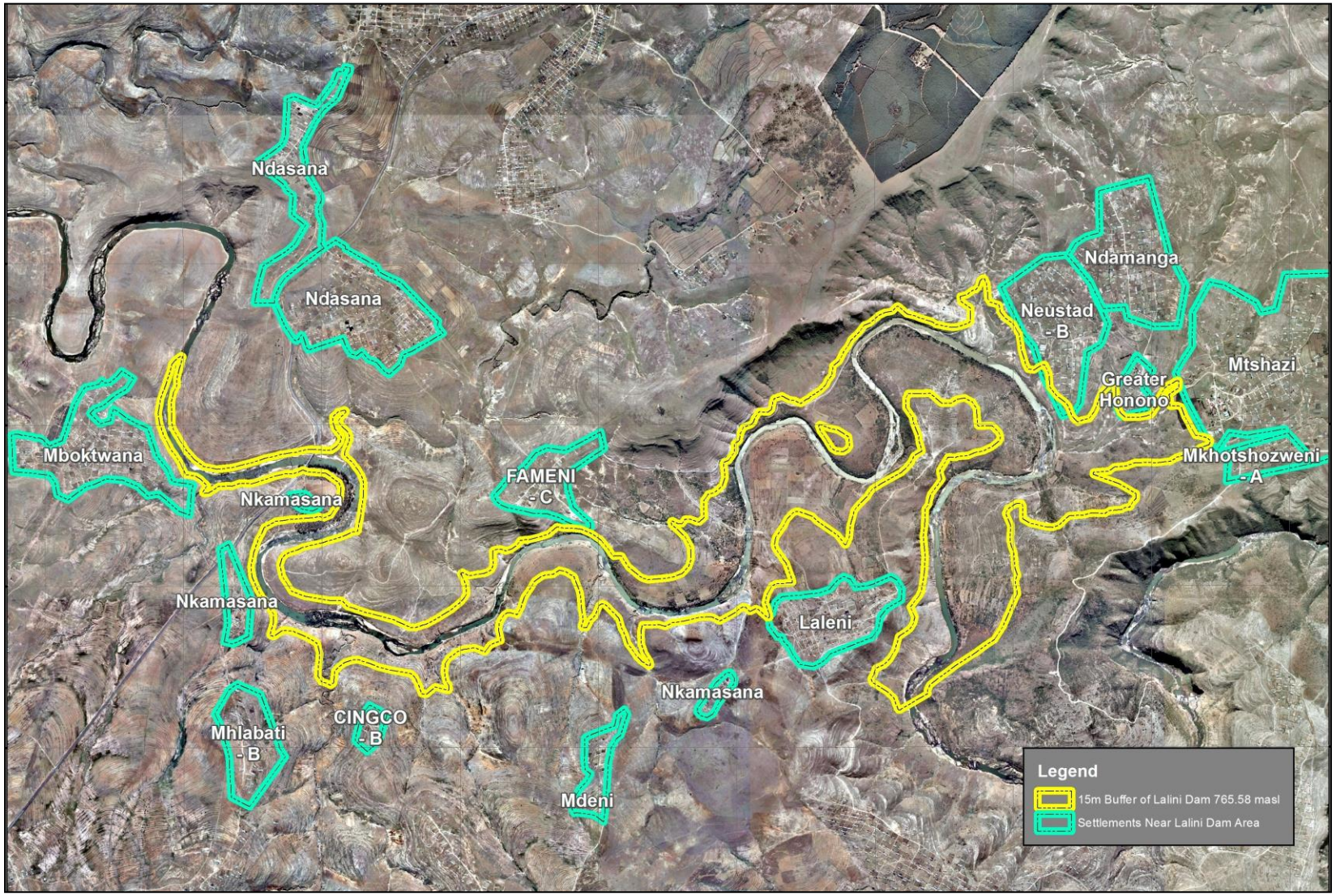

Figure 11: Lalini Dam Basin Preliminary Expropriation Area

Negotiations play a big role in such matters and if handled sensitively can allow construction to proceed before all of the land issues are dealt with and finalized. This must be done by an experienced practitioner otherwise unrealistic expectations can occur. The Department of Rural Development and Land Reform (DRDLR) should play a major role in this respect. Compensation paid must be in line with a professional valuator's report as well as DRDLR's policies.

The actual expropriation needs are being identified under the Independent EIA study. These investigations are being based upon the footprints and alignments of infrastructure that will be constructed as temporary or permanent works which have been developed at a Feasibility Study level of detail. The detailed design of these works will further optimise the scheme and as such the general arrangements, alignments, and footprints of the works will often change.

The final survey lines and control beacons established during the detailed design will inform DWS as to the final nature and quantum of the expropriation and compensation requirements.

Aerial photography of the dam basin and dam wall location was taken in early 2013 (Ntabelanga) and in 2014 (Lalini) and forms a record of land use and existing structures in that particular area at that time, which can be used as a guide to be used as a basis for compensation negotiations. However, the basis of compensation is what is on the land at the exact moment the valuator has his meetings with the affected parties.

It should be noted that as soon as affected people in the area realise that there might be infrastructure being developed close to their land, there tends to be opportunistic actions to maximise the potential compensation from the ensuing resettlement or servitude process.

This is unfortunate but can be controlled with the assistance of the local Chief and Councillors, but adherence to protocol and an approved Record of Decision is required. Local development within affected lands cannot be stopped until there is a 100% certainty that the project is going to commence. In the period before the project construction commences it would likely be impossible to prevent people developing lands that would be expropriated. This emphasises the need for the EIA consultation process to not create expectations and to only discuss land issues at an appropriate time.

It is therefore recommended that the consultation process includes a careful recording of current structures and land use, and gives notification to the affected parties that no new development or change of land use should take place in order to leverage more compensation. However, as reiterated above, this must only be undertaken at a time when the project is definitely about to commence.

It is also reiterated that the process to be undertaken must be implemented in close consultation and co-operation with the traditional leaders in the affected areas, and involving the Provincial Departments of Rural Development and Agrarian Reform, Rural Development and Land Reform, and Local Government and Traditional Affairs. The Councillors are the starting point of such a process and the National Departments must be involved as this is State land and not Provincial land. The DRDLR is the custodian of the land.

This will require a dedicated facilitation unit or service provider to be assigned to undertake this process, and significant time and cost will need to be allowed for this process to be implemented. DWS is able to do this as it is a part of their duties on a regular basis.

From preliminary analysis, the indications are that the buildings of between 20 and 40 households could be affected directly by the flooded dam basin, but more households in the zones lying closest to the river course could also be affected as regards the use of some of the land allocated to them for the growing of crops or livestock grazing.

It would appear that a fairly high proportion of this land is not suitable or regularly used for crop production, some is highly eroded and unsuitable for any usage, and a significant proportion is classed as riparian, and should not be used for arable or grazing purposes. This exercise is only indicative of the general scale of implications of the inundation of the basin, and the EIA Report better quantifies the impacts and resettlement implications. The professional valuator will confirm this in his report, but the resettlement of affected people residing in the dam basin falls under the jurisdiction of the DDG:NWIR.

NEW FARMING UNITS FOR EMERGING COMMERCIAL FARMERS

No existing commercial farmers operate in this study area and all farming that is currently undertaken is by resource-poor subsistence farmers.

The Irrigation Development component of the study identified a total of some 2 868 ha of high potential land that could viably be developed for commercial irrigated agriculture, of which some 418 ha is located adjacent to the north shore of the dam basin and along the river just downstream of the dam wall, and the other 2 450 ha is located around the Tsolo area.

These areas are shown on Figure 12.

BULK RAW WATER SUPPLY TO THE IRRIGATION AREAS

Raw water supply to the smaller areas in the dam reservoir basin and along the river itself would be via portable abstraction systems, but the main supply of bulk raw water to the Tsolo areas is planned to be via a raw water pumping pipeline directly pumped from the Ntabelanga Dam outlet.

This system would transfer raw water to an intermediate storage reservoir which would be an open earth embankment dam located on a ridge and as shown also on Figure 4.

From that storage site, raw water would be gravitated through a system of distribution pipes to the edge of the farming unit field shown on the figure. Most of these pipelines would flow by gravity, but two small booster pumping stations would be required to lift water to outlying farming units that are located at higher elevations.

Table 2 summarises the diameters and lengths of raw water pipelines to be constructed.

Table 2: Irrigation Raw Water Transfer Pipeline from Ntabelanga Dam to Tsolo Area

Pipeline Quantities	
Diameter	***Length m***
1 200	*9 780*
900	*2 000*
800	*9 660*
600	*4 460*
500	*3 100*
450	*5 900*
350	*1 770*
300	*9 970*
200	*2 143*
Total:	***48 783***

The same temporary and permanent servitude rules will apply as is described above for the potable water pipeline system. Two small booster pumping stations will require land to be acquired to the same size as the boosters described above.

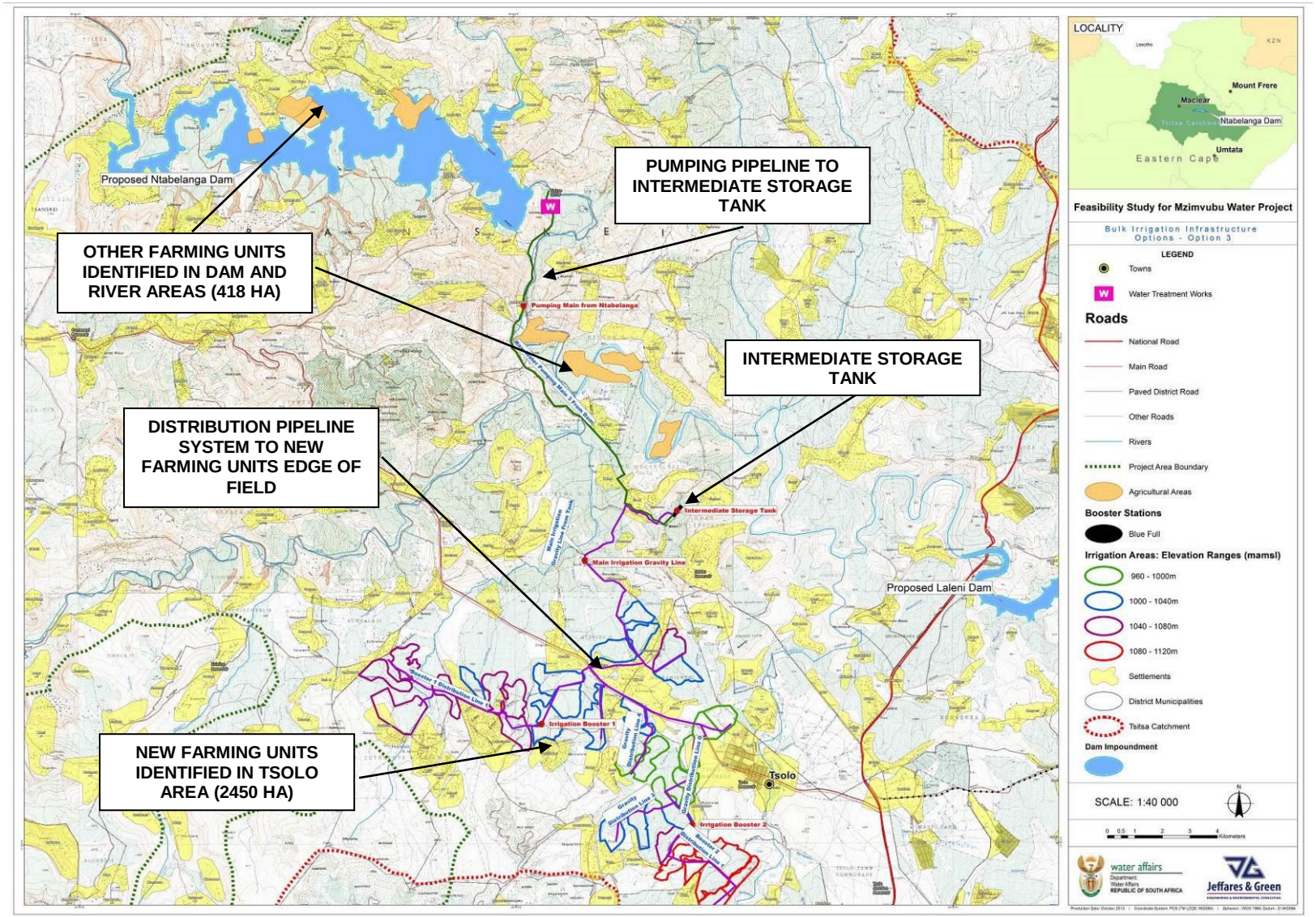

Figure 12: Layout of Proposed New Farming Units and Bulk Raw Water Distribution System

The final location, configuration and sizing of the intermediate storage tank will need to be determined once the final number and size of farming units, their water requirements, pumping scheduling and seasonal irrigation pattern requirements have been finalized. At feasibility level this storage has been sized at some 85 000 m^3, which would require a bunded storage tank of dimensions approximately 120 m x 180 m, and this would require the acquisition of land of approximately 3 ha in extent.

LAND USE REFORM REQUIREMENTS FOR EMERGING FARMER DEVELOPMENT

It was recommended that for irrigation farms to be feasible they need to be economically viable, implying that they can be operated as stand-alone farms with profits that exceed operating costs. This will empower the farmers to have their own implements, make independent decisions, and will encourage them to become sustainable contributors to the local economy and to become employers within the community. For this reason an average farming unit size of 60 ha was settled upon, which resulted in the potential for up to 45 farming units to be developed in the Tsolo area.

THE DRDLR, DRDAR and DAFF work together on such aspects and they have policies and legislation with which such land use reform processes must comply.

The success of this new approach will hinge on a radical shift in farming methods currently being practiced in the area, and will require the support and buy in from Government at large, applicable Government Departments (such as the DRDAR and DRDLR) and other agencies (Eastern Cape Rural Development Agency) that will assist with support, training, land administration matters and getting community consensus, Traditional Leaders that currently administer the land under the communal farming system, the community who currently reside on and farm the land, and local training institutions that will be required to train and support the farmers. If support is withdrawn from any of the above sections of the community, the venture will almost certainly fail as a commercial proposition. DRDLR and DAFF must be consulted and involved at all stages during the process.

SYSTEM OF TENURE

It is proposed that the farming units are established as economically viable commercial irrigation farms. The most reasonable system of land tenure would be a medium-term lease entered into between the State and the farmer. This lease need to be long enough that the farmer can establish themselves on the land, establish a number of enterprises, invest in the farm, and repay any loans raised to finance the investment. The lease should also be long enough that the farmer can take a medium term view in developing the farm. This may entail a few lean years in the early stages of farm development, with more profitable years to follow once the farm has been well established.

A lease period of 20 years should be considered for the system of land tenure. It is important that the lease is linked to agricultural performance, with cancellation of the lease being an option if the farmer fails to establish any agricultural production within (say) 3 years, or if the land is used for non-agricultural purposes.

It is critical that the land allocation under the current system of communal farming is audited and that a land register is set up. This should be done early on in the implementation phase of the project, and should form part of the community consultation process. This will establish a benchmark for the current land use in terms of who has been allocated which land, since what date, what land area, if it is currently being farmed, how much land in total has been allocated, and how much land remains unallocated. This will form the basis of any discussions around land rights, any compensation payable, any offset arrangements, or any land trading system. Without such a system being set up early on, the process will quickly become mired in squabbles by community members who feel they are being disenfranchised or unfairly removed from their land.

Those people currently using the land to be transformed in this way, will therefore need to be dealt with in a very sensitive manner, and solutions developed should maximize the participation of, and

livelihood benefits to, these people, and/or offer alternatives that are equal to, or better than, the situation from which they are being asked to change.

It will be essential to undertake all of the activities in accordance with the existing legislation relevant to the National Departments that are responsible for this function.

TRAINING AND SUPPORT RESOURCES

Irrigation farming is not common in the communal areas and communities surrounding the town of Tsolo. It will be viewed as new technology, and it is important that there is appropriate training and extension support of new and emerging farmers if the technology is to be successfully implemented.

A number of resources are available which will be important for the training of new farmers, the support and guidance of farmers as they become established, and the continued support of farmers through extension and advisory services:

- *Tsolo Agricultural College;*
- *Jongiliswe Agricultural College for Traditional leaders; and*
- *Eastern Cape Department of Rural Development and Agrarian Reform.*

Feedback has been provided during consultative meetings held as part of this study that the technical support in terms of agricultural training and extension support does exist within these institutions listed above. However, no formal business skills training exists. Farms that are 60 ha in size (as proposed) will have annual turnover of R3 to 5 million, and appropriate business skills will be as important as agricultural skill development for the farms to be sustainable. Business courses either need to be developed and offered as courses/modules within the existing training facilities, or new business skill training facilities need to be established in the area. However, these actions should only be implemented once there is concensus and confirmation that commercialized irrigation the Tsolo area is both viable and has sufficient numbers of people willing to accept the necessary land and agrarian reform implications.

All of the above activities must comply with current policies, legislation and regulations of the DRDLR and DAFF.

BENEFICIARY SELECTION

It has been strongly advocated from the consultative meetings held to date that the process of beneficiary selection needs to be designed to succeed. That is, prospective farmers to be settled on the plots need to have demonstrated:

- *Agricultural skills and knowledge to enable them to farm effectively;*
- *Business skills to be able to farm profitably and sustainably, and to enable them to contribute to the local economy through becoming primary producers and providing employment opportunities;*
- *Aptitude to become farmers, to work hard, and to remain enthusiastic; and*
- *Willingness to embrace new technology, and to continue learning as new agricultural technologies evolve.*

Commercially successful farmers will not only make best use of the land and the irrigation investment, but will contribute to food security in the area, to the regional economy, and will generate up to 3 375 permanent jobs and up to 1 350 seasonal jobs on the 45 proposed farming units. By contrast, failed farming units would make poor use of the available land, reduce food security, and diminish the leveraging effect that job creation can have on the local economy.

CONCLUDING REMARKS

The above process of land use reform will be complex, and must be handled in an extremely sensitive manner.

The consultation process should be overseen and guided by the Provincial Department of Rural Development and Agrarian Reform, the National Department of Rural Development and Land Reform, and the Department of Agriculture Forestry and Fisheries, who will consult and co-operate closely with the relevant Councillors, Traditional Leaders and the Department of Local Government and Traditional Affairs. The Regional Land Claims Commissioner would need to be a key roleplayer throughout the process.

Extensive time and resources will need to be allowed for this process to take its course, and this will very likely be one of the most challenging issues to address on the whole project.

Final land expropriation needs, relocation, and compensation requirements can only be determined once the detailed design has been finalised.

The final land acquisition requirements will be confirmed by the DWS Spatial Land Information Management (SLIM) following the detailed design when they prepare the final servitude data as well as the dam boundary lines. Land Schedules would then be provided by SLIM for acquisition purposes.

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LIST OF ACRONYMS AND ABBREVIATIONS

ASGISA-EC	Accelerated and Shared Growth Initiative for South Africa – Eastern Cape
CAPEX	Capital Expenditure
CFRD	Concrete-faced rockfill dam
CMA	Catchment Management Agency
CTC	Cost to Company
CV	Coefficient of Variability
DAFF	Department of Agriculture, Forestry and Fisheries
DBSA	Development Bank of Southern Africa
DEA	Department of Environment Affairs
DM	District Municipality
DME	Department of Minerals and Energy
DoE	Department of Energy
DRDAR	Department of Rural Development and Agrarian Reform
DRDLR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Eastern Cape
ECRD	Earth core rockfill dam
EF	Earthfill (dam)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPWP	Expanded Public Works Programme
ESIA	Environmental and Social Impact Assessment
EWR	Environmental Water Requirements
FSL	Full Supply Level
GERCC	Grout enriched RCC
GN	Government Notices
GW	Gigawatt
GWh/a	Gigawatt hour per annum
IAPs	Invasive Alien Plants
IB	Irrigation Board
IFC	International Finance Corporation
IPP	Independent Power Producer
IRR	Internal Rate of Return
IVRCC	Internally vibrated RCC
ISO	International Standards Organisation
kW	Kilowatt
LM	Local Municipality
ℓ/s	Litres per second

MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MEC	Member of the Executive Council
MIG	Municipal Infrastructure Grant
million m^3	Million cubic metres
MW	Megawatt
NEMA	National Environmental Management Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NOCL	Non-overspill crest level
NWA	National Water Act
NWPR	National Water Policy Review
NWRMS	National Water Resources Management Strategy
O&M	Operations and Maintenance
OPEX	Operational Expenditure
PICC	Presidential Infrastructure Co-Ordinating Committee
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PSC	Project Steering Committee
PSP	Professional Services Provider
RBIG	Regional Bulk Infrastructure Grant
RCC	Roller-compacted concrete
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RWI	Regional Water Institution
RWU	Regional Water Utilities
SAWS	South African Weather Service
SEZ	Special Economic Zone
SIP	Strategic Integrated Project
SMC	Study Management Committee
SPV	Special Purpose Vehicle
TCTA	Trans Caledon Tunnel Authority
ToR	Terms of Reference
UOS	Use of System
URV	Unit Reference Value
WEF	Water Energy Food
WRYM	Water Resources Yield Model
WSA	Water Services Authority
WSP	Water Services Provider
WTE	Water Trade Entity
WUA	Water User Association

LIST OF UNITS

Description	Standard unit
Elevation	m a.s.l.
Height	m
Distance	m, km
Dimension	mm, m
Area	m^2 , ha or km^2
Volume (storage)	m^3
Yield, Mean Annual Runoff	m^3/a
Rotational speed	rpm
Head of Water	m
Pressure	Pa
Diameter	mm or m
Temperature	^oC

Description	Standard unit
Velocity, speed	m/s, km/hr
Discharge	m^3/s
Mass	kg, tonne
Force, weight	N
Gradient (V:H)	%
Slope (H:V) or (V:H)	1:5 (H:V) or 5:1 (V:H)
Volt	V
Power	W
Energy used	kWh
Acceleration	m/s^2
Density	kg/m^3
Frequency	Hz

1. BACKGROUND AND INTRODUCTION

The Mzimvubu River catchment in the Eastern Cape Province of South Africa is situated in one of the poorest and least developed regions of the country. Development of the area to accelerate the social and economic upliftment of the people was therefore identified as one of the priority initiatives of the Eastern Cape Provincial Government.

Harnessing the water resources of the Mzimvubu River, the only major river in the country which is still largely unutilised, is considered by the Eastern Cape Provincial Government as offering one of the best opportunities in the Province to achieve such development. In 2007, a special-purpose vehicle (SPV) called ASGISA-Eastem Cape (Pty) Ltd (ASGISA-EC) was formed in terms of the Companies Act to initiate planning and to facilitate and drive the Mzimvubu River Water Resources Development.

The five pillars on which the Eastern Cape Provincial Government and ASGISA-EC proposed to model the Mzimvubu River Water Resources Development are:

- Forestry;
- Irrigation;
- Hydropower;
- Water transfer; and
- Tourism.

The Department of Water and Sanitation (DWS) commissioned the Mzimvubu Water Project with the overarching aim of developing water resources schemes (dams) that can be multi-purpose reservoirs in order to provide benefits to the surrounding communities and to provide a stimulus for the regional economy, in terms of irrigation, forestry, domestic water supply and the potential for hydropower generation amongst others.

1.1 Study Locality

The Mzimvubu River Catchment is situated in the Eastern Cape (EC) Province of South Africa which consists of six District Municipalities (DM) and two Metropolitan Municipalities (Buffalo City and Nelson Mandela Bay). These include Cacadu DM in the west across to the Alfred Nzo DM in the east with the two Metropolitan Areas being located around the two major centres of the province, East London and Port Elizabeth, both of which border the Indian Ocean.

The Mzimvubu River Catchment is situated within three of the DM's namely the Joe Gqabi DM in the north west, the OR Tambo DM in the south and the Alfred Nzo DM in the east and north east. A locality map of the whole catchment area and its position in relation to the DM's in the area is provided in Figure 1-1.

1.2 Study Programme

The study commenced in January 2012 and was completed in October 2014 in three stages as follows:

- Inception ;
- Phase 1 – Preliminary Study; and
- Phase 2 – Feasibility Study.

The purpose of the study is not to repeat or restate the research and analyses undertaken on the several key previous studies described below, but to make use of that information previously collected, to update and add to this information, and to undertake more focussed and detailed investigations and feasibility level analyses for the dam site options identified as being the most promising and cost beneficial.

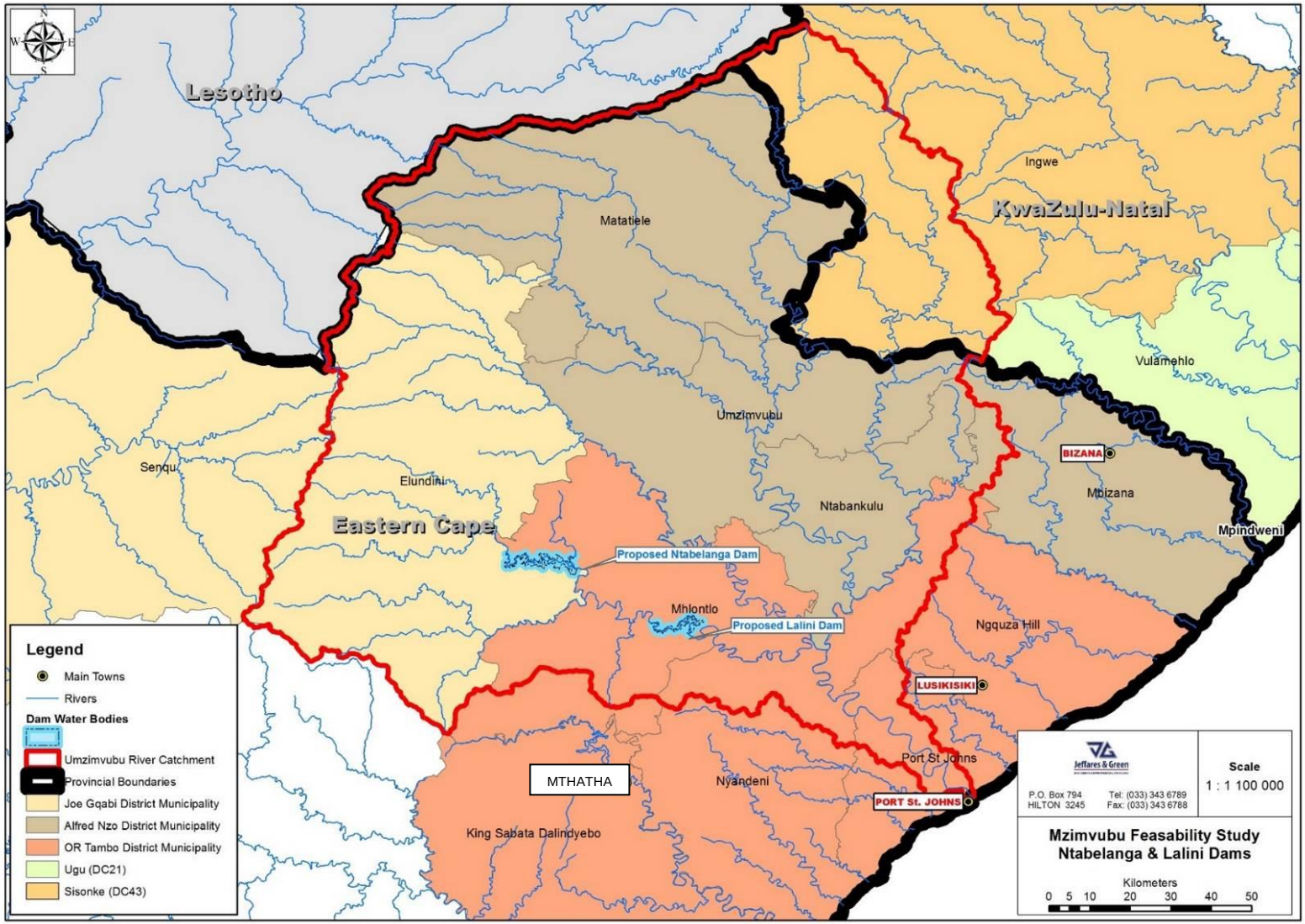


Figure 1-1: Mzimvubu River Catchment Area

1.2.1 Inception Phase

The aim of the Inception Phase was to finalise the Terms of Reference (TOR) as well as to include, inter alia, the following:

- A detailed review of all the data and information sources available for the assignment.
- A revised study methodology and scope of work.
- A detailed review of the proposed project schedule, work plan and work breakdown structure indicating major milestones.
- Provision of an updated organogram and human resources schedule.
- Provision of an updated project budget and monthly cash flow projections.

The Inception Phase has been completed and culminated in the production of an Inception Report (DWS Report Number P WMA 12/T30/00/5212/1) which also constitutes the final TOR for the study.

1.2.2 Preliminary Study Phase

This Preliminary Report describes the activities undertaken during the preliminary study phase, summarizes the findings and conclusions, and provides recommendations for the way forward and scope of work to be undertaken during the Feasibility Study phase.

The Preliminary Study Phase was divided into two Stages:

1. Desktop Study
2. Preliminary Study

The aim of the Desktop Study was, through a process of desktop review, analyses of existing reports and data, and screening, to determine the three best development options from the pre-identified 19 development options (from the previous investigation). This process is described in Section 2 of this Report.

The aim of the Preliminary Study was to gather more information with regard to the three selected development options as well as to involve the Eastern Cape Provincial Government and key stakeholders in the process of selecting the single best development option to be taken forward into Phase 2 of the Study.

The main activities undertaken during of the second stage of Phase 1 were as follows:

- Stakeholder involvement;
- Environmental screening;
- Water requirements (including domestic water supply, irrigation and hydropower);
- Hydrological investigations;
- Geotechnical investigations;
- Topographical survey investigations;
- Selection process; and
- Reporting.

1.2.3 Phase 2 – Feasibility Study

The Preliminary Study recommended a preferred dam site and scheme development to be taken forward to Feasibility Study level.

The key activities undertaken during the Feasibility Study are as follows:

- Detailed hydrology (over and above that undertaken during the Preliminary Study);
- Reserve determination;
- Water requirements investigation (including agricultural and domestic water supply investigations);
- Topographical survey (over and above that undertaken during the Preliminary Study);
- Geotechnical investigation (more detailed investigations than during the Preliminary Study);
- Dam design;
- Land matters;
- Public participation;
- Regional economics; and
- Legal, institutional and financial arrangements.

An Environmental Impact Assessment was undertaken by and independent PSP in a separate study that ran in parallel to this one.

1.2.4 Scheme Components

Following the completion of the above feasibility study stages it was agreed that the sizing and modus operandi of the Ntabelanga Dam and its associated works would take into account its multi-purpose role, namely:

i) to supply potable water to some 726 616 people and other water consumers in the region;
ii) to supply raw water for irrigation of some 2 868 ha of high potential agricultural land;
iii) to generate hydropower locally at the dam wall to reduce the cost of energy consumption when pumping water;
iv) to provide sufficient flow of water downstream of the Ntabelanga Dam to meet environmental water requirements for an ecological Class C; and
v) to provide additional balancing storage volume and consistent downstream flow releases to enable a second, smaller dam at Lalini (located on the Tsitsa River some 3.5 km above the Tsitsa Falls) to generate significant hydropower for supply into the national grid.

The suite of study reports describe the development of solutions for these multi-purposes, and the resulting project infrastructure, which comprises the following:

- A new dam on the Tsitsa River at Ntabelanga, with capacity to reliably supply the raw and potable water requirements for i) and ii) above;
- A water treatment works at the Ntabelanga dam to supply the potable water requirements;
- Primary and secondary bulk water distribution systems the deliver potable water to the whole supply area. Tertiary distribution systems to the consumers will be implemented by the District Municipalities;
- A bulk raw water distribution system to supply irrigation water to some 2 868 ha of high potential land; and
- A mini hydropower plant at Ntabelanga Dam to generate up to 5 MW of power.

The Ntabelanga scheme is also expected to work conjunctively with a second hydropower scheme at the Lalini Dam, which is located on the same river and downstream of the Ntabelanga Dam, and which could produce an average of 23 MW of power on a continuous basis.

The relative locations of Ntabelanga Dam and Lalini Dam are shown on the above Figure 1-1 and Figure 1-2.

Figures 1-3 to 1-5 show the layouts of the Ntabelanga potable and irrigation water bulk distribution systems.

1.2.5 Key Stakeholders

Legal, Institutional and Financing Arrangements Report No. P WMA 12/T30/00/5212/16 documents existing institutional arrangements and stakeholders within the region that have an interest and/or role on the project. It is anticipated that this will include institutions *inter alia*:

- Department of Local Government and Traditional Affairs;
- Department of Minerals and Energy;
- Department Water Affairs;
- Water Boards;
- Department of Agriculture and Environmental Affairs;
- Provincial Government;
- ESKOM;
- Local Agricultural Societies or Associations;
- Water User Associations and Irrigation Boards;
- Department of Agriculture Forestry and Fisheries;
- Chamber of Commerce and representatives from Industry;
- Local and District Authorities; and
- Tribal Authority for the project area.
- Councillors
- National Department of Rural Development and Land Reform
- Regional Land Claims Commissioner

It is anticipated that the above stakeholders and organisations will be involved in the project at various levels, and co-ordination will be required between these organisations during the implementation phase of the scheme.

1.3 Purpose of this Report

The construction and operation of the proposed scheme infrastructure will impact on the existing land use in this region.

The Terms of Reference for this aspect of the Feasibility Study are as follows:

- Provide suggested temporary and permanent servitude routes, with lengths and widths and duration of temporary servitudes, for all roadways needed to construct and operate the scheme;
- Provide all pipeline and canal routes and recommend whether the areas should be acquired by the developer or whether servitudes should be arranged;
- Set out proposed area of acquisition for the dam wall and appurtenant structures and dam basin;
- Set out proposed sub-divisions of farms of existing commercial farmers who are prepared to sub-divide so that emerging commercial or small-scale farmers can settle on land and start farming operations;
- Set out and suggest a means of allocating farms to emerging farmers and suggest what sort of land tenure they should hold, for what period, and at what cost to the prospective emerging farmer; and
- Determine cost estimates for the servitudes and land to be acquired for the above purposes.

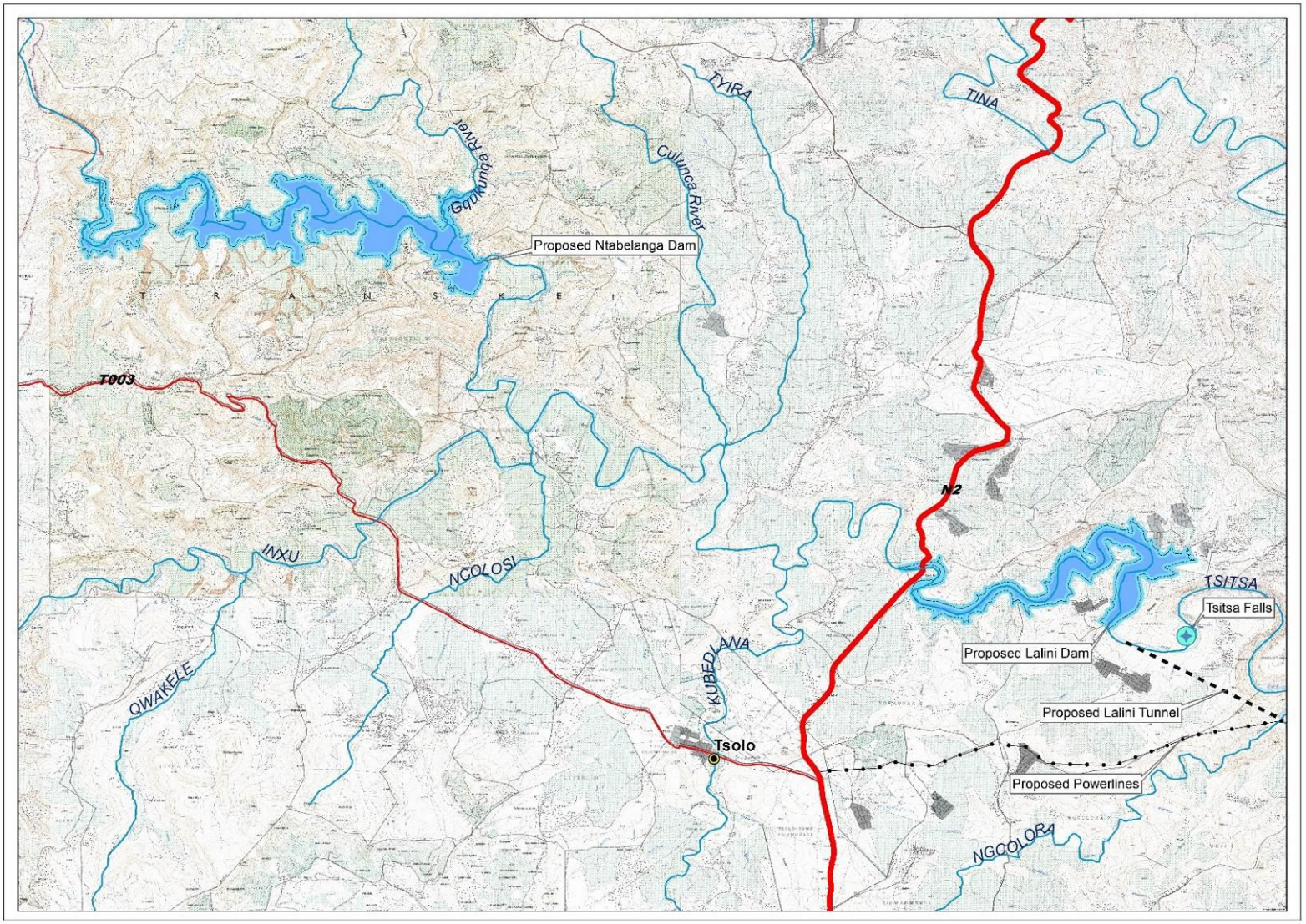


Figure 1-2: Relative Locations of Ntabelanga and Lalini Dams

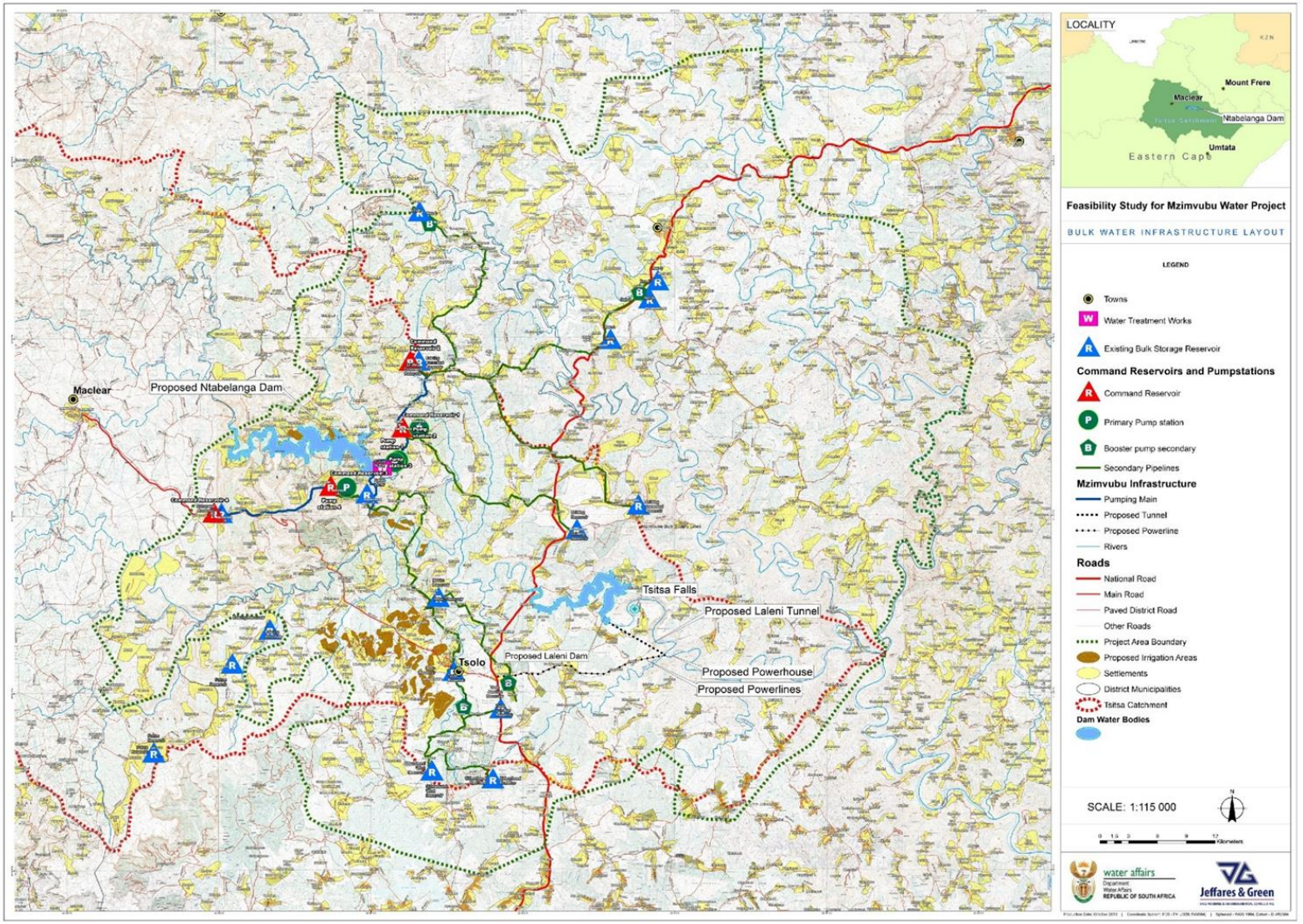


Figure 1-3: Proposed Ntabelanga Primary and Secondary Bulk Water Distribution System

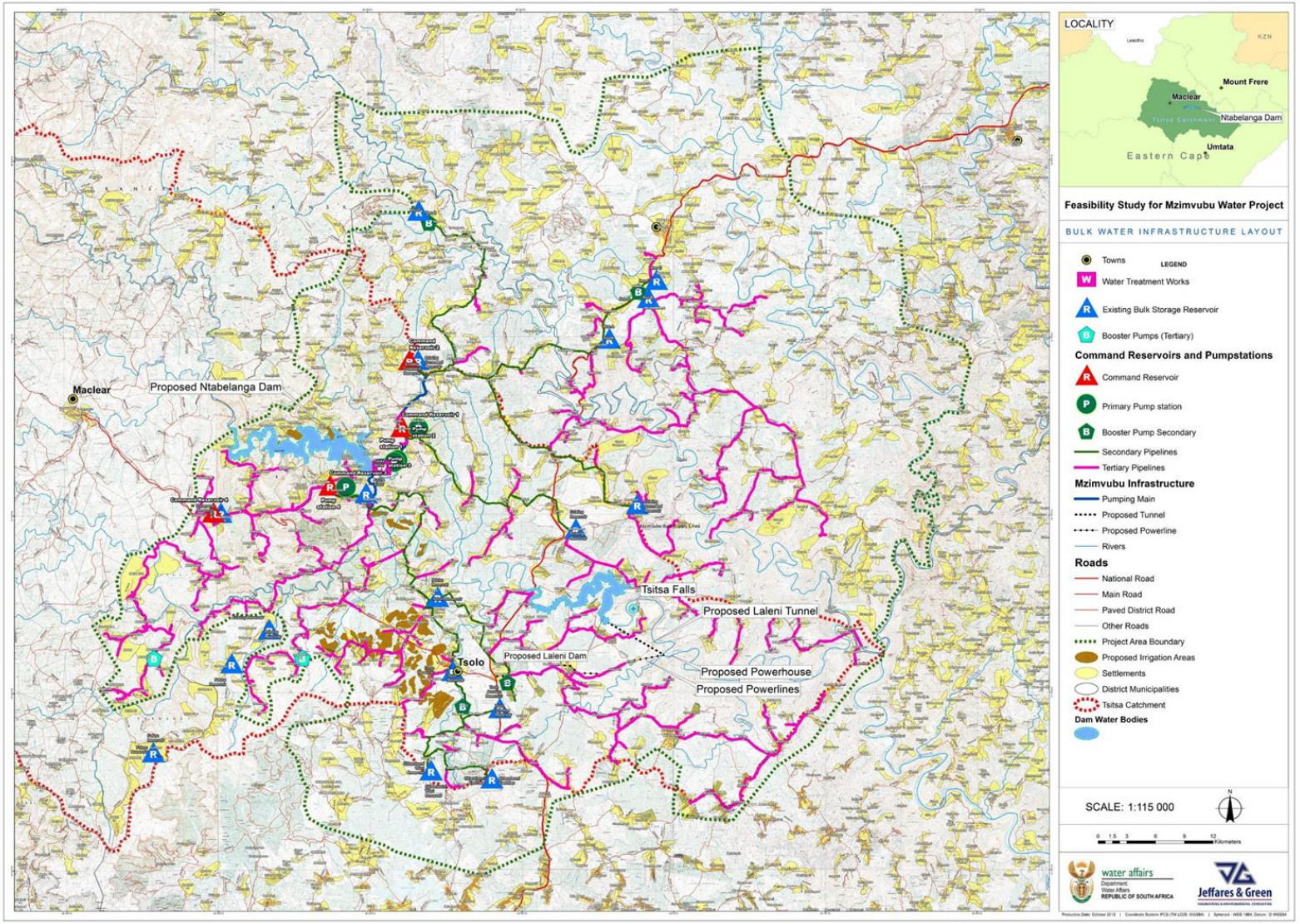


Figure 1-4: Tertiary Bulk Water Distribution System to be Implemented by DMs

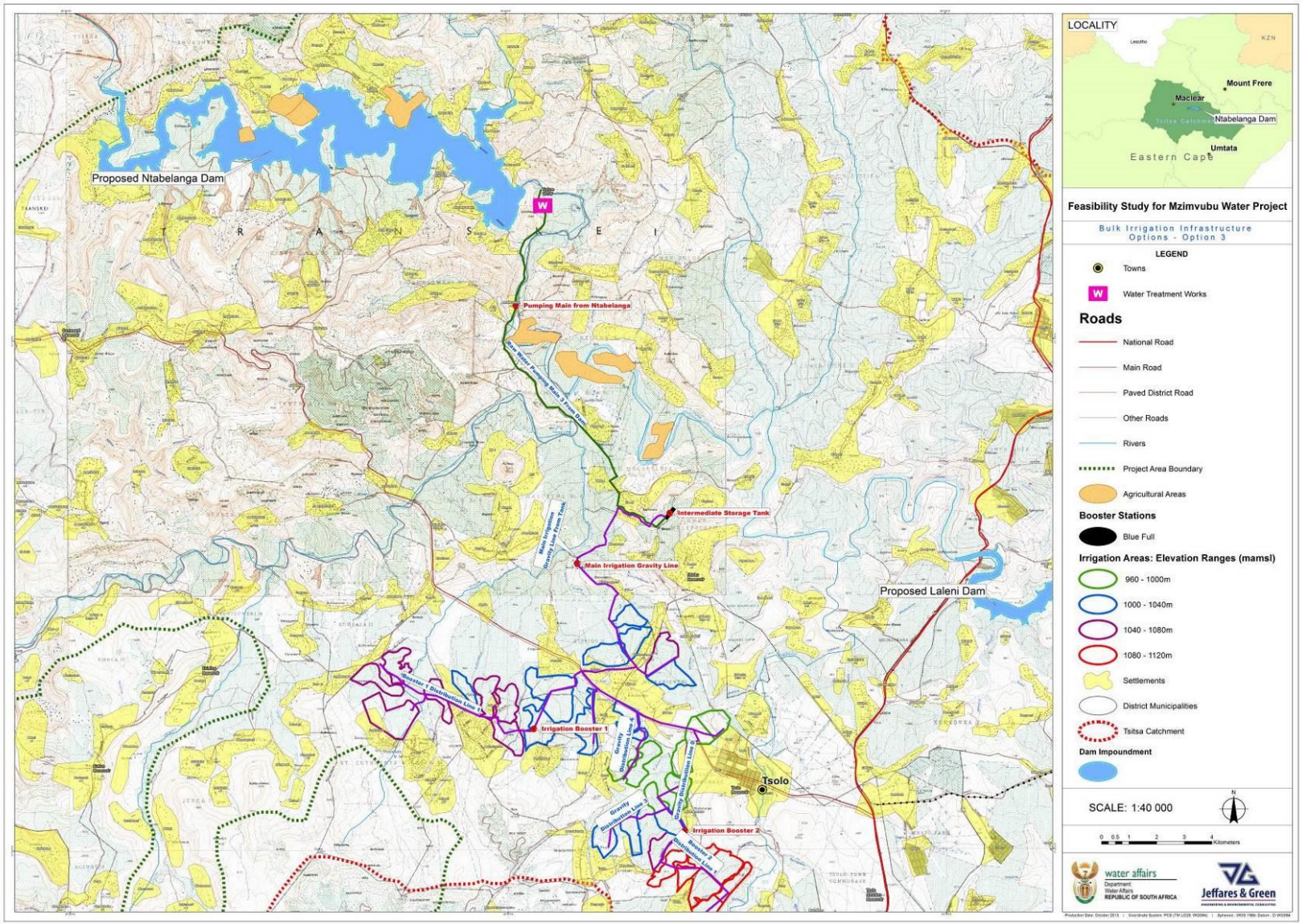


Figure 1-5: Proposed Ntabelanga Irrigation System

The independent EIA study for the conjunctive Ntabelanga - Lalini scheme has undertaken a more detailed analysis of the land issues, including relocation, land expropriation, establishment of temporary and permanent servitudes and other mitigation activities. Therefore whilst this report describes these land matters at a feasibility level of detail, the DWS EIA Report No. P WMA 12/T30/00/5314/1 to 17 should be consulted for more detail.

Once the project moves into the detailed design and implementation stage, it is probable that some of the feasibility designs will be revised which will require changes in the boundaries and extents of the expropriation and servitudes described herein.

2. FINDINGS AND RECOMMENDATIONS FOR LAND MATTERS

2.1 Introduction

All of the land affected by the project infrastructure is State-owned and currently there is no national resettlement and compensation policy in South Africa. The Expropriation Act (63 of 1975) provides for the expropriation of land for public use, and the compensation thereof, but this relates to private land only. State-owned land is a complex issue that is not covered, and, instead international and national best practice should guide the process.

DWS has been compensating unregistered rights under the Expropriation Act on various schemes, which is done with the assistance of a Professional Valuator and under the auspices of the Department of Rural Development and Land Affairs (DRDLR).

The relevant legal framework is discussed hereunder.

2.1.1 The Constitution of South Africa (Act No. 108 of 1996)

The Constitution of South Africa states in Chapter 2: Bill of Rights (Section 25) that:

(2) Property may be expropriated only in terms of law of general application -

(a) For a public purpose or in the public interest; and

(b) Subject to compensation, the amount of which and the time and manner of payment of which have either been agreed to by those affected or decided or approved by a court.

(3) The amount of the compensation and the time and manner of payment must be just and equitable, reflecting an equitable balance between the public interest and the interests of those affected, having regard to all relevant circumstances, including –

(a) The current use of the property; and

(c) The market value of the property.

The DWS is complying with this requirement.

2.1.2 The Expropriation Act (63 of 1975) as amended March 2008

This Act regulates the expropriation of land for public purposes. It looks at compensation based on market value and future financial loss. The DWS is complying with this act.

2.1.3 The Extension of Securities of Tenures Act (62 of 1997)

This Act is primarily concerned with the protection of farm workers from being evicted by owners. Compensation is payable for any structures or crops.

DRDLR and DWS are aware of other relevant legislation when dealing with land matters and including relocation, which must be complied with

2.1.4 International Best Practice

a) World Commission on Dams

The World Commission on Dams released a set of guidelines based on lessons learnt from 1000 dams across the globe. Several of these relate to the relocation and compensation for loss of land and livelihoods:

- Stakeholders must have opportunity to participate in the decision making processes, and decisions affecting indigenous peoples should be taken with their prior consent;
- Livelihoods should be improved beyond mere compensation for losses, including people downstream of the dam; and
- Agreements should be mutually agreed and legally enforceable to insure the implementation of all mitigation, resettlement and development entitlements.

b) World Bank - International Finance Corporation (IFC) Performance Standard 5

The IFC Standard recognises both physical displacement and economic displacement, and the need to quantify and compensate accordingly. It emphasises adequate compensation, and community engagement as essential, and that forced evictions should be avoided. A Resettlement Action Plan must be developed at the outset should physical displacement be necessary. The overarching approach is:

"The client will engage with Affected Communities, including host communities, through the process of stakeholder engagement... Decision-making processes related to resettlement and livelihood restoration should include options and alternatives, where applicable. Disclosure of relevant information and participation of Affected Communities and persons will continue during the planning, implementation, monitoring, and evaluation of compensation payments, livelihood restoration activities, and resettlement to achieve outcomes that are consistent with the objectives of this Performance Standard.

When displacement cannot be avoided, the client will offer displaced communities and persons compensation for loss of assets at full replacement cost and other assistance to help them improve or restore their standards of living or livelihoods, as provided in this Performance Standard. Compensation standards will be transparent and applied consistently to all communities and persons affected by the displacement.

Where livelihoods of displaced persons are land-based, or where land is collectively owned, the client will, where feasible, offer the displaced land-based compensation. The client will take possession of acquired land and related assets only after compensation has been made available and, where applicable, resettlement sites and moving allowances have been provided to the displaced persons in addition to compensation. The client will also provide opportunities to displaced communities and persons to derive appropriate development benefits from the project" (IFC Performance Standard 5, 2012 pg. 3).

c) *World Bank Operational Policy 4.12*
The World Bank policy motivates for a comprehensive resettlement policy and plan to be adopted at the start of the project. These documents must include all of the following issues:

"6(a) The resettlement plan or resettlement policy framework includes measures to ensure that the displaced persons are:

(i) informed about their options and rights pertaining to resettlement;

(ii) consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives; and

(iii) provided prompt and effective compensation at full replacement cost[11] for losses of assets[12] attributable directly to the project.

(b) If the impacts include physical relocation, the resettlement plan or resettlement policy framework includes measures to ensure that the displaced persons are

(i) provided assistance (such as moving allowances) during relocation; and

(ii) provided with residential housing, or housing sites, or, as required, agricultural sites for which a combination of productive potential, locational advantages, and other factors is at least equivalent to the advantages of the old site.

(c) Where necessary to achieve the objectives of the policy, the resettlement plan or resettlement policy framework also include measures to ensure that displaced persons are

(i) offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living and

(ii) provided with development assistance in addition to compensation measures described in paragraph 6(a);

such as land preparation, credit facilities, training, or job opportunities (World Bank OP 4).

2.2 Overview of Existing Land Ownership and Tenure Situation

The new infrastructure that will be built such as the dam, pipelines, waterworks, pump stations, and any associated infrastructure will traverse both urban and rural areas resulting in unavoidable impacts to both the environment and communities.

Part of this land will need to be permanently expropriated in order to expand the service provision of bulk water. This may negatively impact on the current land use and business activities resulting in the need for compensation of the current land owner/user via a valuation report.

Much of the land in the affected project area is, however, State-owned land managed through the tribal authorities, and as a result the process is not governed by law, but by best practice. The process tends to be drawn out, and complex. Outside of the community negotiations, and if the cadastral information is available for all the affected land, the process can take up to 18 months for acquiring the land. DWS is currently dealing with projects where State-owned land is involved and there are processes in place for these actions.

2.3 State-owned Land

State-owned land refers to all properties that are registered in the name of or under the control of the Republic of South Africa or any State Department, including all un-surveyed and/or un-registered State-owned land (that is commonly known as Un-alienated State-owned land) which will be discussed in more detail under the two paragraphs below.

2.3.1 State-owned land under control of the Department of Public Works

As the land in question is rural development land the Department of Public Works (DPW) is not affected by this scheme at all. All land aspects are dealt with by the DWS as the Minister of Water and Sanitation is a custodian of State land and there is a working relationship between the departments when state land is affected. DRDLR is involved with various projects and there are procedures in place that would need to be followed before DWS can access or acquire the land. Neither DPW nor DRDLR would acquire land on behalf of the DWS.

In terms of the Constitution of the Republic of South Africa, 1996 (Act 108 of 1996), all State-owned land has to be "*vested*" (i.e. to confer the right of ownership) in a specific State Department or Organ of State before it can be alienated. This is a lengthy procedure undertaken by the various Regional Land Disposal Committees but the DWS is part of these committees and can therefore vest its own land.

Where such vesting has not taken place, the required process must be undertaken before a decision or approval can be made as to the alienation of the required portion thereof. This is an extremely lengthy process, especially where the land in question is still un-surveyed and/or un-registered State-owned land (such as many properties under the control of the DWS). This can obviously impact negatively on the delivery of vacant possession of a required construction site to an appointed Contractor. DWS has resources and processes in place to deal with the vesting procedures.

This land is a national asset and must be treated accordingly. The current or earmarked use of State-owned land must also be taken into account, especially as projects initiated by Government in the interest of the public good and/or to give fruition to legislation or Government set goals, could negatively impact on the availability of such land for road building purposes. In this instance, specific care should be taken where land is used or earmarked for (amongst others) the following:

- Land Reform, including Land Reform for Agricultural Development (LRAD)
- Housing or School projects
- Defence or Police Services
- Research (including land belonging to the Agricultural Research Council)

2.3.2 State-owned land controlled by the Department of Rural Development and Land Reform and/or Tribal Authorities

Various tracts of land are either held by the State or are under the control of the Department of Land Affairs as, in terms of the Constitution of South Africa, the Minister of Land Affairs is the custodian of the land on behalf of (*inter alia*) various Tribal Authorities.

Most of these properties are within former Homelands and are linked to Chieftainship boundaries to which no property rights are or were ever linked. Prior to 1994, a titling approach called the Permission to Occupy (PTO) was used, and is still being used in some of these areas. However, except in the Province of KwaZulu-Natal, this system has no legal foundation.

Because of the many difficulties associated with the delivering of freehold titles, many people in the former Homelands are still using and relying on PTO's. Furthermore and as was stated before, various Acts which have given recognition to so-called Informal Rights over land, have also been introduced since 1994. This legislation includes the Extension of Security of Tenure Act, 1997 (Act 62 of 1997), the Land Reform (Labour Tenants) Act, 1996 (Act 3 of 1996) and the Interim Protection of Informal Land Rights Act, 1996 (Act 31 of 1996).

However, in a number of urban areas, PTO type titles have not yet been upgraded, either because of administrative problems (underlying titles have to be cleaned up), or because of planning problems (as-built plans do not conform to the applicable planning norms), or because people simply prefer not to be granted full freehold title as the Banks cannot foreclose on their properties currently held under so-called R293 title.

In some cases, formal ownership of unregistered State-owned land is registered in terms of Certificates of Registered State Title (CRST). Such titles are mostly registered in order to facilitate the parcelling or further sub-division of such land, or to facilitate the land management and/or spatial information management of such land. That is, no new rights and no existing rights (i.e. neither those of the State, nor those of the owners or occupants) are registered or altered through the issuing of CRSTs. The process does, however, involve the undertaking of full cadastral survey to freehold accuracies, as well as the formal registration by the State Attorney of Title Deeds in the relevant Deeds Registry. DWA currently undertakes the obtaining of permission, a survey and registration under the name of the Republic of South Africa for the Minister of Water and Sanitation.

As indicated above, this process has special relevance in respect of un-alienated State-owned land, but it is also applied in respect of land that was previously held by or under the control of the former Homeland Governments and/or the former South African Development Trust and which land is now under the control of the Department of Land Affairs. The reasons for the issuing of CRSTs are mainly related to the complexities associated with and lack of legal clarity regarding overlapping laws (especially at the procedural level) and general legal confusion prevailing in these areas.

Given that this project will impact upon the river and its basin upstream of the dam wall, there will be a need to address the resettlement and compensation issues for affected persons living near to or using land within the river's riparian zone. DWS's DDG NWIR has a special unit dealing with the resettlement of affected persons.

Riparian zones are categorized as those that fall within water courses or wetlands, which in terms of NEMA are defined as follows:

"watercourse" means –

a) a river or spring;
b) a natural channel or depression in which water flows regularly or intermittently;
c) a wetland, lake or dam into which, or from which, water flows; and
d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks;

"wetland" means – land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

In the case of the Ntabelanga Dam basin, the impact on those people that will be affected by the permanently raised water level will be somewhat difficult to accurately quantify for compensation purposes. A Professional Valuator would determine this. Whilst land use of the riparian zone would not normally have been permitted, it is probable that no actions would have been taken if people had previously made use of this land, and a precedent would thus have been set. Best practice would typically recommend that affected people should be compensated for the loss of land lying within the current riparian zone. DWS has previous experience of compensation of unregistered rights and works with a Professional Valuator to facilitate this process.

As these works are to be Gazetted as Government Water Works, and given the expropriation powers likely to become available to Government as provided for under the Infrastructure Development Bill, there would not be a legal requirement to compensate affected people for the particular usage of riparian land. However, given the emotive nature of resettlement and the potential disagreement and unrest that might be caused by an insensitive consultation and compensation policy, great discretion is recommended in this case.

This emphasises that the process to be undertaken must be implemented in close consultation and co-operation with the traditional leaders in the affected areas, and involving the Provincial Departments of Rural Development and Agrarian Reform, Rural Development and Land Reform, and Local Government and Traditional Affairs. The Councillors are the starting point of such a process and the National Departments must be involved as this is State land and not Provincial land. The DRDLR is the custodian of the land.

Provided sufficient cadastral information, etcetera are available, legally prescribed procedures must to be followed in order to acquire portions of such land, which normally takes at least 12 (twelve) to 18 (eighteen) months to get through. The less formalised land allocation and ownership issue that will prevail in this case could easily prolong this acquisition process. Acquiring this type of land can therefore seriously hamper construction works as vacant possession thereof cannot be given or guaranteed before all the required and prescribed formalities have not been concluded.

Taking cognisance of the above, the planning process required to fulfil legislative requirements needs to follow a similar process as shown in Figure 2-1.

The actual expropriation needs are still in the process of being identified under the Independent EIA study that has just recently commenced. These investigations are being based upon the footprints and alignments of infrastructure that will be constructed as temporary or permanent works which have been developed at a Feasibility Study level of detail. The detailed design of these works will further optimise the scheme and as such the general arrangements, alignments, and footprints of the works will often change.

Aerial photography of the dam basin and dam wall location was taken in early 2013 and forms a record of land use and existing structures in that particular area at that time, which can be used as a record to be used as a basis for compensation negotiations.

It should be noted that as soon as affected people in the area realise that there might be infrastructure being developed close to their land, there tends to be opportunistic actions to maximise the potential compensation from the ensuing resettlement or servitude process.

It is therefore recommended that the consultation process includes a careful recording of current structures and land use, and gives early notification to the affected parties that no new development or change of land use should take place in order to leverage more compensation.

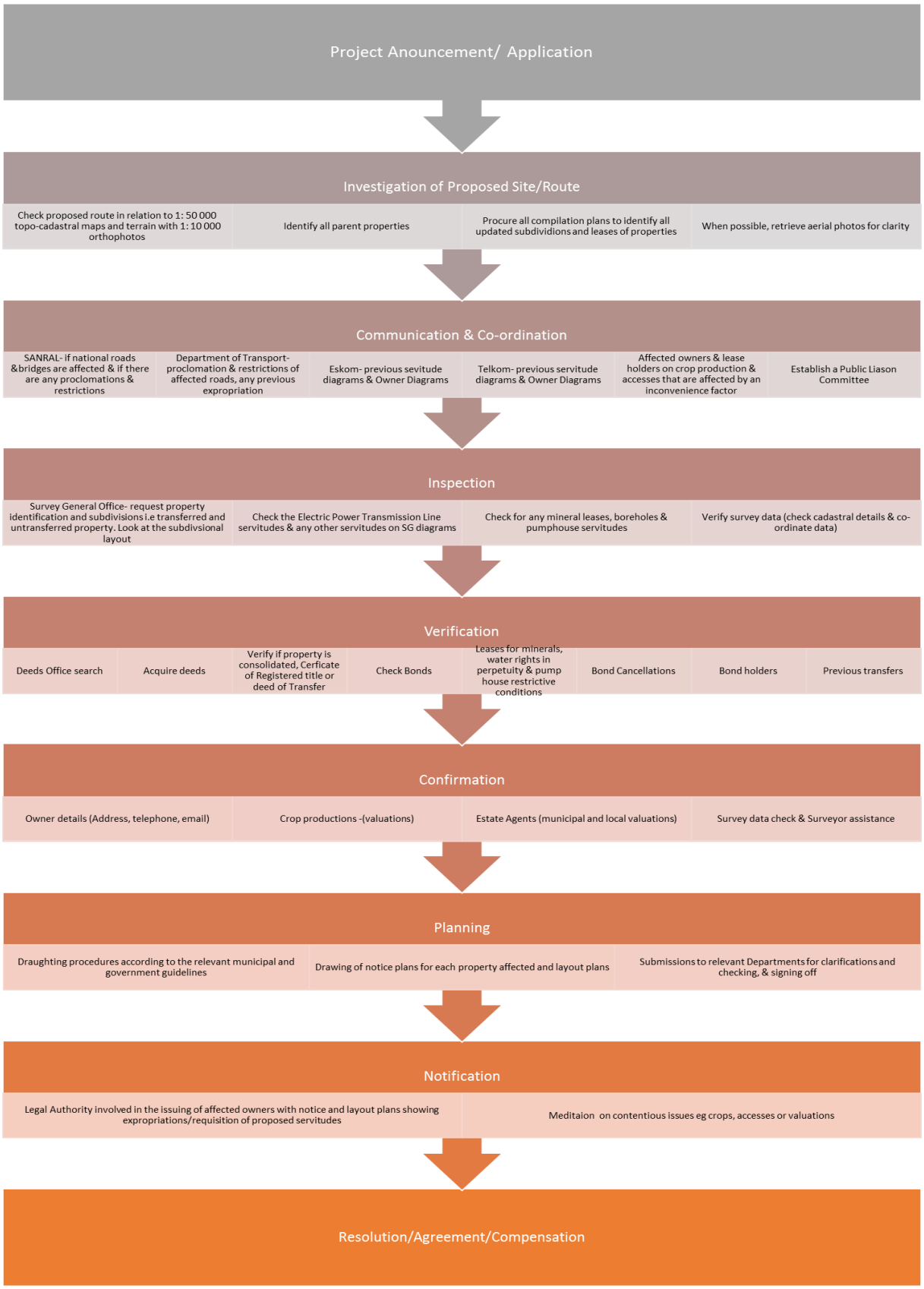


Figure 2-1: Land Expropriation Process

In summary, this project will involve the displacement of people as well as the reform of existing land use of people living on State-owned, traditionally-administered land.

The process to be undertaken must be implemented in close consultation and co-operation with the Traditional Leaders and Councillors in the affected areas, and involving the Provincial Departments of Rural Development and Agrarian Reform, and Local Government and Traditional Affairs.

This will require a dedicated facilitation unit or service provider to be assigned to undertake this process, and significant time and cost will need to be allowed for this process to be implemented.

Allowance has been made in the project budgeting for service providers in this respect, but the quantum of compensation costs can only be confirmed once the resettlement and compensation process to be undertaken under the EIA has been completed.

2.4 Roadways to Construct and Operate the Schemes

Some major road works will be required for the construction and long-term operation of the schemes.

In general, road designs, realignments and upgrades have been designed in accordance with the South African Technical Recommendation for Highways (TRH) standards for such work as detailed in the following documents;

- TRH 4 : Structural design of Flexible Pavements
- TRH 17: Geometric Design of Rural Roads
- TRH 20: The Structural Design Construction and Rehabilitation of Unpaved Roads

2.4.1 Roads and Bridges at Ntabelanga Dam and Associated Works

The local gravel roads on the north and south banks of the Ntabelanga basin (shown in purple on Figure 2-2 are existing low quality access roads to the local settlements, and are normally affected by inclement weather. Some sections of the existing tracks will be inundated by the reservoir water level and will need to be realigned. The main bridge across the river linking the two sides will also be inundated and a new bridge will be constructed just downstream of the dam wall, to restore this main crossing route.

All of these tracks and drainage structures will be upgraded to all-weather gravel roads so that the affected settlements will have improved transport links which are unaffected by the raised water level.

These particular upgrades will total some 32 km of road, which will have a servitude width of some 10 m. As all of these improvements will be aligned along existing tracks, or on currently unoccupied areas, this should have only limited or no resettlement or compensation implications.

The two existing gravel access roads shown in yellow and green are currently low quality roads albeit wider than the above existing gravel roads. It is proposed that both these roads are upgraded to secondary surfaced standards, in order to provide all-weather access to heavy vehicles during construction, as well as leaving behind upgraded transport routes to the larger centres of Maclear, Tsolo, and beyond, for those most affected by the project.

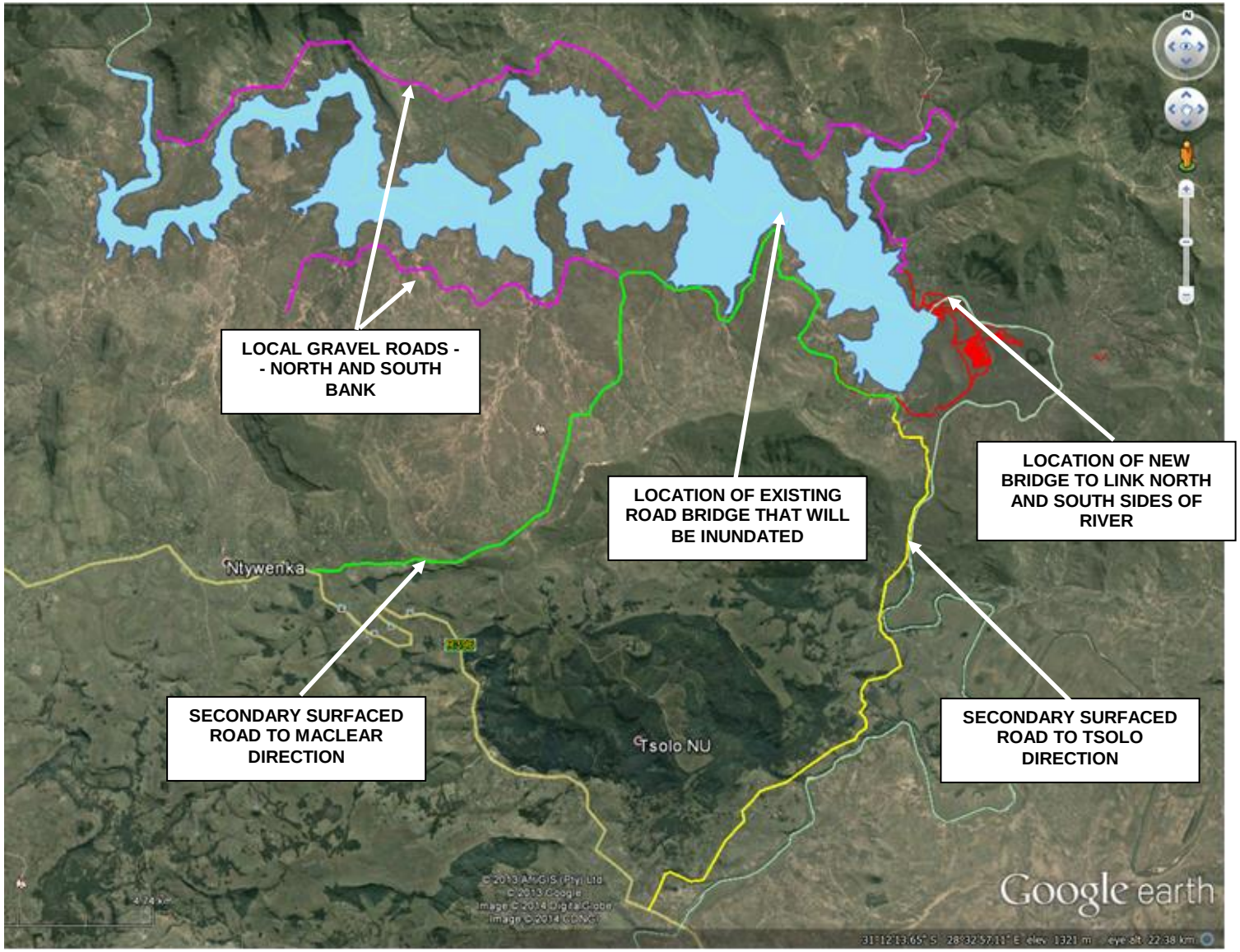


Figure 2-2: Roadways to be Permanently Upgraded at Ntabelanga

These two route upgrades will also contribute to improvement of the economy in the area by improving speed and ease of access for business and private travel as well as opening up tourism in the area. Better road quality also reduces wear, tear and maintenance to vehicles using the road.

These upgrades will be to a higher standard than the other roads above, and will be two lane carriageways (one each way) with and servitude width of between 20 m and 30 m (depending on terrain).

The Maclear route would be some 18.9 km long and the Tsolo link some 12.9 km long. Once again, these improvements will be primarily aligned along existing routes, and this should have only limited or no resettlement or compensation implications.

Figure 2-3 shows new roads that will have to be constructed at the dam wall itself, and its appurtenant outlet works, hydropower plant, water treatment works and offices, staff housing, and pumping station site.

A new dam site access road will be required which will connect with the above upgraded road in from the Tsolo direction, and will run through the new operational works as shown.

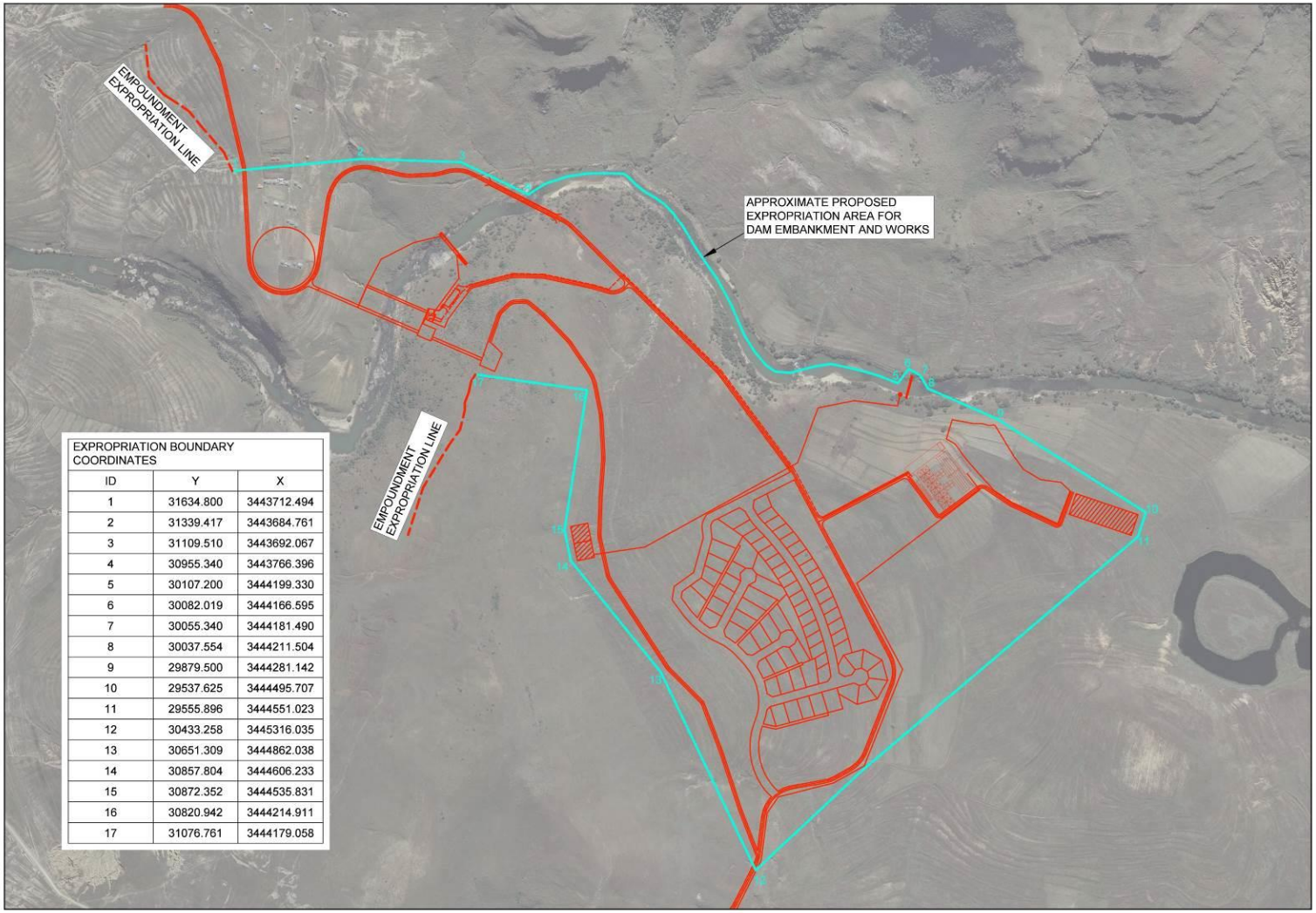
This road will have service roads branching off it to the temporary water works, the staff housing, the hydropower plant, the water and wastewater treatment plants, the pumping stations, accesses to the dam wall and outlet works, and then across the new river bridge to link with the upgraded existing roads on the north bank of the scheme.

The length of this new road will be approximately 5 km and will have a servitude width of approximately 20 m. The existing land use features some subsistence agriculture which fields are fenced, but no habitable structures.

The site (as bounded in light blue) as a whole would need to be expropriated in its entirety, and the boundaries of this land required are given below.

This will include a site for a proposed visitor's centre, which will required resettlement involving two or three existing dwellings that can be seen on the figure.

The layout of these roads and associated works on Figure 2-3 will be reviewed during the detailed design of the works, and the geometry may therefore change.



EXPROPRIATION BOUNDARY COORDINATES		
ID	Y	X
1	31634.800	3443712.494
2	31339.417	3443684.761
3	31109.510	3443692.067
4	30955.340	3443766.396
5	30107.200	3444199.330
6	30082.019	3444166.595
7	30055.340	3444181.490
8	30037.554	3444211.504
9	29879.500	3444281.142
10	29537.625	3444495.707
11	29555.896	3444551.023
12	30433.258	3445316.035
13	30651.309	3444862.038
14	30857.804	3444606.233
15	30872.352	3444535.831
16	30820.942	3444214.911
17	31076.761	3444179.058

Figure 2-3: Expropriation Area (light blue) for Ntabelanga Dam and Appurtenant Works

2.4.2 Roads and Bridges at Lalini Dam and Associated Works

a) Main Access Road

Figure 2-4 shows the existing District Road DR 08170 linking the N2 national road near to the Tsolo to Maclear road junction with the villages of Lotana and Lalini in the vicinity of the dam and hydropower infrastructure locations.

This existing gravel road also services the settlements of Madadeni, Gwali, Upper Lotana, Cingcosdwadeni, Ngcolorha, Manzimabi, Mahoyana, and Mbutho.

This 17.4 km "Main Access Road" provides the best access to the dam and tunnel construction sites from the main road and does not have any major bridge crossings to contend with. Some donga crossing would need to be widened and upgraded to carry heavy loads.

In addition to construction traffic, this road would be the main route used for the delivery of the heavy electromechanical components of the HEP, which will require abnormal load vehicles able to transport loads of up to 100 tonnes.

Thus it is proposed that this road be upgraded geometrically and structurally to cater for heavy construction traffic and abnormal vehicles that are anticipated to be used in the construction activities. This district road would, however, remain a gravel surfaced road. Provision has been made in the costing to refurbish the upper base courses to a high standard gravel road once construction has been completed in order to ensure that the road is handed back to the Provincial Roads Department in an acceptable state.

From this main access road, several new roads will need to be constructed for both construction and permanent access purposes. These are shown on Figure 2-5.

b) Dam and Pipeline Access Roads

The 4.2 km roads shown in blue will be new roads. These roads will be initially established as gravel haul roads for use by normal construction vehicles. However as this will be the main permanent access route to the Lalini Dam and mini-hydropower plant, the road would be upgraded to a double sealed surface, once main construction activities have ceased.

c) Tunnel Entrance Portal Access Road

This 1.3 km road shown in dark green will be a new road to the upper entrance to the tunnel. The road would be constructed as a gravel haul road for use by normal construction vehicles. It will mainly be used during the construction of the tunnel portal section, and during the delivery and installation of the pipeline section within the tunnel. As frequent access to the tunnel in the future would not be required, this could remain a gravel road.

However, as this section of road is relatively short it is recommended that this also be upgraded to a double sealed surface, once main construction activities have ceased.

d) Access to the Main HEP and Tunnel Exit Portal

The access road to the main HEP building and outlet portal of the tunnel is the highest priority road. This road has exacting requirements in terms of gradients and load carrying capacity, and yet has to traverse the most difficult terrain on the whole project.

This road will be used as the main construction haul link for the tunnel and HEP building construction. It will also be the route along which the abnormal loads (up to 100 tons) travel when delivering the hydropower electro-mechanical and transformer components, and for servicing and replacement of such plant in the future.

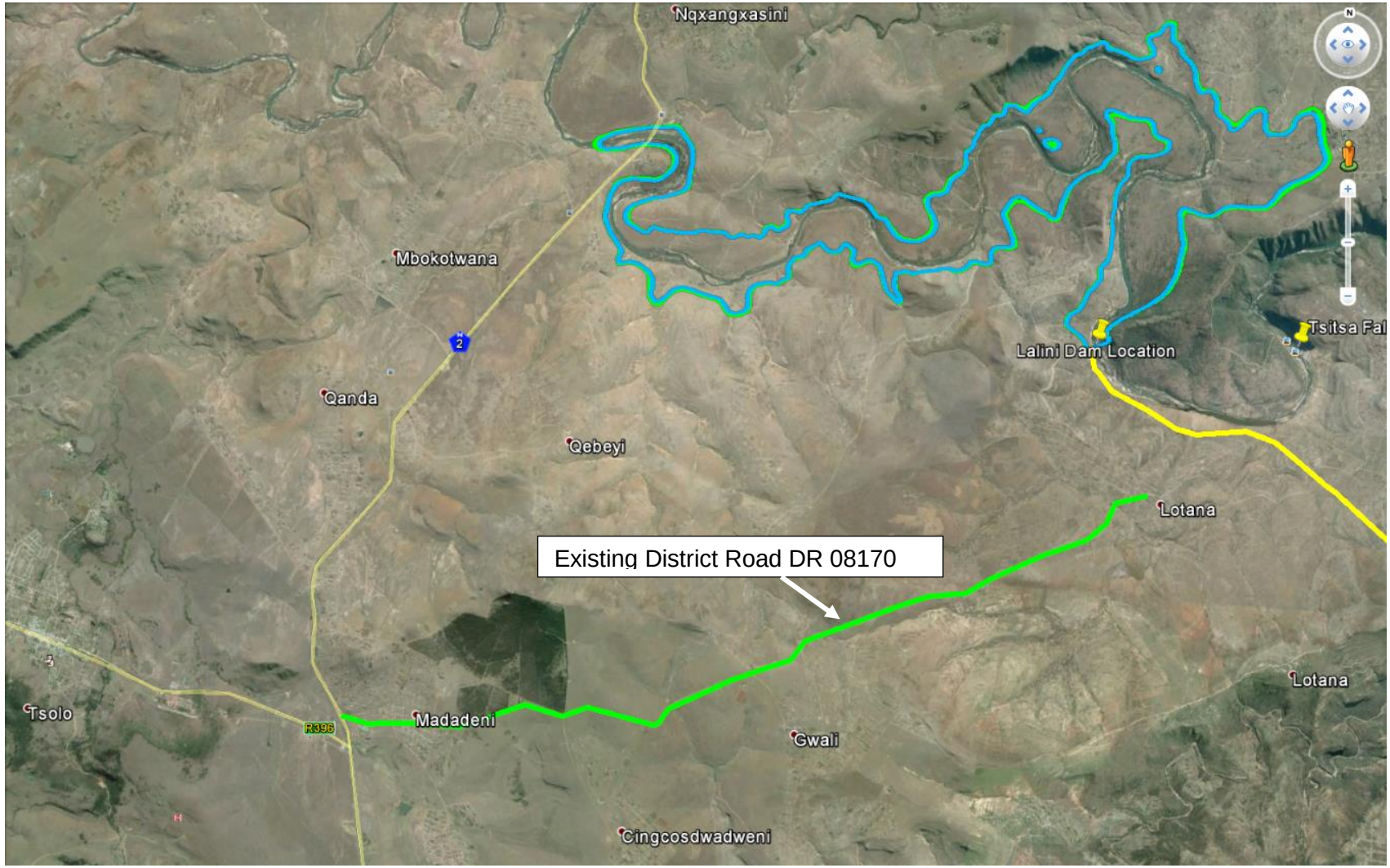


Figure 2-4: Main Access Road to Lalini Infrastructure Construction Locations

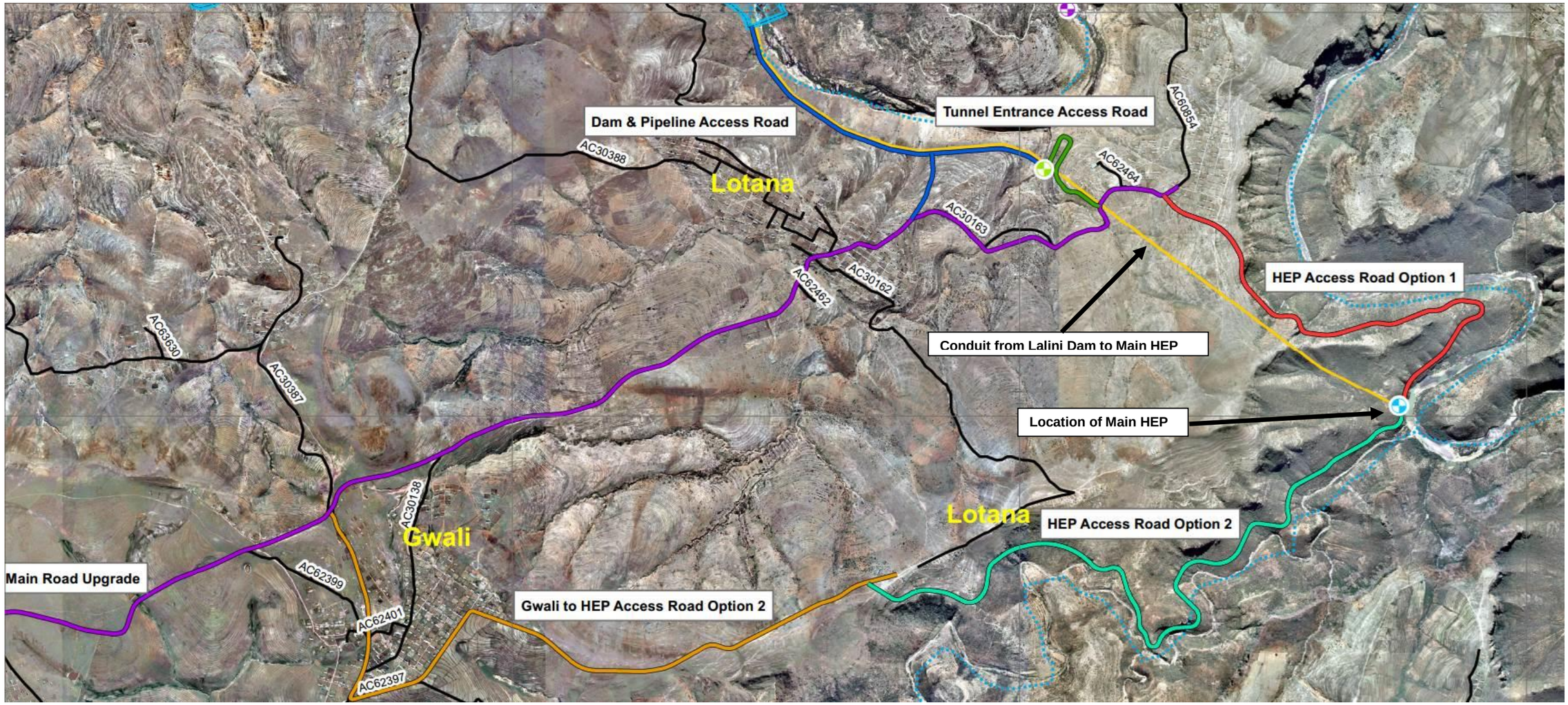


Figure 2-5: Main Access Road and Other Roads to Lalini Scheme Construction Sites

Two options were investigated, and these are shown as HEP Access Road Option 1 (red) and HEP Access Road Option 2 (light green) in Figure 2-5.

Option 1 provides serious challenges in that it requires large cuts and fills to be constructed at significant costs. Therefore Option 2 was also investigated. Option 2 follows the valley wall of a south west tributary of the Tsitsa River flowing from Gwali to the HEP location.

The geometric design criteria for Option 2 were the same as for Option 1, and it was easier to achieve vertical alignment grades ranging between 1.5% and 10%, with the requirement of retaining walls reduced proportionally to that of Option 1.

Whilst this access road provides more suitable operational conditions for the abnormal vehicles, it would be, at 8.1 km long, significantly more expensive to construct than Option 1, which is 5.3 km long.

In addition, Option 2 also requires the upgrading of a further 8.2 km of the existing roads from the main access road at Gwali to the start of the new Option 2 HEP Access Road. Technically Option 2 will be easier to construct, but it will be significantly longer and more expensive, and will also impact a larger area of sensitive vegetation.

Whilst option 1 is the recommendation from the feasibility study, both options should be revisited at detailed design stage in the light of further geotechnical investigations, detailed Environmental Impact studies and more detailed technical and financial optimisation.

e) Gwali to HEP Option 2 Existing Road Upgrade

This 8.2 km long section of road would need to be upgraded if Option 2 were to be adopted. The geometric standards and layer works would be the same as for the Main Access Road.

At this feasibility design level of study, Option 1 has been adopted as being the preferred option, but it is recommended that further detailed investigation and optimisation of the HEP Access Road route be undertaken at the detailed design stage. This optimisation should take all relevant factors into consideration, such as technical aspects, construction difficulty, cost and permanent impact on the environment.

f) Roads and Bridges: Upgrades and Realignment

Other major road works will be required to undertake the realignment of infrastructure that will become inundated once the Lalini Dam has been commissioned. The layouts of these roads are shown on Figure 2-6.

g) Mtshazi Main Road

The impoundment of Lalini Dam will inundate some existing roads as well as drowning an existing river crossing vehicular bridge. The latter connects the village of Lalini with the settlements of Mtshazi, Shawbury, and the main N2 national road to Qumbu and Mthatha.

District Road DR 08167 shown in pink is a tarred road, is the main access from these villages to the N2, and is also a main tourist route for visitors to the Thina and Tsitsa Falls.

This 10.4 km road is currently in a pot-holed state, and some 40% of the existing route will need to be realigned to ensure that it passes outside of the future inundated area.

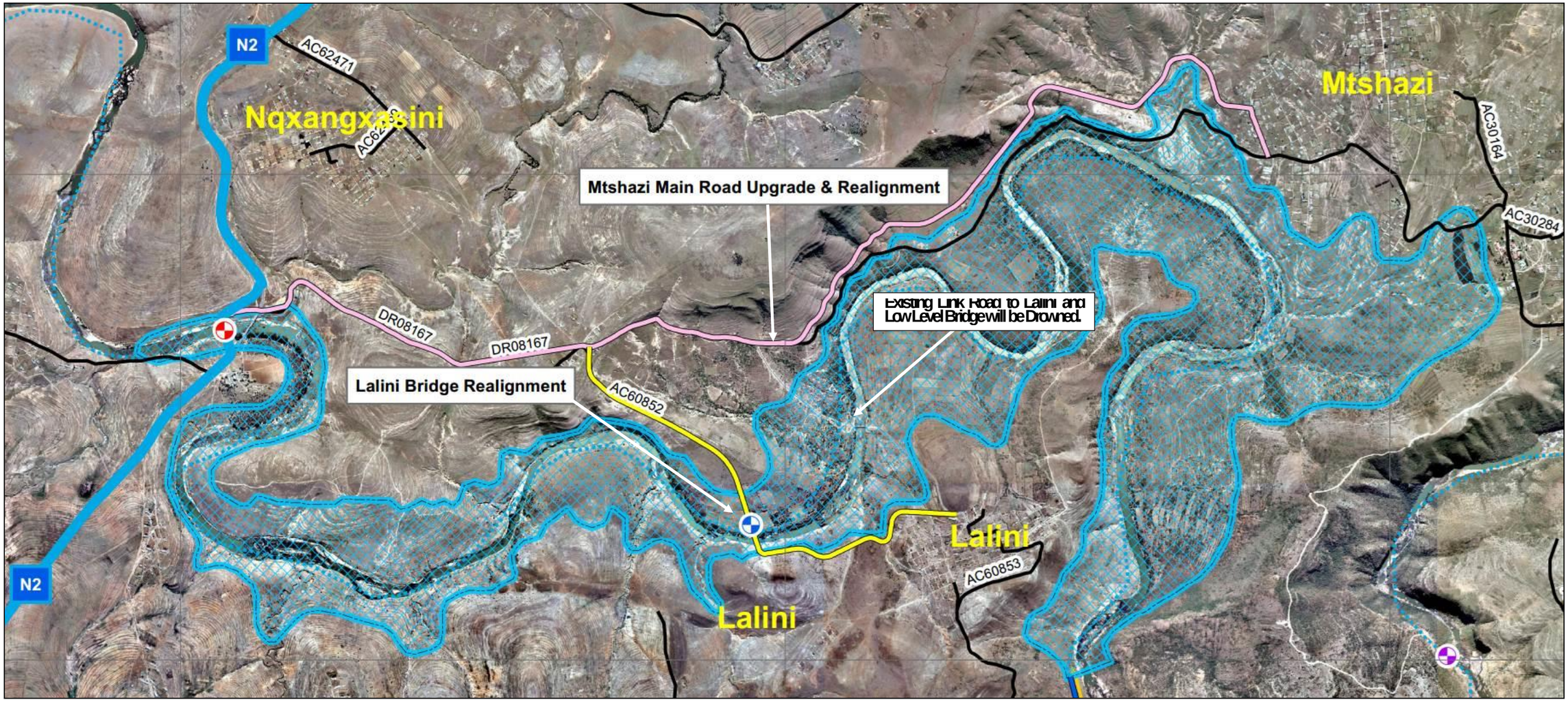


Figure 2-6: Roads and Bridges to be Permanently Upgraded and Realigned at Lalini Dam

h) Lalini Bridge Relocation

The existing link road from the above Mtshazi road to Lalini village crosses the Tsitsa River via a low level single track vehicular bridge, which was constructed by SANRAL. This carries both vehicular and pedestrian traffic and is the main route for Lalini residents to travel to Mtshazi, Shawbury and the main N2 national road.

This existing bridge and road will be permanently drowned by the impoundment of Lalini Dam.

Alternative routes were sought to replace this route, which included a new road from Lalini along the south bank of the river and connecting to the N2. Unfortunately this would increase the travelling distance for journeys from Lalini to Mtshazi and Shawbury by 15 km. This would be highly unacceptable for pedestrians which include children going to school. If this option were adopted, then a high level footbridge would also be required to cater for the pedestrian users. This option would however still not be an acceptable solution as far as additional travel distance and time required by the vehicular road users.

The EIA study team were consulted and it was suggested that in such circumstances the solution should follow the principles of a “like-for-like” replacement. In order to meet the SANRAL standards, the bridge deck soffit would be required to be at an elevation providing 1.4 m freeboard above the 1 in 100 year flood level. This results in a bridge deck length of 450 m.

The alignment of the new link road and bridge is shown in yellow on Figure 2-6.

A general arrangement of the proposed bridge is given in Figure 2-7.

A multi-purpose bridge was therefore designed which has a single track vehicular way and a barrier-protected pedestrian walkway. Given the long length of the bridge, the vehicular carriageway has two widened waiting bays for vehicles to pass each other. The bridge must meet SANRAL design standards.

The 4.4 km new link road connecting the bridge to the existing Mtshazi road and to the existing main road into Lalini, would be designed to the same standards and have the same layer works as for the district road DR 08167 above, and would therefore be a tarred surface road.

2.4.3 Road Servitudes at Ntabelanga and Lalini Schemes

Many of the works to be undertaken would be upgrades to existing road alignments for which servitudes have already been allocated.

Where new roads or road realignments are required, the servitude width will be between 20 and 30 m depending upon the standard of the road and the terrain through which it is passing. This will be confirmed during the detailed design stage of implementation.

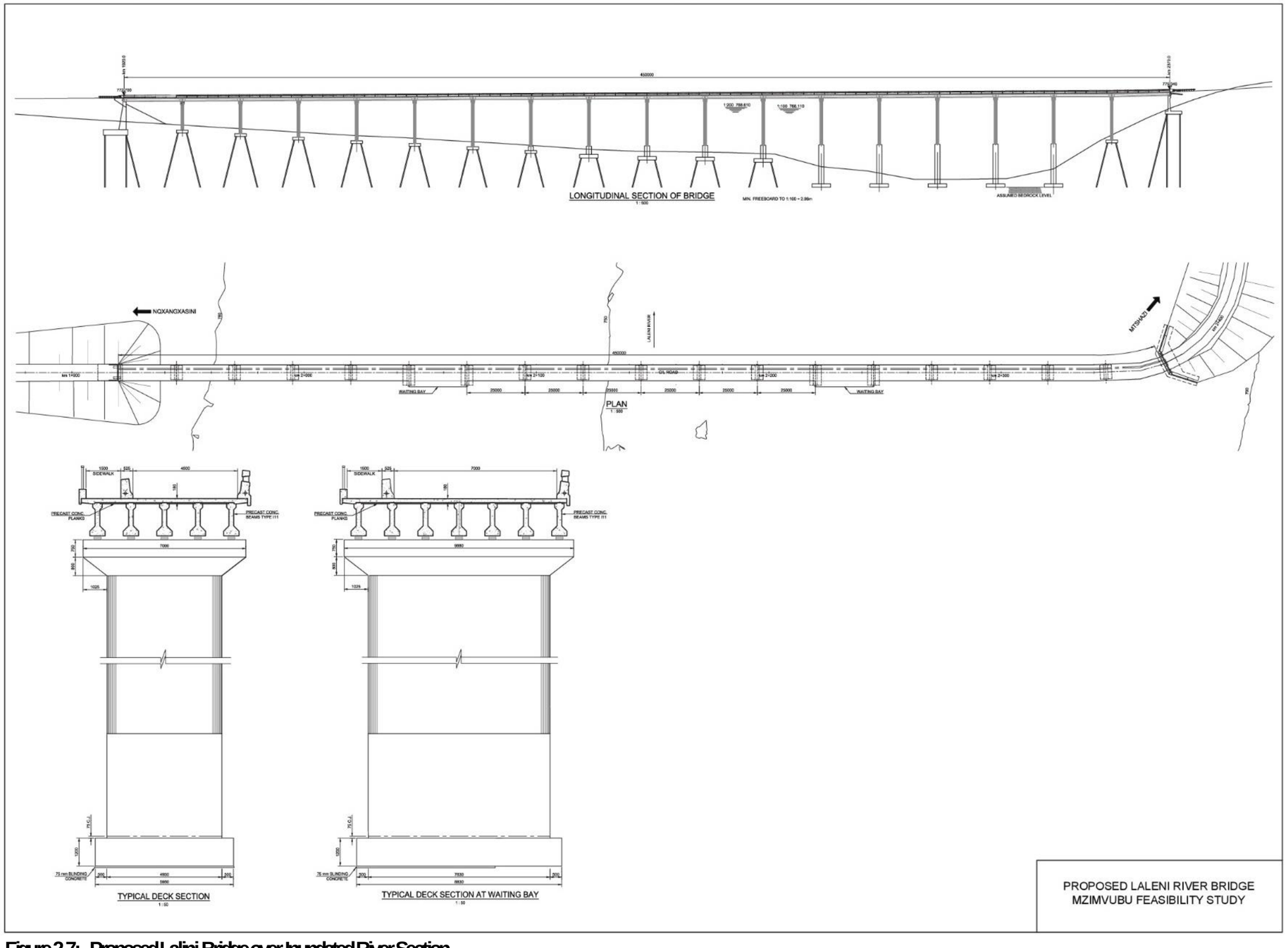


Figure 2-7: Proposed Lalini Bridge over Inundated River Section

2.4.4 Ntabelanga and Lalini Dam Walls and Appurtenant Structures

The Ntabelanga Dam wall and appurtenant structures are those that are shown on Figure 2-3. This also includes the area of land that will be required to accommodate the proposed visitor's centre on the left flank of the dam wall. Apart from the visitor's centre, no habitable structures or buildings are present, but there is currently some crop growing activity and some fencing in the area where the access road and housing would be located.

The Lalini Dam wall and appurtenant structures are those that are shown on Figure 2-8. This also includes the area of land that will be required to accommodate the proposed visitor's centre on the right flank of the dam wall and the operations offices and accommodation village. Whilst one or two dwellings the lie close to the accommodation village might be affected, no other habitable structures or buildings are present, and there is apparently no crop growing activity within the works area boundary.

The main hydropower plant (HEP) at Lalini will be located in the Tsitsa River valley downstream of the Tsitsa Falls as shown on Figure 2-5. This will be serviced from the access road described above, and will initially comprise a platform cut into the hillside to form a construction working area at the tunnel exit portal.

This platform will also be excavated deeper to construct the hydroelectric plant building and to lay the steel conduit from it exit point at the tunnel portal into the HEP building. Figure 2-9 shows the layout of these works and the co-ordinates of the land that would need to be expropriated.

All of the above land described in this section would need to be expropriated as Government Water Works.

2.5 Ntabelanga Pipeline Routes, Bulk Storage and Pumping Station Sites

The layouts of the Ntabelanga primary and secondary pipelines and sites where bulk storage and/or booster pumping stations are located are shown on Figure 2-10.

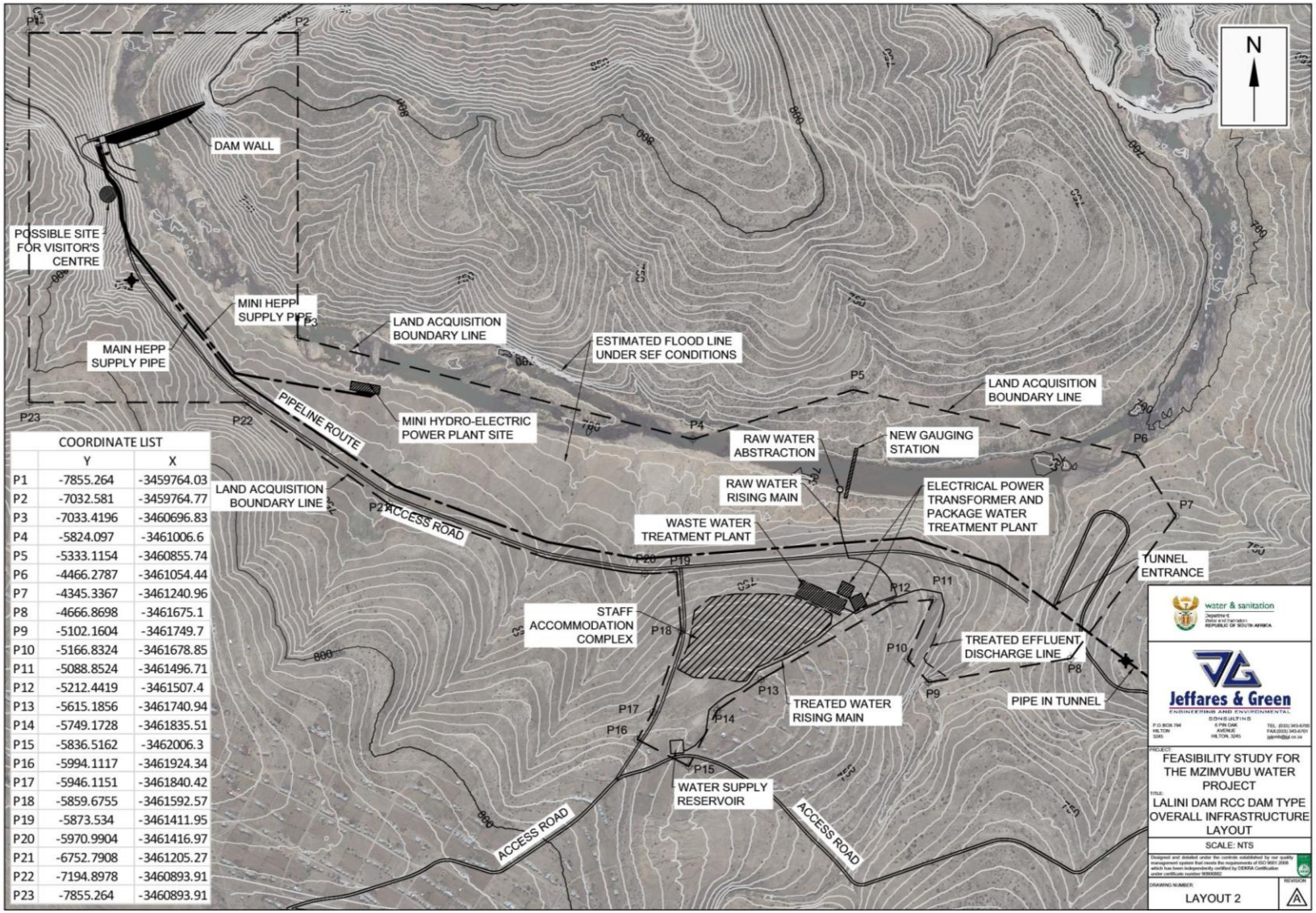
All of these routes are planned at a feasibility study level of detail only, and further detailed planning and detailed design is currently being undertaken for some parts of this system, and will be further reviewed by others during the detailed design stage. Some of the secondary pipelines have recently been constructed and EIA and servitude issues are therefore already dealt with[2].

More detailed alignments of these pipeline routes, pumping station and reservoir locations are given in the Book of Drawings attached to the Main Report No. P WMA 12/T30/00/5212/4, and the Bulk Water Distribution Infrastructure Report No. P WMA 12/T30/00/5212/13, which include co-ordinates of these alignments and locations.

Many of the existing (Blue Triangles) storage sites will need to be expanded in the longer term and this may require permanent land acquisition for the increased site footprint. The new (Red Triangles) Command Reservoir sites will each required permanent land acquisition as well as servitudes for access roads, to be finalized during the detailed design stages.

On average, these sites will be approximately 80 m x 60 m in extent (ie approximately 0.5 ha). Two of these sites will also include new booster pumping stations and will therefore require a larger footprint, say 100 m x 80 m). Three other small booster pumping stations will also be required (Green Pentagons), each of which will also require permanent land acquisition, with an average footprint of 40 m x 30 m.

[2] *Details can be obtained from the Implementing Agent - Amatola Water, East London*



COORDINATE LIST		
	Y	X
P1	-7855.264	-3459764.03
P2	-7032.581	-3459764.77
P3	-7033.4196	-3460696.83
P4	-5824.097	-3461006.6
P5	-5333.1154	-3460855.74
P6	-4466.2787	-3461054.44
P7	-4345.3367	-3461240.96
P8	-4666.8698	-3461675.1
P9	-5102.1604	-3461749.7
P10	-5166.8324	-3461678.85
P11	-5088.8524	-3461496.71
P12	-5212.4419	-3461507.4
P13	-5615.1856	-3461740.94
P14	-5749.1728	-3461835.51
P15	-5836.5162	-3462006.3
P16	-5994.1117	-3461924.34
P17	-5946.1151	-3461840.42
P18	-5859.6755	-3461592.57
P19	-5873.534	-3461411.95
P20	-5970.9904	-3461416.97
P21	-6752.7908	-3461205.27
P22	-7194.8978	-3460893.91
P23	-7855.264	-3460893.91

Figure 2-8: Expropriation Boundary Co-ordinates for Lalini Dam Wall and Appurtenant Works

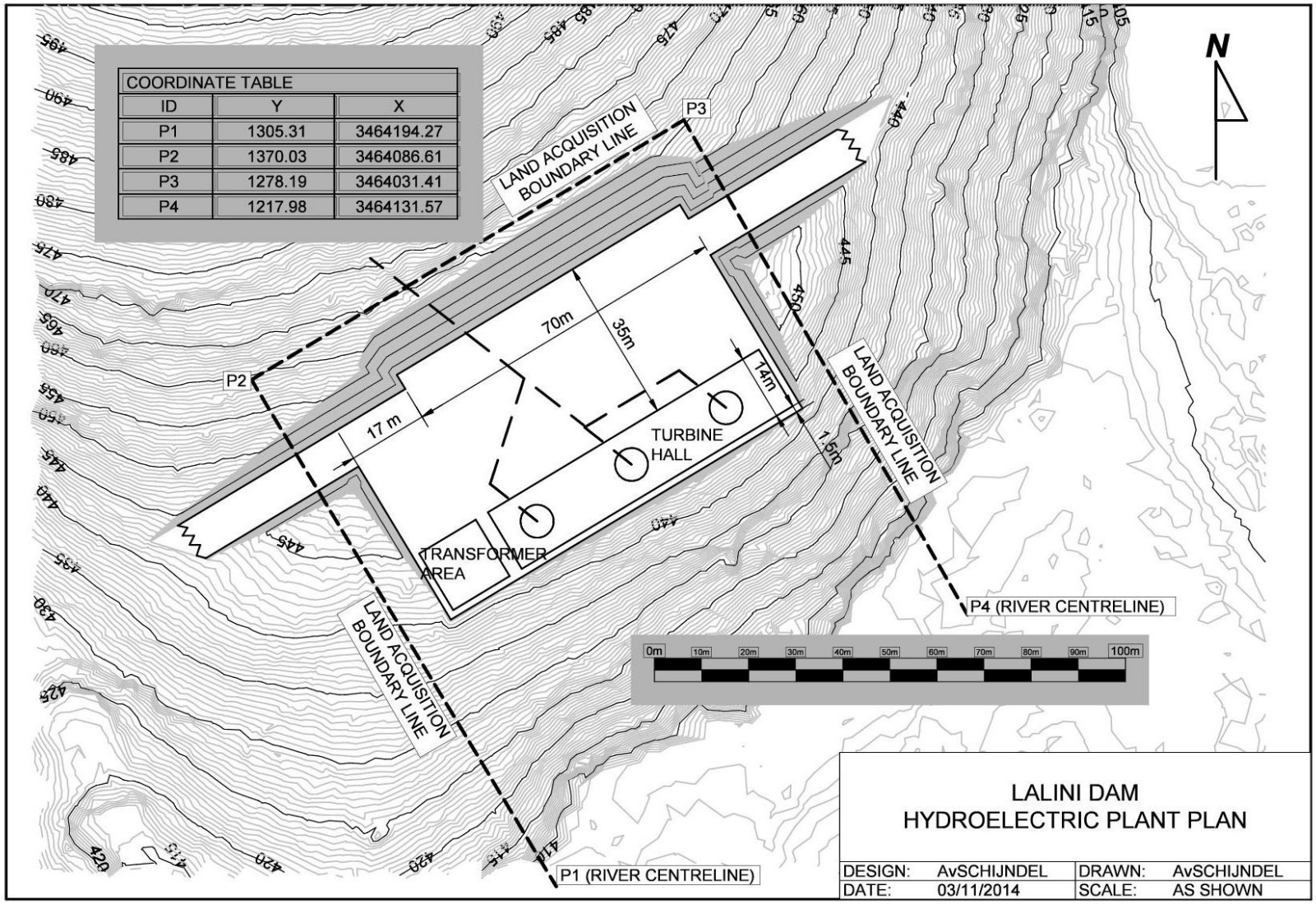


Figure 2-9: Expropriation Boundary Co-ordinates for Lalini Main Hydropower Plant and Tunnel Portal

The primary and secondary pipelines will comprise the following:

Table 2-1: Quantities and Sizes of Primary and Secondary Pipelines

Primary and Secondary Bulk Pipelines			
Item	**Description**	**Unit**	**Quantity**
1	Pipelines – supply, lay, joint, test, disinfect		
1.1	Bulk Pipelines		
1.1.2	50 HDPE Class 12	m	34 103
1.1.3	63 uPVC Class 12	m	2 633
1.1.4	75 uPVC Class 12	m	6 725
1.1.5	90 uPVC Class 12	m	86
1.1.6	110 uPVC Class 12	m	8 925
1.1.7	160 uPVC Class 12	m	10 326
1.1.8	200 uPVC Class 12	m	8 742
1.1.9	250 uPVC Class 12	m	12 100
1.1.10	315 uPVC Class 12	m	17 565
1.1.11	355 uPVC Class 12	m	12 085
1.1.12	400 uPVC Class 12	m	28 044
1.1.13	450 uPVC Class 12	m	4 917
1.1.14	500 steel	m	45 437
1.1.16	600 steel	m	29 261
1.1.17	700 steel	m	11 692
1.1.19	900 steel	m	15 691
		Total	**248 332**

All of the above sites will require low to medium voltage power supplies. The process followed would be to make application to ESKOM for a connection to each site, and ESKOM then undertake the planning and installation process. ESKOM would therefore deal with land matters and EIA with regard to these power line routings.

As is shown on Table 2-1, some 250 km of pipelines will be constructed, ranging in diameter from 50 to 900 mm. These will be in PVC, HDPE, and steel materials, depending in diameters and pressure classes required. These pipes will normally be laid with a minimum crown cover depth of between 900 and 1 500 mm below ground level.

The pipeline routes will also feature other structures such as valve, air valve, and scour valve chambers (normally made of brick, concrete rings, or reinforced concrete), which will protrude above ground surface level when completed and need to be accessible by the operational staff at all times. Most of these pipelines are routed along existing tracks and roads, and can normally be aligned to avoid property, graves and other structures as much as possible, although sometimes conflicts are unavoidable and some relocation or compensation will be required.

The pipeline routes will all need a temporary servitude typically of width 20 m during construction, to allow space for the works to take place, and stock-piling of excavated material etc. During the operational phase a permanent servitude of width of between 6 and 10 m would be required (depending on pipeline size and terrain) to allow for operational access to the line at all times.

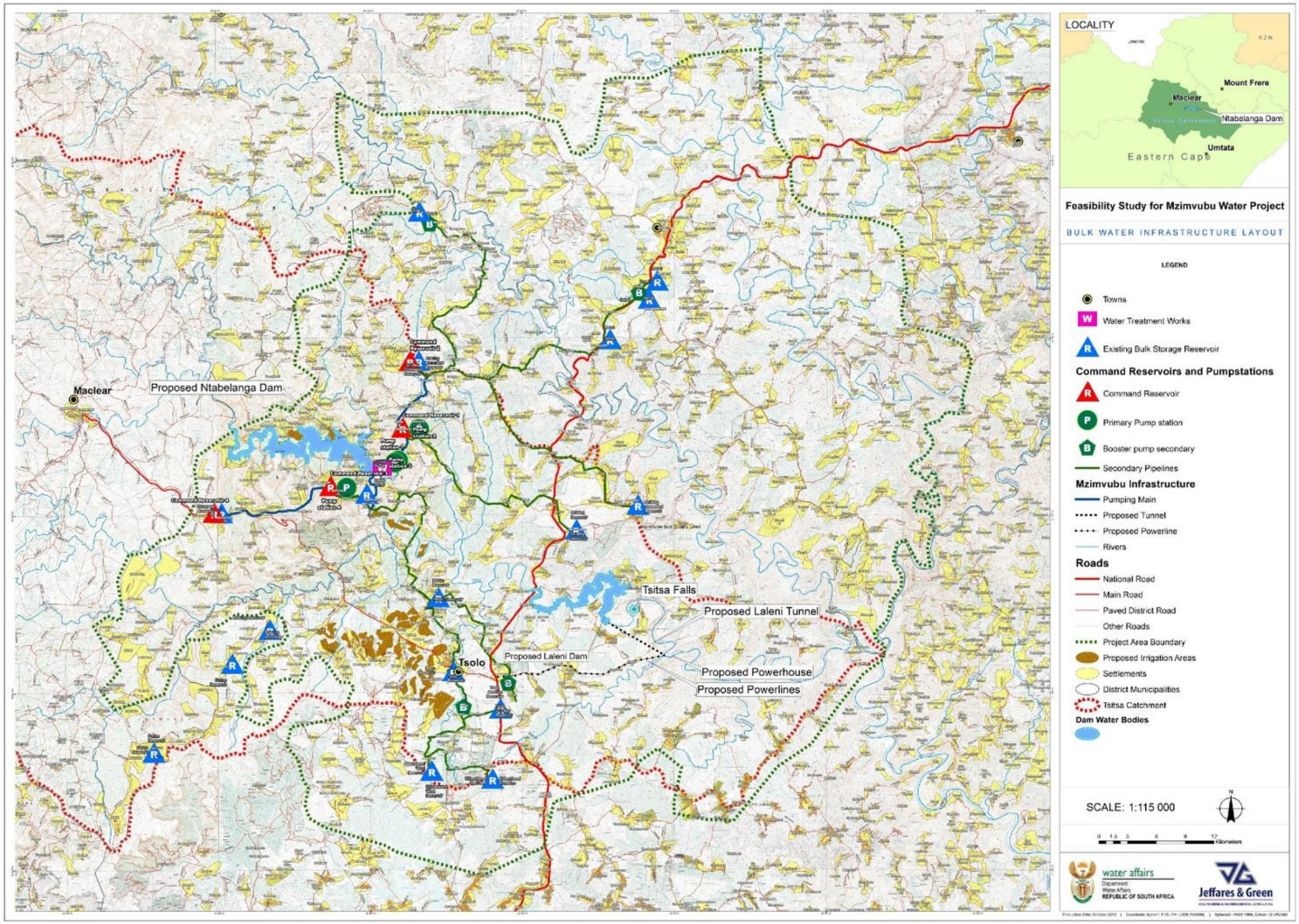


Figure 2-10: Layout of Primary and Secondary Bulk Pipelines and Sites

Where routes unavoidably pass through arable land, permission can often be granted for land-users to continue to grow crops over the alignment, provided deep ploughing or use of heavy plant and equipment is not employed.

It is reiterated that the alignments and operation arrangement of this infrastructure may change during the detailed planning and design stage.

2.6 Lalini Hydropower Conduit Route and Hydroelectric Plant Site

As shown on Figure 2-5, the route of the Lalini hydropower water transfer conduit from the dam to the main hydroelectric plant (HEP) initially runs roughly parallel to the Tsitsa river downstream of the dam wall and will be constructed as a 2 500 mm diameter welded steel pipeline laid in an excavated trench with a normal depth of cover to the crown of the pipe of 1 000 mm. This conduit would be twinned from the Lalini Dam outlet works to the mini-hydropower plant, then continue as a single 2 500 mm diameter pipeline to the main HEP, which is some 7.95 km from the Lalini Dam. At a point 3.5 km from the dam, the pipeline enters a tunnel section within which it will be laid to emerge close to the main HEP.

Given the large diameter of this conduit, a temporary servitude of 30 m width would be required during construction, whence a permanent servitude of 10 m would be required. The entrance and exit portals of the tunnel will require significant temporary servitudes for working areas during construction but only limited permanent land expropriation at each location to allow access to the tunnel and its pipeline for maintenance purposes.

2.7 Dam Basin Expropriation Boundary

Figure 2-11 and Figure 2-12 show the probable land expropriation area boundaries for the Ntabelanga and Lalini dam basin areas which will be inundated. This is based upon the greater of the 1 in 100 year flood water level, or 15 m horizontally from the full supply water level. The settlements that might be impacted by this expropriation requirement are indicated on the figures.

The co-ordinates of these preliminary expropriation boundaries are given in Appendices A and B.

Each expropriation line will need to be reviewed during the detailed design and a survey carried out to install permanent beacons defining the expropriated land. This will involve some “smoothing” of the boundary of the expropriated land into straight lines between beacons, and DWS will acquire that land in terms of the surveyed lines.

Given that this project will impact upon the river and its basin upstream of the dam wall, there will be a need to address the relocation and compensation issues for affected persons living near to, or using land within, the river’s riparian zone. Refer to DWS EIA Report Nos. P WMA 12/T30/00/5314/1 to 17

In the case of the dam basins, the impact on those people that will be affected by the permanently raised water level is difficult to accurately quantify for compensation purposes at this feasibility stage. The land in question will need to be valued by a professional valuator, and the affected parties will be compensated in accordance with the valuator’s report, in accordance with normal DWS practice.

Figure 2-11: Ntabelanga Dam Basin Preliminary Expropriation Area

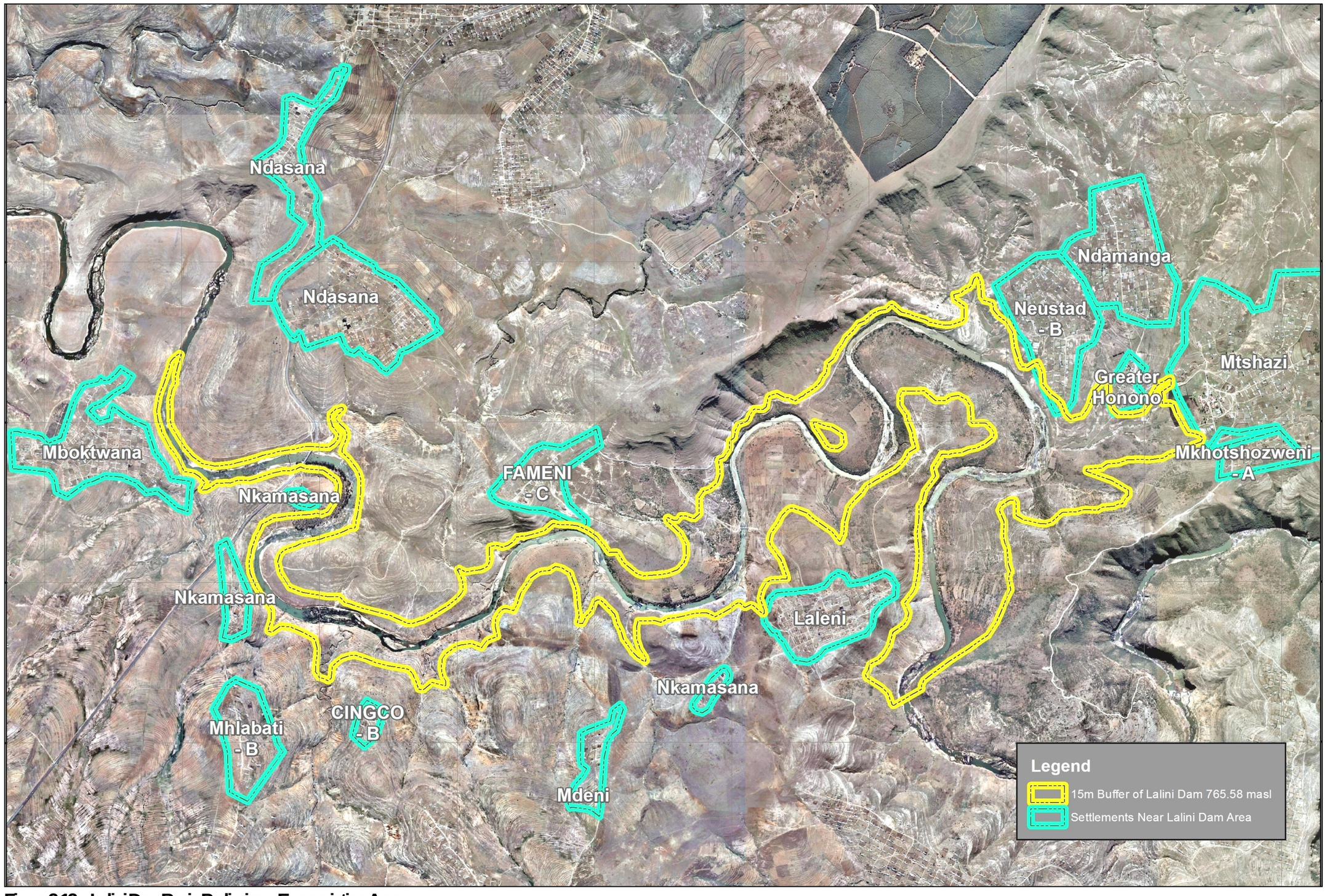


Figure 2-12: Lalini Dam Basin Preliminary Expropriation Area

Whilst land use of the riparian zone would not normally have been permitted, it is probable that no actions would have been taken if people had previously made use of this land, and a precedent would thus have been set. Best practice would typically recommend that affected people should be compensated for the loss of land lying within the current riparian zone, although this is not necessarily compulsory.

In this area, the affected land will have been allocated to a Kgosi, Chief or CPA, and with rural development land, the Chief as well as the affected parties are compensated for different reasons. It will be important to consult with the correct Chief in each area.

As these works are to be Gazetted as Government Water Works, and given the expropriation powers likely to become available to Government as provided for under the Infrastructure Development Bill, there would not be a legal requirement to compensate affected people for the particular usage of riparian land. However, given the emotive nature of resettlement and the potential disagreement and unrest that might be caused by an insensitive consultation and compensation policy, great discretion is recommended in this case

DWS have legal powers to expropriate land, and used both the Water Act and the Constitution in doing so. It is therefore reiterated that it is a legal requirement to compensate all affected parties and this means that different kinds of compensation are often required for different people on the same portion of land.

Provided sufficient cadastral information, etcetera are available, the legally prescribed procedures to be followed in order to acquire portions of such land normally take at least 12 (twelve) to 18 (eighteen) months to get through. The less formalised land allocation and ownership issue that will prevail in this case could easily prolong this acquisition process.

Negotiations play a big role in such matters and if handled sensitively can allow construction to proceed before all of the land issues are dealt with and finalized. This must be done by an experienced practitioner otherwise unrealistic expectations can occur. The Department of Rural Development and Land Reform (DRDLR) should play a major role in this respect. Compensation paid must be in line with a professional valuator's report as well as DRDLR's policies.

The actual expropriation needs are being identified under the Independent EIA study. These investigations are being based upon the footprints and alignments of infrastructure that will be constructed as temporary or permanent works which have been developed at a Feasibility Study level of detail. The detailed design of these works will further optimise the scheme and as such the general arrangements, alignments, and footprints of the works will often change.

The final survey lines and control beacons established during the detailed design will inform DWS as to the final nature and quantum of the expropriation and compensation requirements.

Aerial photography of the dam basin and dam wall locations was taken in early 2013 (Ntabelanga) and in 2014 (Lalini) and forms a record of land use and existing structures in that particular area at that time, which can be used as a guide to be used as a basis for compensation negotiations. However, the basis of compensation is what is on the land at the exact moment the valuator has his meetings with the affected parties.

It should be noted that as soon as affected people in the area realise that there might be infrastructure being developed close to their land, there tends to be opportunistic actions to maximise the potential compensation from the ensuing resettlement or servitude process.

This is unfortunate but can be controlled with the assistance of the local Chief and Councillors, but adherence to protocol and an approved Record of Decision is required. Local development within affected lands cannot be stopped until there is a 100% certainty that the project is going to commence. In the period before the project construction commences it would likely be impossible to prevent people developing lands that would be expropriated. This emphasises the need for the EIA consultation process to not create expectations and to only discuss land issues at an appropriate time.

It is therefore recommended that the consultation process includes a careful recording of current structures and land use, and gives notification to the affected parties that no new development or change of land use should take place in order to leverage more compensation. However, as reiterated above, this must only be undertaken at a time when the project is definitely about to commence.

It is also reiterated that the process to be undertaken must be implemented in close consultation and co-operation with the traditional leaders in the affected areas, and involving the Provincial Departments of Rural Development and Agrarian Reform, Rural Development and Land Reform, and Local Government and Traditional Affairs. The Councillors are the starting point of such a process and the National Departments must be involved as this is State land and not Provincial land. The DRDLR is the custodian of the land.

This will require a dedicated facilitation unit or service provider to be assigned to undertake this process, and significant time and cost will need to be allowed for this process to be implemented. DWS is able to do this as it is a part of their duties on a regular basis.

From preliminary analysis, the indications are that the buildings of between 20 and 40 households could be affected directly by the flooded dam basin, but more households in the zones lying closest to the river course could also be affected as regards the use of some of the land allocated to them for the growing of crops or livestock grazing.

It would appear that a fairly high proportion of this land is not suitable or regularly used for crop production, some is highly eroded and unsuitable for any usage, and a significant proportion is classed as riparian, and should not be used for arable or grazing purposes. This exercise is only indicative of the general scale of implications of the inundation of the basin, and the EIA Report better quantifies the impacts and resettlement implications. The professional valuator will confirm this in his report, but the resettlement of affected people residing in the dam basin falls under the jurisdiction of the DDG:NWIR.

2.8 Ntabelanga Bulk Water Supply for Irrigated Agriculture

No existing commercial farmers operate in this study area and all farming that is currently undertaken is by resource-poor subsistence farmers.

The Irrigation Development component of the study (see Report No P WMA 12/T30/00/5212/9) identified a total of some 2 868 ha of high potential land that could viably be developed for commercial irrigated agriculture, of which some 418 ha is located adjacent to the north shore of the dam basin and along the river just downstream of the dam wall, and the other 2 450 ha is located around the Tsolo area. These areas are shown on Figure 2-13.

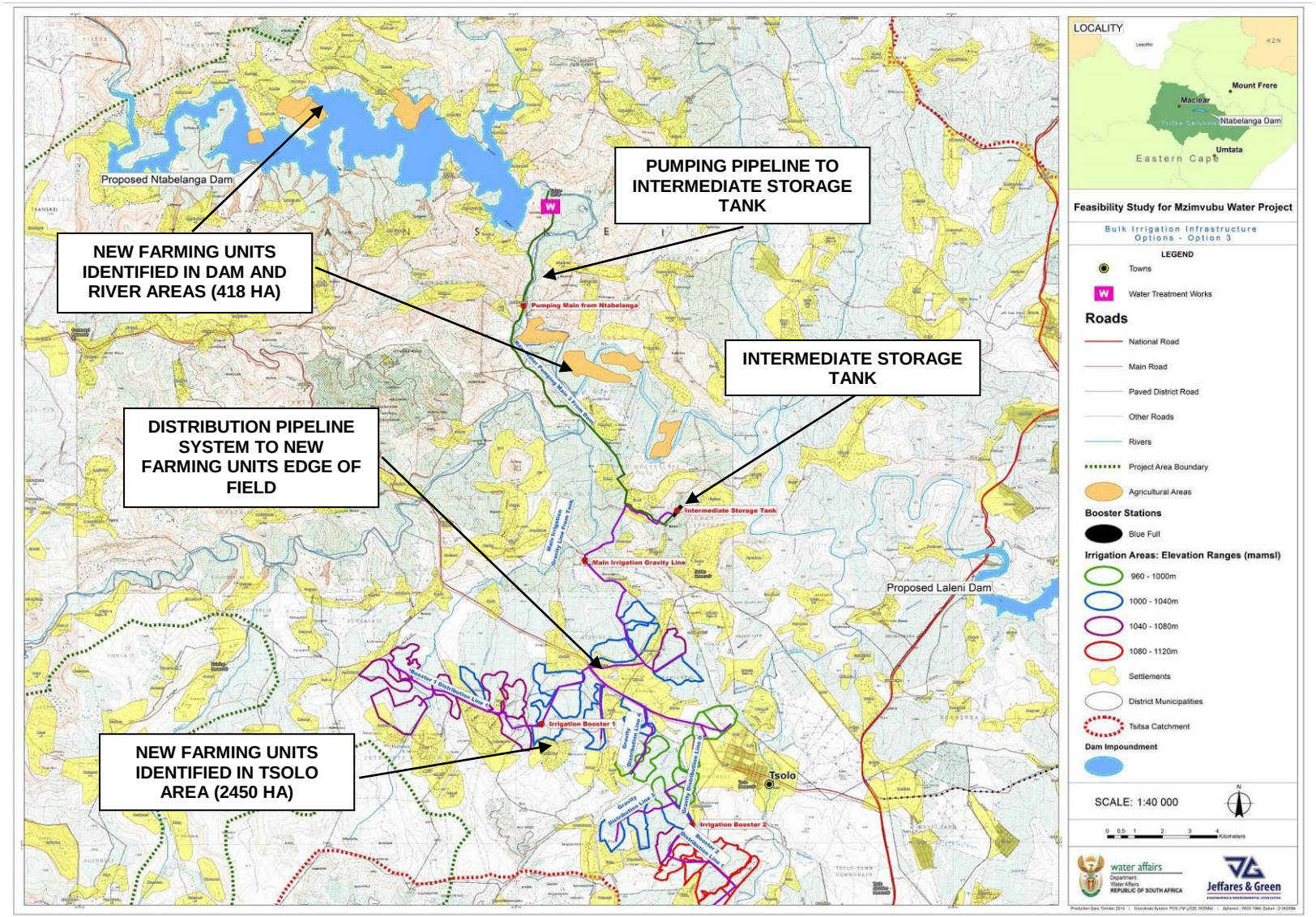


Figure 2-13: Layout of Proposed New Farming Units and Bulk Raw Water Distribution System

2.8.1 Bulk Raw Water Transfer to Edge of Fields in Tsolo Area

Raw water supply to the smaller areas would be via portable abstraction systems from the dam reservoir and the river itself, bulk the supply of raw water in bulk is planned to be via a raw water pumping pipeline directly pumped from the Ntabelanga Dam outlet.

This system would transfer raw water to an intermediate storage reservoir which would be an earth embankment open top dam located on a ridge, thus commanding the main irrigation areas around Tsolo. The currently identified location is on arable land between the two villages of Nkamasana and Mncetyana, as shown on Figure 2-14.

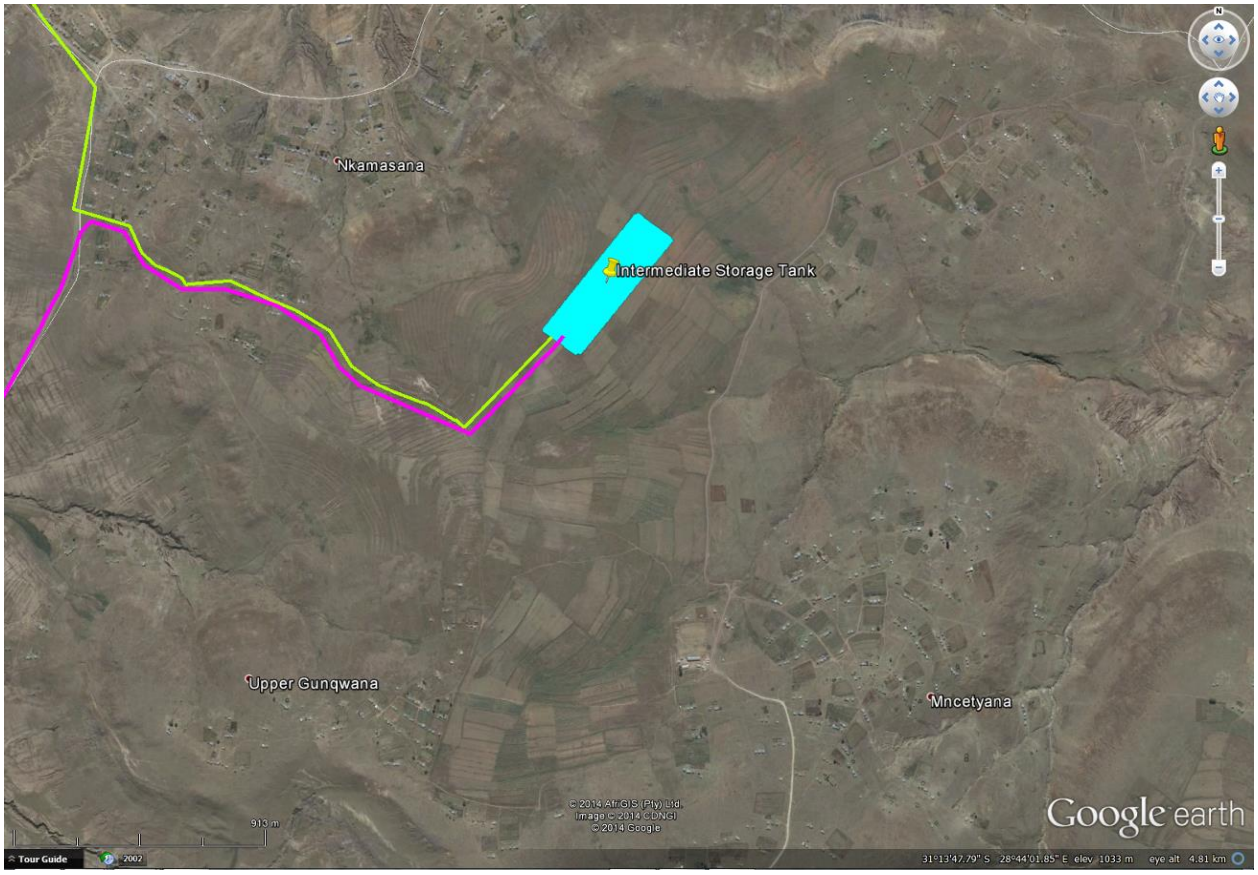


Figure 2-14: Preliminary Location of the Raw Water Intermediate Tank

From that storage site, raw water would be gravitated through a system of distribution pipes to the edge of the farming unit field shown on the figure. Most of these pipelines would flow by gravity, but two small booster pumping stations would be required to lift water to outlying farming units that are located at higher elevations.

Table 2-2 summarises the diameters and lengths of raw water pipelines to be constructed.

Table 2-2: Irrigation Raw Water Transfer Pipeline from Ntabelanga Dam to Tsolo Area

Pipeline Quantities	
Diameter	***Length m***
1 200	*9 780*
900	*2 000*
800	*9 660*
600	*4 460*
500	*3 100*
450	*5 900*
350	*1 770*
300	*9 970*
200	*2 143*
Total:	***48 783***

The same temporary and permanent servitude rules will apply as is described above for the potable water pipeline system.

Two small booster pumping stations will require land to be acquired to the same size as the boosters described above.

The final location, configuration and sizing of the intermediate storage tank will need to be determined once the final number and size of farming units, their water requirements, pumping scheduling and seasonal irrigation pattern requirements have been finalized. At feasibility level this storage has been sized at some 85 000 m^3, which would require a bunded storage tank of dimensions approximately 120 m x 180 m, and this would require the acquisition of land of approximately 3 ha in extent.

2.8.2 Other Irrigation Systems Required

The maximum area of land to be irrigated is 2 868 ha, of which:

1. Circa 2 450 ha is in Tsolo area;
2. About 190 ha is located in three units on the north shore of the Ntabelanga Dam inundated basin (see white bounded areas);
3. About 228 ha is located in four units very close to the river channel and downstream of the dam wall (see white bounded areas)

The total raw water to be supplied to all of these areas has been estimated to be 27.8 million m^3/a on average, including losses.

This total raw water requirement has been allowed for in the minimum sizing of the dam.

Some 85.4% of this total, or 23.75 million m^3/a, is to be pumped directly from the dam outlet works (pump house close to the water treatment works) to the Tsolo farming units via the pipeline shown on the above figure.

The fields on the north shore of the dam basin would abstract some 1.84 million m^3/a (6.6% of total) directly from the dam using moveable pumps and intake pipes, given the varying water levels in the dam.

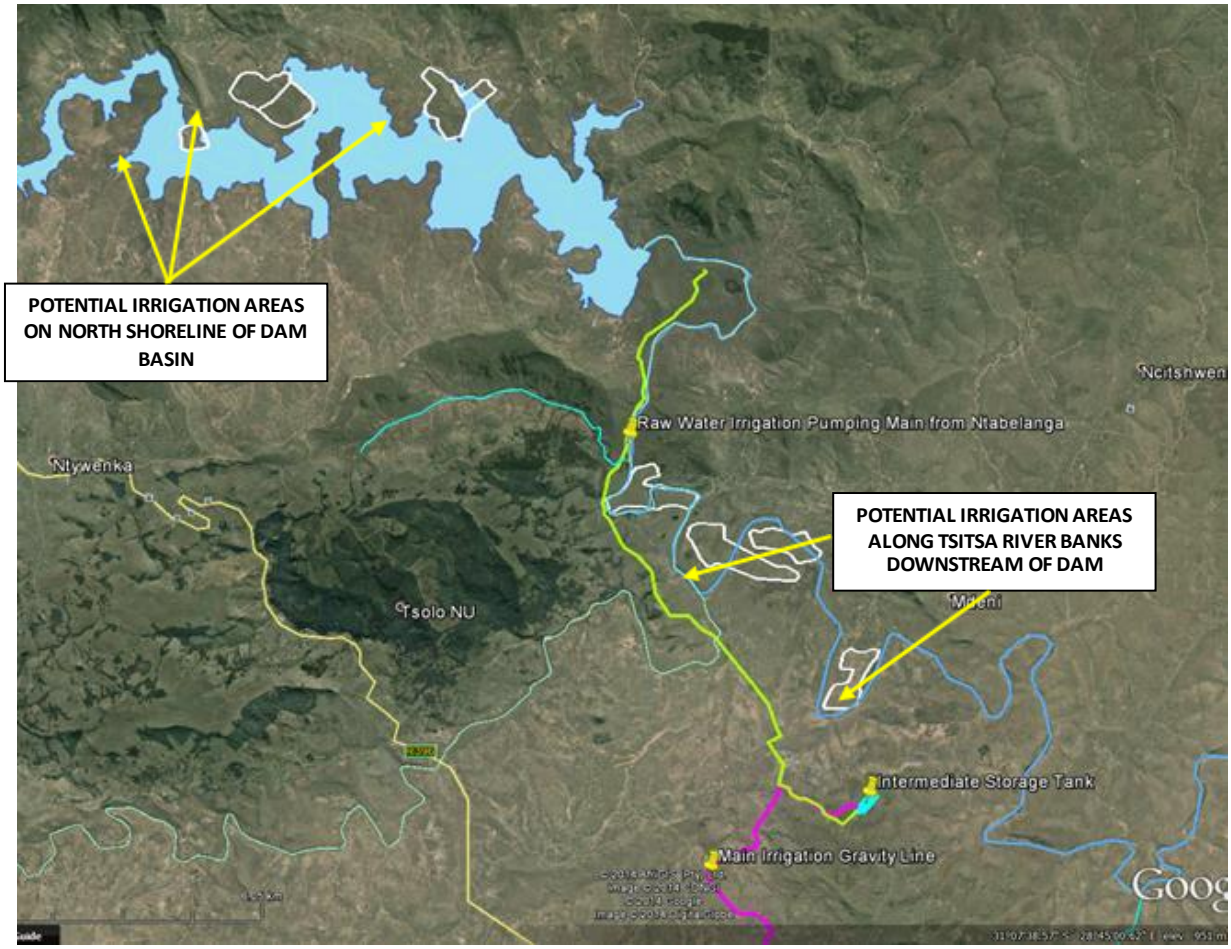


Figure 2-15: Location of Other Potential Irrigation Areas Near to the Dam Basin and River

The fields downstream of the dam along the river banks would abstract some 2.2 million m^3/a (8% of total) water directly from the river, again using movable abstraction points (submersibles) or could be connected into the raw water rising main from the dam to the intermediate storage.

The latter would have the advantage of clearer water to be delivered to these fields, although it is not normally good practice to connect into pumping mains in this way. Many of these fields are also on the opposite side of the river to the rising main.

If the former option is eventually implemented, then allowance will need to be made in the operation of the dam to release this amount into the river in addition to the EWR requirement, although this has higher loss factors.

The non-contiguous and less accessible nature of the areas described in 2. and 3. above would possibly make them less attractive to investment by emerging farmers than those areas in the Tsolo area. However, there is still adequate raw water provision allowed for if these are eventually developed for commercially orientated irrigation.

2.9 Land Use Reform Requirements for Emerging Farmer Development

2.9.1 Proposed Farming Model

A number of farming models were considered for the identified land. The land is currently communally farmed and un-irrigated, and any move towards modern, commercial irrigation farming will almost certainly be met with strong resistance from those incumbent land users who perceive they may:

- Lose land they have farmed for years;
- Lose a historical or spiritual link to the land;
- Lose power, through not being able to freely allocate land; and
- Have new technology forced upon them.

Resolution of these fundamental land issues will require broad community consensus, without which the development of the proposed farms will almost certainly fail. Widespread and inclusive community consultation must be the starting point of any implementation phase of the development.

Right from the start a view needs to be taken on whether the irrigation project is to be developed according to a social benefit model, maximising the number of people that will benefit irrespective of profitability, or according to an economically sustainable model whereby the farms can be individually profitable and sustainably farmed.

The social benefit model to maximise the number of people benefitting from the irrigation scheme will be the most palatable politically. However, it is likely to have a number of serious shortcomings:

- Plot sizes that are too small to be economically farmed as standalone enterprises;
- Low turnover and low profit on small farms means the farms will generate supplementary income only, reducing incentive and interest in the enterprise;
- Small farm sizes will result in losses of economies due to scale, unless cooperative farming schemes or centralised farming committees are established;
- Small farms that rely on shared resources often do not have the resources and implements available when required for critical planting or harvesting operations;
- Small farms that are subject to communal management structures often battle to farm effectively. As soon as decision making is removed from the individual farmer and is vested in a committee, accountability and responsibility are likewise removed from the individual farmer and the basis for sound and sustainable decision making is weakened;
- Commercial banks are reticent to loan money to communal farming collectives that do not have a commercially viable business plan; and
- Long term subsidisation of farms creates false economies and also creates dependencies, which are counterproductive in the long term.

It was the view of the study authors that for irrigation farms to be feasible they need to be economically viable, implying that they can be operated as stand-alone farms with profits that exceed operating costs. This will empower the farmers to have their own implements, make independent decisions, and will encourage them to become sustainable contributors to the local economy and to become employers within the community.

For this reason an average farming unit size of 60 ha was settled upon, which resulted in the potential for up to 45 farming units to be developed in the Tsolo area.

The success of this new approach will hinge on a radical shift in farming methods currently being practiced in the area, and will require the support and buy in from Government at large, applicable Government Departments (such as the Department of Rural Development and Agrarian Reform, Department of Rural Development and Land Reform) and other agencies (Eastern Cape Rural Development Agency) that will assist with support, training, land administration matters and getting community consensus. This process must involve Traditional Leaders that currently administer the land under the communal farming system, the local Councillors, the community who currently reside on and farm the land, and local training institutions that will be required to train and support the farmers. If support is withdrawn from any of the above sections of the community, the venture will almost certainly fail as a commercial proposition.

2.9.2 System of Tenure

It is proposed that the farming units are established as economically viable commercial irrigation farms. The most reasonable system of land tenure would be a medium-term lease entered into between the State and the farmer. This lease need to be long enough that the farmer can establish themselves on the land, establish a number of enterprises, invest in the farm, and repay any loans raised to finance the investment. The lease should also be long enough that the farmer can take a medium term view in developing the farm. This may entail a few lean years in the early stages of farm development, with more profitable years to follow once the farm has been well established.

A lease period of 20 years should be considered for the system of land tenure. It is important that the lease is linked to agricultural performance, with cancellation of the lease being an option if the farmer fails to establish any agricultural production within (say) 3 years, or if the land is used for non-agricultural purposes.

It is critical that the land allocation under the current system of communal farming is audited and that a land register is set up. This should be done early on in the implementation phase of the project, and should form part of the community consultation process. This will establish a benchmark for the current land use in terms of who has been allocated which land, since what date, what land area, if it is currently being farmed, how much land in total has been allocated, and how much land remains unallocated. This will form the basis of any discussions around land rights, any compensation payable, any offset arrangements, or any land trading system. Without such a system being set up early on, the process will quickly become mired in squabbles by community members who feel they are being disenfranchised or unfairly removed from their land.

Those people currently using the land to be transformed in this way, will therefore need to be dealt with in a very sensitive manner, and solutions developed should maximize the participation of, and livelihood benefits to, these people, and/or offer alternatives that are equal to, or better than, the situation from which they are being asked to change.

It will be essential to undertake all of the activities in accordance with the existing legislation relevant to the National Departments that are responsible for this function.

2.9.3 Training and Support Resources

Irrigation farming is not common in the communal areas and communities surrounding the town of Tsolo. It will be viewed as new technology, and it is important that there is appropriate training and extension support of new and emerging farmers if the technology is to be successfully implemented.

A number of resources are available which will be important for the training of new farmers, the support and guidance of farmers as they become established, and the continued support of farmers through extension and advisory services:

- Tsolo Agricultural College;
- Jongiliswe Agricultural College for Traditional leaders; and
- Eastern Cape Department of Rural Development and Agrarian Reform.

Feedback has been provided during consultative meetings held as part of this study that the technical support in terms of agricultural training and extension support does exist within these institutions listed above. However, no formal business skills training exists. Farms that are 60 ha in size (as proposed) will have annual turnover of R3 to 5 million, and appropriate business skills will be as important as agricultural skill development for the farms to be sustainable. Business courses either need to be developed and offered as courses/modules within the existing training facilities, or new business skill training facilities need to be established in the area. However, these actions should only be implemented once there is consensus and confirmation that commercialized irrigation the Tsolo area is both viable and has sufficient numbers of people willing to accept the necessary land and agrarian reform implications.

All of the above activities must comply with current policies, legislation and regulations of the DRDLR and DAFF.

2.9.4 Beneficiary Selection

It has been strongly advocated from the consultative meetings held to date that the process of beneficiary selection needs to be designed to succeed. That is, prospective farmers to be settled on the plots need to have demonstrated:

- Agricultural skills and knowledge to enable them to farm effectively;
- Business skills to be able to farm profitably and sustainably, and to enable them to contribute to the local economy through becoming primary producers and providing employment opportunities;
- Aptitude to become farmers, to work hard, and to remain enthusiastic; and
- Willingness to embrace new technology, and to continue learning as new agricultural technologies evolve.

Commercially successful farmers will not only make best use of the land and the irrigation investment, but will contribute to food security in the area, to the regional economy, and will generate up to 3 375 permanent jobs and up to 1 350 seasonal jobs on the 45 proposed farming units. By contrast, failed farming units would make poor use of the available land, reduce food security, and diminish the leveraging effect that job creation can have on the local economy.

2.9.5 Concluding Remarks Regarding Agricultural Land Reform

The above process of land use reform will be complex, and must be handled in an extremely sensitive manner. The consultation process should be overseen and guided by the Department of Rural Development and Agrarian Reform, who will consult and co-operate closely with the relevant Traditional Leaders and the Department of Local Government and Traditional Affairs.

Extensive time and resources will need to be allowed for this process to take its course, and this will very likely be one of the most challenging issues to address on the whole project.

2.10 Cost Estimates

Given that the project footprint lies on State-owned land, there will be no land purchase costs to provide for.

Budgets will be required for both the ongoing assessment and consultation process, as well as the resettlement and compensation costs.

At present, the scheme cost estimates include nominal budgets for “mitigation” and separate allowance for professional service provider fees that is based upon the overall capital cost also includes the social sciences component.

The independent EIA process that has recently concluded addresses the resettlement and compensation issues in more detail, and quantifies affected lands, structures, and parties. Please refer to the suite of DWS Reports Nos. P WMA 12/T30/00/5314/1 to 17.

The land matters assessment process will continue throughout the detailed design and implementation stage, whence the land and servitude areas, and relocation and compensation requirements, will be finalized.

Land expropriation requirements will be confirmed by the DWS Spatial Land Information Management (SLIM) following the detailed design when they prepare the final servitude data as well as the dam boundary lines. Land Schedules would then be provided by SLIM for acquisition purposes.

APPENDIX A

BOUNDARY CO-ORDINATES OF NTABELANGA DAM AND BASIN EXPROPRIATION LINE

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
1	28.59654	-31.1039		36	28.66897	-31.1309		71	28.6849	-31.1259		106	28.66647	-31.1125		141	28.66577	-31.0945
2	28.5963	-31.1048		37	28.66933	-31.1301		72	28.68571	-31.1253		107	28.66619	-31.1117		142	28.66672	-31.0947
3	28.59643	-31.1056		38	28.66985	-31.1293		73	28.68651	-31.1247		108	28.6652	-31.1114		143	28.66723	-31.0941
4	28.59655	-31.1065		39	28.67024	-31.1285		74	28.68731	-31.1241		109	28.66501	-31.1107		144	28.66724	-31.0932
5	28.59662	-31.1074		40	28.67069	-31.1277		75	28.68811	-31.1235		110	28.66568	-31.1101		145	28.6679	-31.0925
6	28.59681	-31.1083		41	28.67109	-31.1268		76	28.68891	-31.123		111	28.66657	-31.1096		146	28.66853	-31.0921
7	28.59732	-31.1091		42	28.67126	-31.126		77	28.68971	-31.1224		112	28.66607	-31.109		147	28.66855	-31.0912
8	28.59816	-31.1096		43	28.67169	-31.1251		78	28.69029	-31.1217		113	28.66596	-31.1081		148	28.66936	-31.0907
9	28.59914	-31.1099		44	28.67191	-31.1243		79	28.68953	-31.1212		114	28.66628	-31.1073		149	28.67037	-31.0905
10	28.59999	-31.1095		45	28.67181	-31.1235		80	28.68865	-31.1207		115	28.66551	-31.1072		150	28.67038	-31.0898
11	28.60013	-31.1086		46	28.67205	-31.1226		81	28.68776	-31.1202		116	28.66462	-31.1076		151	28.67093	-31.08914
12	28.60012	-31.1077		47	28.67244	-31.1218		82	28.68687	-31.1197		117	28.66362	-31.1079		152	28.67093	-31.08823
13	28.60019	-31.1069		48	28.67293	-31.121		83	28.68593	-31.1193		118	28.66294	-31.1076		153	28.67064	-31.08739
14	28.60037	-31.106		49	28.67354	-31.1203		84	28.68502	-31.1189		119	28.6629	-31.1067		154	28.67008	-31.08663
15	28.60006	-31.1052		50	28.674	-31.1196		85	28.6843	-31.1189		120	28.66268	-31.1059		155	28.66944	-31.08592
16	28.59934	-31.1045		51	28.6742	-31.1187		86	28.68331	-31.1186		121	28.66243	-31.105		156	28.66915	-31.08507
17	28.59902	-31.1037		52	28.67523	-31.1188		87	28.68228	-31.1186		122	28.66205	-31.1042		157	28.66917	-31.08417
18	28.59907	-31.1028		53	28.67627	-31.1189		88	28.68128	-31.1186		123	28.66143	-31.1034		158	28.66955	-31.08338
19	28.59957	-31.102		54	28.67681	-31.1194		89	28.68065	-31.1179		124	28.66065	-31.1029		159	28.66971	-31.08259
20	28.60015	-31.1013		55	28.67664	-31.1203		90	28.68022	-31.117		125	28.66024	-31.1022		160	28.66951	-31.08175
21	28.60037	-31.1004		56	28.67647	-31.1212		91	28.67966	-31.1163		126	28.66027	-31.1013		161	28.66994	-31.08097
22	28.60024	-31.0996		57	28.67637	-31.1221		92	28.67909	-31.1155		127	28.65968	-31.1005		162	28.6706	-31.08033
23	28.60041	-31.0989		58	28.67677	-31.1229		93	28.67831	-31.1149		128	28.65933	-31.0997		163	28.67091	-31.0795
24	28.60016	-31.0981		59	28.67743	-31.1236		94	28.67742	-31.1145		129	28.65853	-31.0992		164	28.67028	-31.07973
25	28.59925	-31.098		60	28.67809	-31.1243		95	28.67638	-31.1146		130	28.65822	-31.0987		165	28.66963	-31.08041
26	28.59825	-31.0981		61	28.67871	-31.125		96	28.67544	-31.115		131	28.6583	-31.0978		166	28.66904	-31.08113
27	28.59762	-31.0988		62	28.67916	-31.1258		97	28.6745	-31.1146		132	28.65876	-31.0971		167	28.66854	-31.08192
28	28.59733	-31.0997		63	28.67961	-31.1266		98	28.67352	-31.1143		133	28.6596	-31.0966		168	28.66804	-31.0826
29	28.5977	-31.1005		64	28.68006	-31.1274		99	28.67247	-31.1143		134	28.65969	-31.0957		169	28.66789	-31.08331
30	28.59772	-31.1014		65	28.68052	-31.1282		100	28.67142	-31.1142		135	28.65987	-31.0949		170	28.66758	-31.08417
31	28.59725	-31.1022		66	28.681	-31.1289		101	28.67038	-31.1143		136	28.66081	-31.0946		171	28.66754	-31.08507
32	28.59669	-31.1029		67	28.68177	-31.1283		102	28.66934	-31.1144		137	28.66182	-31.0947		172	28.66763	-31.08595
33	28.59655	-31.1038		68	28.68254	-31.1277		103	28.66829	-31.1145		138	28.66284	-31.0946		173	28.66777	-31.08684
34	28.66993	-31.1322		69	28.68331	-31.127		104	28.66784	-31.1139		139	28.66383	-31.0947		174	28.66825	-31.08764
35	28.66924	-31.1316		70	28.6841	-31.1265		105	28.66723	-31.1131		140	28.66482	-31.0947		175	28.66854	-31.08849

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
176	28.66776	-31.08895		211	28.65329	-31.1021		246	28.63252	-31.0873		281	28.62093	-31.0909		316	28.60469	-31.0836
177	28.66678	-31.08916		212	28.65258	-31.1014		247	28.63253	-31.0864		282	28.62012	-31.0911		317	28.60377	-31.0833
178	28.66615	-31.08963		213	28.6521	-31.1007		248	28.63224	-31.0858		283	28.61913	-31.091		318	28.6028	-31.083
179	28.66562	-31.09035		214	28.65168	-31.0999		249	28.6313	-31.086		284	28.61842	-31.0911		319	28.6019	-31.0828
180	28.66484	-31.09062		215	28.65098	-31.0993		250	28.63103	-31.0857		285	28.61842	-31.092		320	28.6011	-31.0823
181	28.66408	-31.09003		216	28.65006	-31.0989		251	28.63106	-31.0847		286	28.61819	-31.0929		321	28.60056	-31.0827
182	28.6633	-31.08946		217	28.64912	-31.0992		252	28.63054	-31.0844		287	28.61724	-31.0932		322	28.60003	-31.0835
183	28.66243	-31.08899		218	28.64843	-31.0999		253	28.6297	-31.085		288	28.61648	-31.0938		323	28.59907	-31.0837
184	28.66147	-31.08862		219	28.64749	-31.1003		254	28.62871	-31.0852		289	28.61664	-31.0946		324	28.59817	-31.0833
185	28.66091	-31.08787		220	28.64649	-31.1002		255	28.62773	-31.0849		290	28.61702	-31.0955		325	28.59749	-31.0839
186	28.65997	-31.08762		221	28.6456	-31.0997		256	28.62671	-31.0848		291	28.61649	-31.0961		326	28.59662	-31.0843
187	28.65896	-31.08749		222	28.64481	-31.0991		257	28.62613	-31.0842		292	28.61551	-31.0964		327	28.59558	-31.0844
188	28.65794	-31.0875		223	28.64397	-31.0986		258	28.62528	-31.0837		293	28.61465	-31.0958		328	28.59457	-31.0845
189	28.65812	-31.08818		224	28.64331	-31.0979		259	28.62424	-31.0836		294	28.61408	-31.0952		329	28.59377	-31.0839
190	28.65817	-31.08907		225	28.64306	-31.0971		260	28.62323	-31.0834		295	28.61426	-31.0943		330	28.59281	-31.0837
191	28.65798	-31.08991		226	28.6432	-31.0962		261	28.62305	-31.0839		296	28.61435	-31.0934		331	28.59248	-31.083
192	28.65716	-31.09046		227	28.64222	-31.096		262	28.62385	-31.0845		297	28.61377	-31.0928		332	28.5915	-31.0828
193	28.65627	-31.09093		228	28.64188	-31.0951		263	28.6247	-31.085		298	28.61311	-31.0922		333	28.5905	-31.0826
194	28.65528	-31.09121		229	28.64163	-31.0943		264	28.6252	-31.0858		299	28.61282	-31.0913		334	28.58961	-31.0822
195	28.65439	-31.09088		230	28.64131	-31.0934		265	28.62591	-31.0864		300	28.61189	-31.0909		335	28.58901	-31.0822
196	28.65372	-31.09087		231	28.64093	-31.0926		266	28.62653	-31.0871		301	28.61145	-31.0902		336	28.58865	-31.083
197	28.65321	-31.0916		232	28.64022	-31.0919		267	28.62689	-31.088		302	28.61207	-31.0895		337	28.58811	-31.0838
198	28.65325	-31.09225		233	28.63973	-31.0913		268	28.62733	-31.0888		303	28.61214	-31.0887		338	28.58769	-31.0846
199	28.65365	-31.09308		234	28.64034	-31.0906		269	28.62787	-31.0895		304	28.61232	-31.088		339	28.58779	-31.0855
200	28.65425	-31.0938		235	28.63983	-31.0906		270	28.62834	-31.0904		305	28.61146	-31.0875		340	28.58715	-31.0861
201	28.65484	-31.0945		236	28.63912	-31.0908		271	28.62877	-31.0912		306	28.61054	-31.0876		341	28.58616	-31.0864
202	28.65492	-31.0954		237	28.63852	-31.0902		272	28.62897	-31.092		307	28.60956	-31.0878		342	28.58525	-31.0868
203	28.6546	-31.0962		238	28.6381	-31.0897		273	28.62837	-31.0927		308	28.60878	-31.0873		343	28.58441	-31.0866
204	28.65419	-31.097		239	28.63719	-31.0901		274	28.62744	-31.093		309	28.6084	-31.0865		344	28.58415	-31.0858
205	28.65417	-31.0978		240	28.63625	-31.0903		275	28.62642	-31.0929		310	28.60884	-31.0857		345	28.58408	-31.0849
206	28.65461	-31.0986		241	28.636	-31.0895		276	28.62541	-31.0929		311	28.60805	-31.0853		346	28.58333	-31.0845
207	28.6545	-31.0995		242	28.63567	-31.0888		277	28.62458	-31.0923		312	28.60722	-31.0849		347	28.58288	-31.0851
208	28.65459	-31.1004		243	28.63465	-31.0889		278	28.62362	-31.092		313	28.60696	-31.0841		348	28.583	-31.0859
209	28.65471	-31.1013		244	28.63366	-31.0886		279	28.62265	-31.0917		314	28.60643	-31.0839		349	28.58295	-31.0868
210	28.65407	-31.102		245	28.63311	-31.0879		280	28.62164	-31.0915		315	28.60548	-31.0842		350	28.58339	-31.0876

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
351	28.58424	-31.0881		386	28.5789	-31.0923		421	28.56019	-31.08296		406	28.56637	-31.0932		441	28.54882	-31.0883
352	28.58526	-31.0883		387	28.578	-31.0922		422	28.55937	-31.08242		407	28.56575	-31.0927		442	28.54788	-31.0887
353	28.58618	-31.0888		388	28.57723	-31.0927		423	28.55868	-31.08178		408	28.56484	-31.0924		443	28.54685	-31.0888
354	28.58695	-31.0894		389	28.57697	-31.0936		424	28.55821	-31.0823		409	28.56519	-31.0916		444	28.54595	-31.0883
355	28.58768	-31.0899		390	28.57615	-31.0941		425	28.55788	-31.08306		410	28.56577	-31.091		445	28.545	-31.0879
356	28.58871	-31.0901		391	28.5753	-31.0946		426	28.55694	-31.08281		411	28.56537	-31.0902		446	28.54421	-31.0874
357	28.58973	-31.0903		392	28.57471	-31.0953		427	28.5562	-31.08218		412	28.56522	-31.0894		447	28.54354	-31.0867
358	28.59063	-31.0907		393	28.57416	-31.0961		428	28.55577	-31.08289		413	28.56441	-31.0889		448	28.54265	-31.0862
359	28.59139	-31.0914		394	28.57402	-31.097		429	28.55513	-31.08351		414	28.56396	-31.088		449	28.54196	-31.0855
360	28.59206	-31.092		395	28.57305	-31.0971		430	28.55412	-31.0835		415	28.56353	-31.0872		450	28.54161	-31.0863
361	28.59263	-31.0928		396	28.57201	-31.0971		431	28.55312	-31.08345		416	28.56321	-31.0864		451	28.54133	-31.0871
362	28.59295	-31.0936		397	28.57104	-31.0974		432	28.55219	-31.08345		417	28.56286	-31.0855		452	28.54067	-31.0878
363	28.59271	-31.0945		398	28.5701	-31.0973		433	28.55214	-31.0842		418	28.56237	-31.0847		453	28.53978	-31.0882
364	28.59221	-31.0952		399	28.56963	-31.0974		434	28.55256	-31.085		419	28.56176	-31.0841		454	28.539	-31.0885
365	28.59161	-31.0959		400	28.56879	-31.0976		435	28.55261	-31.08587		420	28.56092	-31.0836		455	28.53843	-31.089
366	28.59091	-31.0966		401	28.56811	-31.09697		436	28.55173	-31.08615		421	28.56019	-31.083		456	28.53829	-31.0899
367	28.59019	-31.0971		402	28.56732	-31.09638		437	28.55076	-31.08586		422	28.55937	-31.0824		457	28.53777	-31.0907
368	28.58938	-31.0977		403	28.56663	-31.09577		438	28.54981	-31.08599		423	28.55868	-31.0818		458	28.5369	-31.0911
369	28.58836	-31.0978		404	28.5662	-31.09496		439	28.54965	-31.08686		424	28.55821	-31.0823		459	28.53642	-31.0918
370	28.58746	-31.098		405	28.5662	-31.09406		440	28.54951	-31.08774		425	28.55788	-31.0831		460	28.53572	-31.0925
371	28.58736	-31.0989		406	28.56637	-31.09318		441	28.54882	-31.08834		426	28.55694	-31.0828		461	28.53507	-31.0931
372	28.58731	-31.0998		407	28.56575	-31.09268		442	28.54788	-31.08873		427	28.5562	-31.0822		462	28.53451	-31.0939
373	28.58648	-31.1001		408	28.56484	-31.09235		443	28.54685	-31.08876		428	28.55577	-31.0829		463	28.53412	-31.0947
374	28.58545	-31.1003		409	28.56519	-31.09162		444	28.54595	-31.08831		429	28.55513	-31.0835		464	28.53364	-31.0954
375	28.58445	-31.1002		410	28.56577	-31.09102		445	28.545	-31.08794		430	28.55412	-31.0835		465	28.53354	-31.0962
376	28.58359	-31.0997		411	28.56537	-31.09024		446	28.54421	-31.08736		431	28.55312	-31.0834		466	28.53334	-31.0971
377	28.58271	-31.0992		412	28.56522	-31.08937		447	28.54354	-31.08668		432	28.55219	-31.0835		467	28.53289	-31.0979
378	28.58208	-31.0985		413	28.56441	-31.08885		448	28.54265	-31.08622		433	28.55214	-31.0842		468	28.53197	-31.0983
379	28.58177	-31.0977		414	28.56396	-31.08805		449	28.54196	-31.08554		434	28.55256	-31.085		469	28.53101	-31.0987
380	28.58144	-31.0968		415	28.56353	-31.08723		450	28.54161	-31.08627		435	28.55261	-31.0859		470	28.53039	-31.0994
381	28.58091	-31.096		416	28.56321	-31.08637		401	28.56811	-31.097		436	28.55173	-31.0862		471	28.53058	-31.1002
382	28.58088	-31.0952		417	28.56286	-31.08552		402	28.56732	-31.0964		437	28.55076	-31.0859		472	28.5313	-31.1008
383	28.58054	-31.0944		418	28.56237	-31.08473		403	28.56663	-31.0958		438	28.54981	-31.086		473	28.53199	-31.1015
384	28.57964	-31.094		419	28.56176	-31.0841		404	28.5662	-31.095		439	28.54965	-31.0869		474	28.53232	-31.1023
385	28.57909	-31.0932		420	28.56092	-31.08357		405	28.5662	-31.0941		440	28.54951	-31.0877		475	28.53194	-31.1031

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
476	28.53157	-31.104		511	28.5226	-31.0956		546	28.51943	-31.0719		581	28.51917	-31.0929		616	28.51154	-31.10467
477	28.53092	-31.1047		512	28.52285	-31.0947		547	28.5188	-31.0724		582	28.51966	-31.0937		617	28.51092	-31.10539
478	28.52994	-31.1048		513	28.52269	-31.0939		548	28.51885	-31.0732		583	28.52012	-31.0944		618	28.51179	-31.10577
479	28.52891	-31.1049		514	28.52251	-31.093		549	28.51931	-31.074		584	28.51978	-31.0953		619	28.51223	-31.10657
480	28.52787	-31.105		515	28.52209	-31.0922		550	28.51975	-31.0749		585	28.5189	-31.0956		620	28.51238	-31.10745
481	28.52724	-31.1055		516	28.52215	-31.0913		551	28.52012	-31.0757		586	28.51785	-31.0956		621	28.51195	-31.10823
482	28.527	-31.1064		517	28.52219	-31.0904		552	28.52024	-31.0766		587	28.51709	-31.0962		622	28.51172	-31.10899
483	28.52609	-31.1067		518	28.52244	-31.0896		553	28.51983	-31.0774		588	28.51752	-31.0969		623	28.51156	-31.10985
484	28.5251	-31.107		519	28.52258	-31.0887		554	28.51899	-31.0779		589	28.51841	-31.0974		624	28.5115	-31.11073
485	28.52407	-31.1071		520	28.52218	-31.088		555	28.51814	-31.0785		590	28.51931	-31.0978		625	28.51157	-31.11159
486	28.52312	-31.1074		521	28.52202	-31.0872		556	28.51725	-31.0789		591	28.52004	-31.0985		626	28.51164	-31.11249
487	28.52229	-31.1078		522	28.52219	-31.0863		557	28.51641	-31.0794		592	28.52061	-31.0992		627	28.51121	-31.11325
488	28.52151	-31.1084		523	28.52167	-31.0856		558	28.5156	-31.0799		593	28.52076	-31.1001		628	28.5117	-31.11377
489	28.52074	-31.109		524	28.52117	-31.0848		559	28.51478	-31.0805		594	28.52081	-31.101		629	28.51246	-31.11435
490	28.51973	-31.1092		525	28.52019	-31.0845		560	28.51392	-31.081		595	28.52052	-31.1017		630	28.51281	-31.11519
491	28.51869	-31.1093		526	28.51921	-31.0842		561	28.51322	-31.0815		596	28.5196	-31.1021		631	28.51291	-31.11608
492	28.51788	-31.1088		527	28.51832	-31.0839		562	28.51239	-31.0818		597	28.51871	-31.1026		632	28.51264	-31.11695
493	28.51793	-31.108		528	28.51736	-31.0842		563	28.5121	-31.0826		598	28.51787	-31.1031		633	28.512	-31.11764
494	28.51871	-31.1074		529	28.51635	-31.0842		564	28.51206	-31.0835		599	28.51708	-31.1037		634	28.51124	-31.11825
495	28.5195	-31.1068		530	28.51558	-31.0837		565	28.51251	-31.0843		600	28.5162	-31.1042		635	28.51046	-31.11881
496	28.52021	-31.1062		531	28.51515	-31.0828		566	28.51312	-31.085		601	28.51576	-31.10389		636	28.51072	-31.11931
497	28.5209	-31.1055		532	28.51547	-31.0821		567	28.51395	-31.0855		602	28.51553	-31.10304		637	28.51143	-31.11869
498	28.52161	-31.1048		533	28.51604	-31.0813		568	28.51488	-31.0859		603	28.51495	-31.10233		638	28.51229	-31.1182
499	28.52245	-31.1045		534	28.51677	-31.0807		569	28.51585	-31.0862		604	28.5141	-31.10181		639	28.5132	-31.11777
500	28.52298	-31.1038		535	28.51759	-31.0801		570	28.51685	-31.0865		605	28.51356	-31.10107		640	28.51408	-31.11736
501	28.52369	-31.1031		536	28.51835	-31.0795		571	28.51756	-31.087		606	28.51278	-31.10049		641	28.51455	-31.11662
502	28.52439	-31.1025		537	28.51919	-31.079		572	28.51832	-31.0872		607	28.51203	-31.09992		642	28.51509	-31.11588
503	28.52487	-31.1017		538	28.51998	-31.0785		573	28.51933	-31.087		608	28.51129	-31.09932		643	28.5156	-31.11514
504	28.52502	-31.1009		539	28.52065	-31.0778		574	28.52002	-31.0875		609	28.51032	-31.09941		644	28.5162	-31.11445
505	28.52464	-31.1001		540	28.52103	-31.077		575	28.52001	-31.0884		610	28.51087	-31.10007		645	28.51698	-31.11388
506	28.52453	-31.0992		541	28.5211	-31.0761		576	28.52019	-31.0892		611	28.51101	-31.10095		646	28.51791	-31.11415
507	28.52419	-31.0984		542	28.52083	-31.0753		577	28.51987	-31.0901		612	28.51157	-31.10172		647	28.51842	-31.11486
508	28.52382	-31.0976		543	28.52052	-31.0744		578	28.51928	-31.0908		613	28.51195	-31.10247		648	28.51835	-31.11576
509	28.52364	-31.0967		544	28.52003	-31.0736		579	28.51853	-31.0914		614	28.51257	-31.10311		649	28.51884	-31.11653
510	28.52305	-31.0963		545	28.51958	-31.0728		580	28.51849	-31.0922		615	28.51213	-31.10393		650	28.51973	-31.11644

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
651	28.52035	-31.1157		686	28.53879	-31.1131		721	28.5468	-31.0973		756	28.55559	-31.099		791	28.55788	-31.1152
652	28.52126	-31.1153		687	28.5382	-31.1124		722	28.54737	-31.098		757	28.55567	-31.0999		792	28.55837	-31.116
653	28.52227	-31.1151		688	28.53749	-31.1117		723	28.54826	-31.0985		758	28.55541	-31.1008		793	28.55882	-31.1167
654	28.5232	-31.1155		689	28.53682	-31.1111		724	28.54888	-31.0978		759	28.55467	-31.1014		794	28.55921	-31.1175
655	28.52368	-31.1162		690	28.53628	-31.1103		725	28.5495	-31.0971		760	28.55407	-31.1021		795	28.56015	-31.1179
656	28.52402	-31.1171		691	28.53667	-31.1095		726	28.55052	-31.0969		761	28.55328	-31.1026		796	28.56103	-31.1183
657	28.52486	-31.1166		692	28.53651	-31.1088		727	28.55126	-31.0964		762	28.55277	-31.1033		797	28.56112	-31.1174
658	28.52544	-31.1159		693	28.53668	-31.108		728	28.55108	-31.0955		763	28.55201	-31.1039		798	28.56095	-31.1166
659	28.5256	-31.115		694	28.53754	-31.1075		729	28.55146	-31.0948		764	28.55113	-31.1044		799	28.56162	-31.116
660	28.52607	-31.1143		695	28.53843	-31.107		730	28.55218	-31.0942		765	28.55013	-31.1046		800	28.56238	-31.1154
661	28.52624	-31.1134		696	28.53862	-31.1062		731	28.55317	-31.0944		766	28.54911	-31.1049		801	28.56278	-31.1146
662	28.5268	-31.1127		697	28.53917	-31.1055		732	28.55404	-31.094		767	28.5481	-31.1048		802	28.56357	-31.1141
663	28.52777	-31.1124		698	28.54001	-31.105		733	28.55446	-31.0932		768	28.54715	-31.105		803	28.56379	-31.1133
664	28.52875	-31.1126		699	28.54105	-31.105		734	28.55468	-31.0923		769	28.54641	-31.1056		804	28.56343	-31.1125
665	28.52963	-31.1131		700	28.54194	-31.1048		735	28.55447	-31.0915		770	28.54583	-31.1062		805	28.56303	-31.1117
666	28.53054	-31.1135		701	28.54239	-31.104		736	28.55406	-31.0906		771	28.54623	-31.107		806	28.56303	-31.1108
667	28.53096	-31.1143		702	28.54249	-31.1032		737	28.55408	-31.0898		772	28.54674	-31.1078		807	28.56325	-31.1099
668	28.53148	-31.1149		703	28.54159	-31.1027		738	28.55457	-31.089		773	28.54763	-31.1083		808	28.56402	-31.1094
669	28.53178	-31.114		704	28.54072	-31.1022		739	28.55542	-31.0885		774	28.54854	-31.1087		809	28.56503	-31.1091
670	28.53205	-31.1132		705	28.54	-31.1016		740	28.5564	-31.0883		775	28.54953	-31.1088		810	28.56607	-31.1091
671	28.53279	-31.1127		706	28.5396	-31.1008		741	28.55744	-31.0883		776	28.55052	-31.1086		811	28.5671	-31.1089
672	28.5338	-31.1128		707	28.53975	-31.0999		742	28.55848	-31.0883		777	28.55148	-31.1085		812	28.56812	-31.1087
673	28.5347	-31.1132		708	28.53995	-31.099		743	28.55897	-31.089		778	28.55236	-31.108		813	28.56905	-31.109
674	28.53545	-31.1138		709	28.53944	-31.0983		744	28.55942	-31.0898		779	28.5533	-31.1076		814	28.5697	-31.1097
675	28.53618	-31.1141		710	28.53955	-31.0974		745	28.56019	-31.0904		780	28.55428	-31.1073		815	28.57022	-31.1105
676	28.53716	-31.1139		711	28.53995	-31.0966		746	28.56013	-31.0913		781	28.55528	-31.1074		816	28.57003	-31.1113
677	28.53813	-31.1142		712	28.54015	-31.0957		747	28.55959	-31.0921		782	28.55622	-31.1077		817	28.56929	-31.1118
678	28.53843	-31.1149		713	28.54055	-31.0948		748	28.55923	-31.0929		783	28.55662	-31.1086		818	28.56888	-31.1126
679	28.53868	-31.1154		714	28.54122	-31.0942		749	28.5591	-31.0938		784	28.55689	-31.1094		819	28.56929	-31.1134
680	28.53909	-31.1161		715	28.54223	-31.0941		750	28.55835	-31.0944		785	28.55729	-31.1102		820	28.56962	-31.1142
681	28.53929	-31.1169		716	28.54325	-31.0942		751	28.55796	-31.0952		786	28.55727	-31.1111		821	28.56995	-31.1151
682	28.53984	-31.1163		717	28.54414	-31.0947		752	28.55729	-31.0959		787	28.55695	-31.112		822	28.56969	-31.1159
683	28.53995	-31.1154		718	28.54503	-31.0951		753	28.55662	-31.0966		788	28.55726	-31.1128		823	28.57018	-31.1166
684	28.54009	-31.1145		719	28.54566	-31.0958		754	28.55615	-31.0974		789	28.55782	-31.1136		824	28.57042	-31.1173
685	28.53955	-31.1137		720	28.54624	-31.0965		755	28.55567	-31.0981		790	28.55801	-31.1144		825	28.57084	-31.1168

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
826	28.57077	-31.116		861	28.59433	-31.11382		896	28.59932	-31.12116		931	28.62036	-31.1105		966	28.63331	-31.1204
827	28.57129	-31.1155		862	28.59442	-31.11466		897	28.59872	-31.1206		932	28.62079	-31.1113		967	28.63413	-31.1199
828	28.57232	-31.1155		863	28.59396	-31.11547		898	28.59893	-31.11974		933	28.62106	-31.1121		968	28.63485	-31.1192
829	28.57322	-31.1151		864	28.59401	-31.11631		899	28.59938	-31.11893		934	28.62095	-31.113		969	28.63525	-31.1184
830	28.57407	-31.1149		865	28.59387	-31.11718		900	28.59997	-31.11819		935	28.6205	-31.1138		970	28.63554	-31.1176
831	28.57503	-31.1149		866	28.59405	-31.11807		901	28.60086	-31.1178		936	28.61998	-31.1146		971	28.63569	-31.1167
832	28.5747	-31.1141		867	28.59413	-31.11897		902	28.60094	-31.1169		937	28.61966	-31.1154		972	28.63599	-31.1159
833	28.57502	-31.1134		868	28.59397	-31.11983		903	28.60125	-31.116		938	28.61946	-31.1163		973	28.63658	-31.1151
834	28.57537	-31.1126		869	28.59306	-31.12025		904	28.60163	-31.1152		939	28.61945	-31.1172		974	28.63711	-31.1144
835	28.57569	-31.1118		870	28.59249	-31.12091		905	28.60214	-31.1144		940	28.61934	-31.1181		975	28.63787	-31.1138
836	28.57632	-31.1112		871	28.59349	-31.12094		906	28.60298	-31.1139		941	28.62015	-31.1179		976	28.63852	-31.1131
837	28.57727	-31.1109		872	28.59433	-31.12141		907	28.60367	-31.1132		942	28.62098	-31.1174		977	28.63811	-31.1125
838	28.57796	-31.1102		873	28.5945	-31.12226		908	28.60445	-31.1126		943	28.62195	-31.1177		978	28.63811	-31.1116
839	28.57871	-31.1096		874	28.59483	-31.12307		909	28.60546	-31.1124		944	28.62291	-31.118		979	28.63846	-31.1108
840	28.57968	-31.1095		875	28.59509	-31.12394		910	28.6065	-31.1124		945	28.6238	-31.1185		980	28.63883	-31.11
841	28.58051	-31.11		876	28.59499	-31.12477		911	28.60752	-31.1122		946	28.62453	-31.118		981	28.63905	-31.1091
842	28.58107	-31.1108		877	28.59446	-31.12553		912	28.60844	-31.1118		947	28.62511	-31.1173		982	28.6393	-31.1083
843	28.58179	-31.1103		878	28.59403	-31.12635		913	28.60939	-31.1115		948	28.62605	-31.1171		983	28.63962	-31.1074
844	28.58242	-31.1096		879	28.59396	-31.12721		914	28.60891	-31.1108		949	28.62698	-31.117		984	28.64007	-31.1066
845	28.58335	-31.1095		880	28.59405	-31.12809		915	28.60831	-31.11		950	28.62772	-31.1164		985	28.64063	-31.1058
846	28.58379	-31.1102		881	28.59436	-31.12855		916	28.60797	-31.1092		951	28.62873	-31.1163		986	28.64159	-31.1055
847	28.58422	-31.111		882	28.59473	-31.12773		917	28.60852	-31.1084		952	28.62972	-31.1166		987	28.64251	-31.1053
848	28.58431	-31.1119		883	28.59536	-31.12721		918	28.60926	-31.108		953	28.63073	-31.1167		988	28.64291	-31.1061
849	28.58441	-31.1128		884	28.59542	-31.12633		919	28.6103	-31.108		954	28.6315	-31.1173		989	28.64302	-31.107
850	28.58447	-31.1137		885	28.59597	-31.12559		920	28.61133	-31.1079		955	28.63208	-31.1181		990	28.64333	-31.1079
851	28.5847	-31.11446		886	28.59658	-31.1249		921	28.61226	-31.1075		956	28.63251	-31.1189		991	28.64398	-31.1085
852	28.58573	-31.11434		887	28.59684	-31.12404		922	28.61327	-31.1073		957	28.63211	-31.1197		992	28.64496	-31.1088
853	28.58678	-31.11431		888	28.59693	-31.12315		923	28.61426	-31.107		958	28.6315	-31.1204		993	28.6452	-31.1095
854	28.58783	-31.11436		889	28.59732	-31.12235		924	28.61531	-31.107		959	28.63167	-31.1209		994	28.64457	-31.1102
855	28.58884	-31.11458		890	28.59832	-31.12243		925	28.61633	-31.1071		960	28.63171	-31.1216		995	28.64433	-31.1107
856	28.58985	-31.11457		891	28.59935	-31.12255		926	28.61734	-31.1073		961	28.63244	-31.1221		996	28.64535	-31.1109
857	28.59067	-31.11404		892	28.60007	-31.12317		927	28.61787	-31.1081		962	28.63256	-31.1213		997	28.64543	-31.1116
858	28.59146	-31.11346		893	28.60096	-31.12331		928	28.61868	-31.1086		963	28.63329	-31.1219		998	28.64474	-31.1123
859	28.59247	-31.11323		894	28.60049	-31.12253		929	28.61962	-31.1089		964	28.6339	-31.122		999	28.64431	-31.1131
860	28.59347	-31.11332		895	28.60007	-31.12171		930	28.62021	-31.1096		965	28.63339	-31.1213		1000	28.64531	-31.113

Point	East	South		Point	East	South		Point	East	South		Point	East	South		Point	East	South
1001	28.64631	-31.1131		1015	28.65148	-31.1194		1029	28.65998	-31.122		1043	28.65469	-31.1246		1057	28.66099	-31.1294
1002	28.64726	-31.1134		1016	28.65239	-31.1199		1030	28.65894	-31.1222		1044	28.65539	-31.1251		1058	28.6618	-31.13
1003	28.64803	-31.114		1017	28.65334	-31.1199		1031	28.65791	-31.1223		1045	28.65625	-31.1254		1059	28.66217	-31.1308
1004	28.64889	-31.1145		1018	28.65425	-31.1195		1032	28.65693	-31.122		1046	28.65725	-31.1255		1060	28.66303	-31.1307
1005	28.6496	-31.1151		1019	28.65518	-31.1191		1033	28.65602	-31.1216		1047	28.6577	-31.1263		1061	28.66399	-31.131
1006	28.65059	-31.1153		1020	28.65597	-31.1185		1034	28.65511	-31.1212		1048	28.65744	-31.1271		1062	28.66502	-31.1312
1007	28.65147	-31.1148		1021	28.65683	-31.118		1035	28.65408	-31.1213		1049	28.65672	-31.1277		1063	28.66604	-31.1313
1008	28.65248	-31.1148		1022	28.65784	-31.1181		1036	28.65306	-31.1215		1050	28.65685	-31.1284		1064	28.66682	-31.1319
1009	28.65317	-31.1153		1023	28.6588	-31.1183		1037	28.65213	-31.1218		1051	28.65784	-31.1286		1065	28.66643	-31.1327
1010	28.65296	-31.1162		1024	28.65982	-31.1182		1038	28.65121	-31.1221		1052	28.65862	-31.1292		1066	28.66593	-31.1335
1011	28.65236	-31.1169		1025	28.66027	-31.1188		1039	28.65202	-31.1226		1053	28.65882	-31.13		1067	28.66502	-31.1339
1012	28.65217	-31.1178		1026	28.66022	-31.1196		1040	28.65286	-31.123		1054	28.65934	-31.1306				
1013	28.65139	-31.1183		1027	28.66043	-31.1205		1041	28.6538	-31.1234		1055	28.65946	-31.1297				
1014	28.65085	-31.1187		1028	28.66055	-31.1214		1042	28.65472	-31.1237		1056	28.66006	-31.1291				

APPENDIX B

BOUNDARY CO-ORDINATES OF LALINI DAM AND BASIN EXPROPRIATION LINE

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1	-31.26110	28.92286	36	-31.24242	28.94297	71	-31.23170	28.95343	106	-31.23152	28.93979	141	-31.22325	28.92734
2	-31.26085	28.92278	37	-31.24243	28.94366	72	-31.23160	28.95311	107	-31.23116	28.93939	142	-31.22347	28.92658
3	-31.26019	28.92316	38	-31.24242	28.94397	73	-31.23162	28.95206	108	-31.23057	28.93846	143	-31.22348	28.92593
4	-31.25962	28.92396	39	-31.24243	28.94438	74	-31.23124	28.95205	109	-31.23015	28.93810	144	-31.22338	28.92498
5	-31.25883	28.92527	40	-31.24216	28.94485	75	-31.23080	28.95206	110	-31.22960	28.93758	145	-31.22329	28.92467
6	-31.25814	28.92633	41	-31.24206	28.94629	76	-31.23025	28.95190	111	-31.22815	28.93745	146	-31.22319	28.92397
7	-31.25689	28.92863	42	-31.24188	28.94670	77	-31.22957	28.95311	112	-31.22736	28.93701	147	-31.22286	28.92341
8	-31.25603	28.93000	43	-31.24178	28.94729	78	-31.22899	28.95312	113	-31.22749	28.93661	148	-31.22252	28.92205
9	-31.25551	28.93093	44	-31.24133	28.94754	79	-31.22908	28.95290	114	-31.22790	28.93591	149	-31.22230	28.92142
10	-31.25416	28.93193	45	-31.24099	28.94796	80	-31.22926	28.95259	115	-31.22779	28.93500	150	-31.22209	28.92046
11	-31.25306	28.93252	46	-31.24063	28.94797	81	-31.22951	28.95198	116	-31.22720	28.93464	151	-31.22131	28.91941
12	-31.25183	28.93307	47	-31.23960	28.94590	82	-31.22978	28.95166	117	-31.22681	28.93453	152	-31.22157	28.91911
13	-31.25088	28.93364	48	-31.23866	28.94282	83	-31.23061	28.95110	118	-31.22569	28.93414	153	-31.22175	28.91891
14	-31.24948	28.93336	49	-31.23828	28.94281	84	-31.23161	28.95077	119	-31.22492	28.93401	154	-31.22185	28.91869
15	-31.24927	28.93347	50	-31.23818	28.94303	85	-31.23205	28.95038	120	-31.22414	28.93390	155	-31.22196	28.91790
16	-31.24898	28.93364	51	-31.23808	28.94480	86	-31.23247	28.95006	121	-31.22373	28.93358	156	-31.22212	28.91754
17	-31.24831	28.93337	52	-31.23767	28.94543	87	-31.23268	28.94936	122	-31.22314	28.93324	157	-31.22229	28.91712
18	-31.24675	28.93326	53	-31.23754	28.94688	88	-31.23278	28.94863	123	-31.22250	28.93224	158	-31.22307	28.91611
19	-31.24617	28.93299	54	-31.23720	28.94802	89	-31.23277	28.94786	124	-31.22182	28.93161	159	-31.22325	28.91546
20	-31.24554	28.93280	55	-31.23718	28.94938	90	-31.23279	28.94673	125	-31.22116	28.93148	160	-31.22380	28.91504
21	-31.24379	28.93284	56	-31.23720	28.95078	91	-31.23226	28.94609	126	-31.22087	28.93045	161	-31.22428	28.91450
22	-31.24258	28.93221	57	-31.23707	28.95219	92	-31.23135	28.94566	127	-31.22046	28.93013	162	-31.22480	28.91386
23	-31.24202	28.93255	58	-31.23665	28.95300	93	-31.23070	28.94555	128	-31.21891	28.92999	163	-31.22534	28.91356
24	-31.24143	28.93357	59	-31.23656	28.95342	94	-31.22899	28.94544	129	-31.21843	28.92972	164	-31.22591	28.91306
25	-31.24141	28.93441	60	-31.23629	28.95417	95	-31.22909	28.94506	130	-31.21860	28.92950	165	-31.22696	28.91247
26	-31.24177	28.93462	61	-31.23609	28.95510	96	-31.22963	28.94481	131	-31.21927	28.92924	166	-31.22741	28.91176
27	-31.24242	28.93463	62	-31.23570	28.95571	97	-31.23022	28.94410	132	-31.21960	28.92888	167	-31.22834	28.91163
28	-31.24304	28.93462	63	-31.23540	28.95677	98	-31.23115	28.94366	133	-31.21969	28.92845	168	-31.22887	28.91112
29	-31.24347	28.93544	64	-31.23516	28.95692	99	-31.23166	28.94347	134	-31.22011	28.92783	169	-31.22940	28.91083
30	-31.24385	28.93734	65	-31.23495	28.95669	100	-31.23220	28.94316	135	-31.22027	28.92709	170	-31.22991	28.91025
31	-31.24387	28.93806	66	-31.23476	28.95606	101	-31.23290	28.94256	136	-31.22062	28.92720	171	-31.23030	28.90959
32	-31.24368	28.93872	67	-31.23464	28.95517	102	-31.23305	28.94185	137	-31.22132	28.92835	172	-31.23059	28.90901
33	-31.24271	28.93998	68	-31.23359	28.95447	103	-31.23329	28.94102	138	-31.22203	28.92833	173	-31.23077	28.90881
34	-31.24260	28.94187	69	-31.23341	28.95437	104	-31.23280	28.94043	139	-31.22275	28.92835	174	-31.23095	28.90839
35	-31.24242	28.94248	70	-31.23267	28.95388	105	-31.23243	28.94021	140	-31.22307	28.92799	175	-31.23138	28.90773

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
176	-31.23117	28.90724	211	-31.24365	28.89264	246	-31.24655	28.87216	281	-31.24856	28.84497	316	-31.23462	28.85255
177	-31.23104	28.90693	212	-31.24347	28.89223	247	-31.24634	28.87144	282	-31.24786	28.84476	317	-31.23518	28.85238
178	-31.23095	28.90629	213	-31.24368	28.89234	248	-31.24645	28.87078	283	-31.24706	28.84505	318	-31.23568	28.85194
179	-31.23059	28.90547	214	-31.24414	28.89300	249	-31.24783	28.87081	284	-31.24659	28.84557	319	-31.23614	28.85123
180	-31.23081	28.90464	215	-31.24460	28.89352	250	-31.24841	28.87059	285	-31.24640	28.84613	320	-31.23601	28.84860
181	-31.23103	28.90451	216	-31.24490	28.89388	251	-31.24870	28.87008	286	-31.24614	28.84706	321	-31.23612	28.84782
182	-31.23191	28.90434	217	-31.24602	28.89461	252	-31.24886	28.86954	287	-31.24592	28.84757	322	-31.23630	28.84709
183	-31.23222	28.90386	218	-31.24732	28.89464	253	-31.24895	28.86880	288	-31.24568	28.84865	323	-31.23654	28.84508
184	-31.23220	28.90277	219	-31.24814	28.89433	254	-31.24911	28.86769	289	-31.24541	28.85004	324	-31.23669	28.84457
185	-31.23275	28.90234	220	-31.24887	28.89351	255	-31.24877	28.86692	290	-31.24523	28.85064	325	-31.23693	28.84329
186	-31.23323	28.90215	221	-31.24924	28.89245	256	-31.24899	28.86703	291	-31.24489	28.85207	326	-31.23725	28.84221
187	-31.23346	28.90190	222	-31.24937	28.89171	257	-31.24946	28.86732	292	-31.24470	28.85264	327	-31.23747	28.84131
188	-31.23356	28.90168	223	-31.24954	28.88928	258	-31.25002	28.86754	293	-31.24434	28.85358	328	-31.23757	28.84070
189	-31.23377	28.90093	224	-31.24934	28.88855	259	-31.25090	28.86756	294	-31.24423	28.85421	329	-31.23791	28.83914
190	-31.23428	28.90062	225	-31.24915	28.88822	260	-31.25128	28.86734	295	-31.24343	28.85432	330	-31.23808	28.83734
191	-31.23503	28.90048	226	-31.24870	28.88759	261	-31.25191	28.86663	296	-31.24312	28.85445	331	-31.23778	28.83572
192	-31.23518	28.90031	227	-31.24814	28.88682	262	-31.25255	28.86570	297	-31.24081	28.85484	332	-31.23705	28.83454
193	-31.23546	28.89988	228	-31.24780	28.88654	263	-31.25345	28.86408	298	-31.23936	28.85488	333	-31.23603	28.83352
194	-31.23625	28.89989	229	-31.24708	28.88604	264	-31.25407	28.86267	299	-31.23877	28.85465	334	-31.23547	28.83313
195	-31.23718	28.89913	230	-31.24707	28.88581	265	-31.25418	28.86228	300	-31.23811	28.85423	335	-31.23510	28.83281
196	-31.23741	28.89858	231	-31.24708	28.88509	266	-31.25444	28.86137	301	-31.23775	28.85391	336	-31.23475	28.83261
197	-31.23890	28.89876	232	-31.24689	28.88486	267	-31.25445	28.86064	302	-31.23733	28.85354	337	-31.23386	28.83198
198	-31.23977	28.89842	233	-31.24629	28.88435	268	-31.25368	28.85871	303	-31.23650	28.85255	338	-31.23321	28.83179
199	-31.24054	28.89738	234	-31.24541	28.88353	269	-31.25324	28.85692	304	-31.23601	28.85268	339	-31.23091	28.83174
200	-31.24070	28.89666	235	-31.24474	28.88239	270	-31.25289	28.85527	305	-31.23498	28.85317	340	-31.22989	28.83203
201	-31.24125	28.89621	236	-31.24430	28.88120	271	-31.25250	28.85394	306	-31.23452	28.85318	341	-31.22925	28.83241
202	-31.24181	28.89620	237	-31.24418	28.88009	272	-31.25223	28.85298	307	-31.23414	28.85297	342	-31.22846	28.83240
203	-31.24300	28.89623	238	-31.24419	28.87903	273	-31.25164	28.85233	308	-31.23349	28.85219	343	-31.22814	28.83252
204	-31.24356	28.89560	239	-31.24405	28.87841	274	-31.25163	28.85195	309	-31.23302	28.85182	344	-31.22744	28.83272
205	-31.24357	28.89528	240	-31.24478	28.87740	275	-31.25165	28.85086	310	-31.23250	28.85215	345	-31.22636	28.83311
206	-31.24348	28.89494	241	-31.24505	28.87649	276	-31.25136	28.84906	311	-31.23199	28.85276	346	-31.22681	28.83241
207	-31.24329	28.89433	242	-31.24535	28.87510	277	-31.25123	28.84795	312	-31.23212	28.85208	347	-31.22718	28.83209
208	-31.24329	28.89386	243	-31.24544	28.87401	278	-31.25065	28.84624	313	-31.23259	28.85150	348	-31.22797	28.83186
209	-31.24374	28.89352	244	-31.24590	28.87366	279	-31.24947	28.84539	314	-31.23311	28.85149	349	-31.22911	28.83141
210	-31.24375	28.89287	245	-31.24633	28.87293	280	-31.24908	28.84509	315	-31.23369	28.85171	350	-31.22952	28.83125

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
351	-31.23066	28.83074	386	-31.24126	28.85229	421	-31.25827	28.85191	456	-31.25221	28.87384	491	-31.25697	28.88870
352	-31.23132	28.83062	387	-31.24217	28.85166	422	-31.25780	28.85265	457	-31.25114	28.87425	492	-31.25603	28.88832
353	-31.23216	28.83045	388	-31.24280	28.85118	423	-31.25751	28.85364	458	-31.25085	28.87447	493	-31.25470	28.88829
354	-31.23319	28.83064	389	-31.24311	28.85029	424	-31.25749	28.85436	459	-31.25011	28.87505	494	-31.25394	28.88846
355	-31.23443	28.83111	390	-31.24295	28.84958	425	-31.25782	28.85551	460	-31.24945	28.87551	495	-31.25390	28.89061
356	-31.23583	28.83197	391	-31.24307	28.84918	426	-31.25826	28.85686	461	-31.24891	28.87645	496	-31.25407	28.89137
357	-31.23651	28.83257	392	-31.24316	28.84771	427	-31.25860	28.85842	462	-31.24878	28.87688	497	-31.25372	28.89217
358	-31.23711	28.83300	393	-31.24325	28.84685	428	-31.25893	28.86078	463	-31.24868	28.87786	498	-31.25355	28.89355
359	-31.23835	28.83369	394	-31.24324	28.84628	429	-31.25937	28.86131	464	-31.24824	28.87861	499	-31.25313	28.89568
360	-31.23852	28.83486	395	-31.24334	28.84561	430	-31.25959	28.86144	465	-31.24845	28.87951	500	-31.25311	28.89686
361	-31.23886	28.83547	396	-31.24348	28.84443	431	-31.25986	28.86159	466	-31.24901	28.88050	501	-31.25323	28.89728
362	-31.23961	28.83638	397	-31.24407	28.84318	432	-31.26013	28.86175	467	-31.24960	28.88077	502	-31.25352	28.89793
363	-31.23990	28.83617	398	-31.24460	28.84288	433	-31.26103	28.86214	468	-31.25046	28.88117	503	-31.25266	28.89979
364	-31.24030	28.83585	399	-31.24525	28.84248	434	-31.26104	28.86258	469	-31.25086	28.88129	504	-31.25242	28.90006
365	-31.24024	28.83634	400	-31.24660	28.84195	435	-31.26031	28.86356	470	-31.25235	28.88144	505	-31.25205	28.90077
366	-31.23990	28.83701	401	-31.24799	28.84161	436	-31.26040	28.86406	471	-31.25352	28.88164	506	-31.25214	28.90114
367	-31.23972	28.83720	402	-31.24902	28.84174	437	-31.26067	28.86515	472	-31.25419	28.88144	507	-31.25253	28.90158
368	-31.23955	28.83759	403	-31.25043	28.84243	438	-31.26031	28.86511	473	-31.25420	28.88181	508	-31.25223	28.90227
369	-31.23953	28.83874	404	-31.25127	28.84307	439	-31.25993	28.86481	474	-31.25393	28.88197	509	-31.25239	28.90269
370	-31.23954	28.83920	405	-31.25287	28.84433	440	-31.25898	28.86459	475	-31.25347	28.88223	510	-31.25322	28.90378
371	-31.23927	28.84013	406	-31.25371	28.84435	441	-31.25797	28.86473	476	-31.25301	28.88279	511	-31.25295	28.90376
372	-31.23926	28.84052	407	-31.25500	28.84391	442	-31.25740	28.86517	477	-31.25195	28.88328	512	-31.25277	28.90365
373	-31.23928	28.84157	408	-31.25507	28.84416	443	-31.25668	28.86627	478	-31.25176	28.88369	513	-31.25241	28.90355
374	-31.23906	28.84250	409	-31.25443	28.84527	444	-31.25644	28.86708	479	-31.25176	28.88390	514	-31.25179	28.90326
375	-31.23857	28.84418	410	-31.25452	28.84646	445	-31.25627	28.86843	480	-31.25186	28.88427	515	-31.25080	28.90354
376	-31.23828	28.84565	411	-31.25523	28.84839	446	-31.25668	28.86960	481	-31.25258	28.88506	516	-31.24996	28.90412
377	-31.23829	28.84655	412	-31.25584	28.84953	447	-31.25603	28.87017	482	-31.25329	28.88592	517	-31.24970	28.90470
378	-31.23819	28.84677	413	-31.25690	28.84989	448	-31.25590	28.87047	483	-31.25441	28.88629	518	-31.24961	28.90656
379	-31.23811	28.84719	414	-31.25795	28.84978	449	-31.25558	28.87141	484	-31.25501	28.88664	519	-31.24917	28.90638
380	-31.23789	28.84769	415	-31.25926	28.84964	450	-31.25456	28.87110	485	-31.25593	28.88699	520	-31.24873	28.90622
381	-31.23810	28.84841	416	-31.25977	28.85003	451	-31.25377	28.87123	486	-31.25664	28.88758	521	-31.24778	28.90581
382	-31.23824	28.85056	417	-31.25993	28.85062	452	-31.25295	28.87180	487	-31.25715	28.88797	522	-31.24736	28.90544
383	-31.23901	28.85181	418	-31.26012	28.85103	453	-31.25266	28.87230	488	-31.25768	28.88857	523	-31.24709	28.90523
384	-31.23924	28.85221	419	-31.25997	28.85122	454	-31.25265	28.87266	489	-31.25817	28.88941	524	-31.24622	28.90451
385	-31.23993	28.85248	420	-31.25875	28.85138	455	-31.25283	28.87347	490	-31.25790	28.88935	525	-31.24579	28.90438

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
526	-31.24496	28.90457	561	-31.23173	28.92026	596	-31.24219	28.92286	631	-31.23062	28.83060	666	-31.22623	28.83315
527	-31.24439	28.90502	562	-31.23064	28.92023	597	-31.24294	28.92288	632	-31.22947	28.83110	667	-31.22624	28.83316
528	-31.24411	28.90523	563	-31.23006	28.92057	598	-31.24404	28.92276	633	-31.22907	28.83126	668	-31.22624	28.83317
529	-31.24384	28.90544	564	-31.23005	28.92115	599	-31.24488	28.92262	634	-31.22907	28.83126	669	-31.22624	28.83318
530	-31.24304	28.90598	565	-31.23006	28.92183	600	-31.24715	28.92287	635	-31.22907	28.83126	670	-31.22625	28.83318
531	-31.24242	28.90667	566	-31.23003	28.92336	601	-31.24885	28.92274	636	-31.22793	28.83171	671	-31.22625	28.83319
532	-31.24222	28.90711	567	-31.23105	28.92473	602	-31.24981	28.92255	637	-31.22714	28.83194	672	-31.22626	28.83320
533	-31.24222	28.90742	568	-31.23107	28.92579	603	-31.25060	28.92240	638	-31.22714	28.83194	673	-31.22626	28.83321
534	-31.24237	28.90795	569	-31.23069	28.92643	604	-31.25117	28.92208	639	-31.22713	28.83194	674	-31.22626	28.83321
535	-31.24278	28.90925	570	-31.23051	28.92747	605	-31.25225	28.92109	640	-31.22712	28.83194	675	-31.22627	28.83322
536	-31.24324	28.90977	571	-31.23099	28.92850	606	-31.25326	28.92160	641	-31.22712	28.83195	676	-31.22627	28.83322
537	-31.24430	28.91153	572	-31.23132	28.92876	607	-31.25400	28.92142	642	-31.22711	28.83195	677	-31.22627	28.83322
538	-31.24467	28.91218	573	-31.23169	28.92905	608	-31.25458	28.92098	643	-31.22710	28.83196	678	-31.22628	28.83323
539	-31.24529	28.91279	574	-31.23341	28.92918	609	-31.25488	28.92052	644	-31.22709	28.83196	679	-31.22629	28.83324
540	-31.24565	28.91307	575	-31.23338	28.93071	610	-31.25536	28.91966	645	-31.22673	28.83229	680	-31.22630	28.83324
541	-31.24503	28.91340	576	-31.23349	28.93098	611	-31.25670	28.91922	646	-31.22673	28.83229	681	-31.22630	28.83325
542	-31.24376	28.91353	577	-31.23385	28.93138	612	-31.25763	28.91858	647	-31.22672	28.83230	682	-31.22631	28.83325
543	-31.24308	28.91375	578	-31.23411	28.93168	613	-31.25828	28.91785	648	-31.22671	28.83230	683	-31.22632	28.83325
544	-31.24222	28.91400	579	-31.23447	28.93190	614	-31.25870	28.91683	649	-31.22671	28.83231	684	-31.22633	28.83326
545	-31.24153	28.91463	580	-31.23483	28.93191	615	-31.25927	28.91666	650	-31.22670	28.83232	685	-31.22634	28.83326
546	-31.24075	28.91558	581	-31.23519	28.93170	616	-31.25967	28.91635	651	-31.22670	28.83232	686	-31.22635	28.83326
547	-31.24042	28.91584	582	-31.23579	28.93084	617	-31.25994	28.91646	652	-31.22626	28.83301	687	-31.22635	28.83326
548	-31.23997	28.91619	583	-31.23625	28.92980	618	-31.26086	28.91818	653	-31.22625	28.83302	688	-31.22636	28.83326
549	-31.23948	28.91715	584	-31.23643	28.92874	619	-31.26158	28.91905	654	-31.22625	28.83303	689	-31.22637	28.83326
550	-31.23907	28.91794	585	-31.23673	28.92791	620	-31.26274	28.91957	655	-31.22624	28.83304	690	-31.22638	28.83326
551	-31.23818	28.91981	586	-31.23682	28.92676	621	-31.26110	28.92286	656	-31.22624	28.83305	691	-31.22639	28.83326
552	-31.23772	28.92037	587	-31.23692	28.92642	622	-31.23216	28.83029	657	-31.22624	28.83306	692	-31.22640	28.83326
553	-31.23718	28.92088	588	-31.23691	28.92555	623	-31.23215	28.83029	658	-31.22623	28.83306	693	-31.22640	28.83326
554	-31.23654	28.92124	589	-31.23816	28.92466	624	-31.23215	28.83029	659	-31.22623	28.83307	694	-31.22640	28.83326
555	-31.23608	28.92214	590	-31.23835	28.92465	625	-31.23214	28.83030	660	-31.22623	28.83309	695	-31.22748	28.83288
556	-31.23574	28.92204	591	-31.23906	28.92487	626	-31.23130	28.83046	661	-31.22623	28.83310	696	-31.22818	28.83268
557	-31.23527	28.92185	592	-31.23939	28.92463	627	-31.23064	28.83059	662	-31.22623	28.83311	697	-31.22818	28.83268
558	-31.23447	28.92172	593	-31.24064	28.92352	628	-31.23064	28.83059	663	-31.22623	28.83312	698	-31.22819	28.83267
559	-31.23330	28.92120	594	-31.24106	28.92340	629	-31.23063	28.83059	664	-31.22623	28.83313	699	-31.22819	28.83267
560	-31.23272	28.92103	595	-31.24170	28.92325	630	-31.23062	28.83060	665	-31.22623	28.83314	700	-31.22848	28.83255

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
701	-31.22925	28.83257	736	-31.23656	28.84453	771	-31.23259	28.85135	806	-31.23186	28.85282	841	-31.23301	28.85200
702	-31.22926	28.83257	737	-31.23641	28.84503	772	-31.23258	28.85135	807	-31.23187	28.85283	842	-31.23340	28.85231
703	-31.22927	28.83257	738	-31.23641	28.84503	773	-31.23257	28.85135	808	-31.23187	28.85284	843	-31.23404	28.85308
704	-31.22928	28.83257	739	-31.23641	28.84504	774	-31.23256	28.85135	809	-31.23188	28.85285	844	-31.23405	28.85309
705	-31.22928	28.83257	740	-31.23641	28.84505	775	-31.23256	28.85135	810	-31.23188	28.85286	845	-31.23405	28.85309
706	-31.22929	28.83256	741	-31.23641	28.84506	776	-31.23255	28.85136	811	-31.23189	28.85287	846	-31.23406	28.85310
707	-31.22930	28.83256	742	-31.23617	28.84706	777	-31.23254	28.85136	812	-31.23189	28.85287	847	-31.23407	28.85310
708	-31.22931	28.83255	743	-31.23599	28.84778	778	-31.23253	28.85136	813	-31.23190	28.85288	848	-31.23407	28.85311
709	-31.22931	28.83255	744	-31.23599	28.84778	779	-31.23252	28.85137	814	-31.23191	28.85289	849	-31.23408	28.85311
710	-31.22993	28.83218	745	-31.23599	28.84779	780	-31.23252	28.85137	815	-31.23191	28.85289	850	-31.23408	28.85312
711	-31.23092	28.83190	746	-31.23599	28.84780	781	-31.23251	28.85138	816	-31.23192	28.85290	851	-31.23446	28.85333
712	-31.23319	28.83195	747	-31.23588	28.84858	782	-31.23250	28.85139	817	-31.23193	28.85290	852	-31.23446	28.85333
713	-31.23381	28.83213	748	-31.23588	28.84858	783	-31.23250	28.85139	818	-31.23194	28.85291	853	-31.23447	28.85333
714	-31.23468	28.83274	749	-31.23588	28.84859	784	-31.23249	28.85140	819	-31.23194	28.85291	854	-31.23448	28.85334
715	-31.23468	28.83274	750	-31.23588	28.84860	785	-31.23202	28.85197	820	-31.23194	28.85291	855	-31.23449	28.85334
716	-31.23469	28.83275	751	-31.23588	28.84861	786	-31.23201	28.85198	821	-31.23195	28.85291	856	-31.23450	28.85334
717	-31.23469	28.83275	752	-31.23601	28.85118	787	-31.23201	28.85199	822	-31.23196	28.85292	857	-31.23451	28.85334
718	-31.23503	28.83294	753	-31.23558	28.85183	788	-31.23200	28.85199	823	-31.23197	28.85292	858	-31.23452	28.85334
719	-31.23539	28.83326	754	-31.23512	28.85223	789	-31.23200	28.85200	824	-31.23198	28.85292	859	-31.23452	28.85334
720	-31.23540	28.83326	755	-31.23465	28.85238	790	-31.23200	28.85201	825	-31.23199	28.85292	860	-31.23498	28.85333
721	-31.23540	28.83327	756	-31.23378	28.85159	791	-31.23199	28.85202	826	-31.23200	28.85292	861	-31.23499	28.85333
722	-31.23595	28.83364	757	-31.23377	28.85159	792	-31.23199	28.85203	827	-31.23201	28.85292	862	-31.23499	28.85333
723	-31.23695	28.83465	758	-31.23377	28.85158	793	-31.23199	28.85204	828	-31.23201	28.85292	863	-31.23500	28.85333
724	-31.23765	28.83579	759	-31.23376	28.85157	794	-31.23198	28.85205	829	-31.23202	28.85291	864	-31.23501	28.85333
725	-31.23795	28.83735	760	-31.23375	28.85157	795	-31.23186	28.85273	830	-31.23203	28.85291	865	-31.23502	28.85332
726	-31.23778	28.83912	761	-31.23374	28.85157	796	-31.23186	28.85273	831	-31.23204	28.85291	866	-31.23503	28.85332
727	-31.23744	28.84066	762	-31.23374	28.85156	797	-31.23185	28.85274	832	-31.23204	28.85291	867	-31.23605	28.85283
728	-31.23744	28.84067	763	-31.23373	28.85156	798	-31.23185	28.85275	833	-31.23205	28.85290	868	-31.23646	28.85272
729	-31.23744	28.84067	764	-31.23315	28.85134	799	-31.23185	28.85276	834	-31.23206	28.85290	869	-31.23723	28.85365
730	-31.23734	28.84128	765	-31.23314	28.85134	800	-31.23185	28.85277	835	-31.23206	28.85289	870	-31.23723	28.85365
731	-31.23712	28.84216	766	-31.23314	28.85134	801	-31.23185	28.85278	836	-31.23207	28.85289	871	-31.23724	28.85366
732	-31.23680	28.84323	767	-31.23313	28.85134	802	-31.23186	28.85279	837	-31.23208	28.85288	872	-31.23725	28.85367
733	-31.23680	28.84323	768	-31.23312	28.85133	803	-31.23186	28.85280	838	-31.23208	28.85287	873	-31.23725	28.85367
734	-31.23680	28.84324	769	-31.23311	28.85133	804	-31.23186	28.85281	839	-31.23209	28.85287	874	-31.23767	28.85403
735	-31.23680	28.84325	770	-31.23311	28.85133	805	-31.23186	28.85282	840	-31.23258	28.85227	875	-31.23803	28.85435

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
876	-31.23804	28.85436	911	-31.24432	28.85432	946	-31.24853	28.84512	981	-31.25311	28.85696	1016	-31.24872	28.86678
877	-31.23804	28.85436	912	-31.24433	28.85432	947	-31.24854	28.84513	982	-31.25311	28.85697	1017	-31.24871	28.86678
878	-31.23805	28.85436	913	-31.24433	28.85431	948	-31.24854	28.84513	983	-31.25355	28.85876	1018	-31.24870	28.86679
879	-31.23870	28.85479	914	-31.24434	28.85430	949	-31.24903	28.84524	984	-31.25356	28.85876	1019	-31.24870	28.86679
880	-31.23871	28.85480	915	-31.24434	28.85429	950	-31.24939	28.84552	985	-31.25356	28.85877	1020	-31.24869	28.86680
881	-31.23871	28.85480	916	-31.24435	28.85428	951	-31.24939	28.84552	986	-31.25356	28.85878	1021	-31.24868	28.86680
882	-31.23872	28.85480	917	-31.24435	28.85427	952	-31.24940	28.84552	987	-31.25432	28.86067	1022	-31.24868	28.86680
883	-31.23872	28.85480	918	-31.24436	28.85427	953	-31.25054	28.84635	988	-31.25431	28.86134	1023	-31.24868	28.86681
884	-31.23932	28.85503	919	-31.24436	28.85426	954	-31.25110	28.84799	989	-31.25405	28.86223	1024	-31.24867	28.86682
885	-31.23933	28.85503	920	-31.24436	28.85425	955	-31.25123	28.84908	990	-31.25405	28.86223	1025	-31.24867	28.86682
886	-31.23934	28.85503	921	-31.24436	28.85424	956	-31.25123	28.84909	991	-31.25405	28.86223	1026	-31.24866	28.86683
887	-31.23934	28.85504	922	-31.24436	28.85424	957	-31.25152	28.85088	992	-31.25394	28.86261	1027	-31.24866	28.86683
888	-31.23935	28.85504	923	-31.24446	28.85363	958	-31.25150	28.85194	993	-31.25333	28.86400	1028	-31.24865	28.86684
889	-31.23936	28.85504	924	-31.24482	28.85270	959	-31.25150	28.85195	994	-31.25244	28.86561	1029	-31.24865	28.86685
890	-31.23937	28.85504	925	-31.24482	28.85270	960	-31.25150	28.85195	995	-31.25181	28.86653	1030	-31.24865	28.86686
891	-31.24081	28.85500	926	-31.24482	28.85270	961	-31.25151	28.85233	996	-31.25121	28.86721	1031	-31.24864	28.86687
892	-31.24082	28.85500	927	-31.24502	28.85212	962	-31.25151	28.85234	997	-31.25087	28.86740	1032	-31.24864	28.86688
893	-31.24083	28.85500	928	-31.24502	28.85212	963	-31.25151	28.85235	998	-31.25004	28.86738	1033	-31.24864	28.86689
894	-31.24083	28.85500	929	-31.24502	28.85211	964	-31.25151	28.85236	999	-31.24951	28.86717	1034	-31.24864	28.86690
895	-31.24314	28.85460	930	-31.24536	28.85069	965	-31.25151	28.85237	1000	-31.24905	28.86689	1035	-31.24864	28.86691
896	-31.24315	28.85460	931	-31.24554	28.85009	966	-31.25151	28.85238	1001	-31.24905	28.86689	1036	-31.24864	28.86692
897	-31.24315	28.85460	932	-31.24554	28.85009	967	-31.25152	28.85239	1002	-31.24904	28.86689	1037	-31.24864	28.86693
898	-31.24316	28.85459	933	-31.24554	28.85008	968	-31.25152	28.85239	1003	-31.24883	28.86678	1038	-31.24864	28.86694
899	-31.24316	28.85459	934	-31.24554	28.85007	969	-31.25152	28.85240	1004	-31.24882	28.86678	1039	-31.24864	28.86695
900	-31.24346	28.85447	935	-31.24581	28.84868	970	-31.25153	28.85241	1005	-31.24881	28.86677	1040	-31.24864	28.86696
901	-31.24425	28.85436	936	-31.24605	28.84762	971	-31.25153	28.85242	1006	-31.24881	28.86677	1041	-31.24864	28.86697
902	-31.24425	28.85436	937	-31.24626	28.84713	972	-31.25154	28.85243	1007	-31.24880	28.86677	1042	-31.24865	28.86698
903	-31.24426	28.85436	938	-31.24626	28.84713	973	-31.25155	28.85244	1008	-31.24879	28.86677	1043	-31.24865	28.86699
904	-31.24427	28.85436	939	-31.24627	28.84712	974	-31.25155	28.85244	1009	-31.24878	28.86676	1044	-31.24865	28.86699
905	-31.24428	28.85435	940	-31.24627	28.84711	975	-31.25211	28.85307	1010	-31.24877	28.86676	1045	-31.24865	28.86699
906	-31.24428	28.85435	941	-31.24627	28.84711	976	-31.25237	28.85399	1011	-31.24876	28.86676	1046	-31.24897	28.86772
907	-31.24429	28.85435	942	-31.24653	28.84618	977	-31.25237	28.85399	1012	-31.24875	28.86677	1047	-31.24882	28.86877
908	-31.24430	28.85434	943	-31.24671	28.84566	978	-31.25237	28.85399	1013	-31.24874	28.86677	1048	-31.24882	28.86878
909	-31.24431	28.85434	944	-31.24713	28.84519	979	-31.25276	28.85531	1014	-31.24874	28.86677	1049	-31.24873	28.86950
910	-31.24431	28.85433	945	-31.24786	28.84493	980	-31.25311	28.85696	1015	-31.24873	28.86677	1050	-31.24858	28.87001

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1051	-31.24832	28.87046	1086	-31.24621	28.87147	1121	-31.24392	28.87839	1156	-31.24694	28.88581	1191	-31.24470	28.89341
1052	-31.24781	28.87065	1087	-31.24621	28.87148	1122	-31.24392	28.87840	1157	-31.24694	28.88581	1192	-31.24424	28.89290
1053	-31.24645	28.87062	1088	-31.24621	28.87149	1123	-31.24392	28.87841	1158	-31.24694	28.88605	1193	-31.24379	28.89224
1054	-31.24645	28.87062	1089	-31.24621	28.87149	1124	-31.24392	28.87842	1159	-31.24694	28.88605	1194	-31.24378	28.89223
1055	-31.24645	28.87062	1090	-31.24641	28.87216	1125	-31.24392	28.87843	1160	-31.24694	28.88607	1195	-31.24378	28.89222
1056	-31.24644	28.87062	1091	-31.24621	28.87286	1126	-31.24392	28.87844	1161	-31.24694	28.88608	1196	-31.24377	28.89222
1057	-31.24643	28.87062	1092	-31.24580	28.87355	1127	-31.24392	28.87845	1162	-31.24695	28.88609	1197	-31.24376	28.89221
1058	-31.24642	28.87062	1093	-31.24537	28.87388	1128	-31.24406	28.87905	1163	-31.24695	28.88610	1198	-31.24376	28.89220
1059	-31.24641	28.87063	1094	-31.24537	28.87388	1129	-31.24404	28.88008	1164	-31.24695	28.88610	1199	-31.24375	28.89220
1060	-31.24640	28.87063	1095	-31.24536	28.87389	1130	-31.24404	28.88010	1165	-31.24695	28.88611	1200	-31.24374	28.89219
1061	-31.24640	28.87063	1096	-31.24535	28.87390	1131	-31.24404	28.88011	1166	-31.24696	28.88612	1201	-31.24374	28.89219
1062	-31.24639	28.87064	1097	-31.24535	28.87390	1132	-31.24416	28.88122	1167	-31.24696	28.88613	1202	-31.24353	28.89208
1063	-31.24638	28.87064	1098	-31.24534	28.87391	1133	-31.24416	28.88122	1168	-31.24697	28.88614	1203	-31.24352	28.89208
1064	-31.24637	28.87065	1099	-31.24533	28.87392	1134	-31.24417	28.88123	1169	-31.24697	28.88615	1204	-31.24352	28.89208
1065	-31.24637	28.87065	1100	-31.24533	28.87393	1135	-31.24417	28.88124	1170	-31.24698	28.88616	1205	-31.24352	28.89208
1066	-31.24636	28.87066	1101	-31.24533	28.87394	1136	-31.24417	28.88125	1171	-31.24699	28.88616	1206	-31.24351	28.89208
1067	-31.24636	28.87066	1102	-31.24532	28.87394	1137	-31.24417	28.88126	1172	-31.24699	28.88617	1207	-31.24350	28.89207
1068	-31.24635	28.87067	1103	-31.24532	28.87395	1138	-31.24417	28.88126	1173	-31.24700	28.88618	1208	-31.24349	28.89207
1069	-31.24635	28.87067	1104	-31.24531	28.87396	1139	-31.24462	28.88245	1174	-31.24701	28.88618	1209	-31.24348	28.89207
1070	-31.24635	28.87067	1105	-31.24531	28.87397	1140	-31.24462	28.88246	1175	-31.24773	28.88667	1210	-31.24347	28.89207
1071	-31.24634	28.87068	1106	-31.24531	28.87398	1141	-31.24463	28.88247	1176	-31.24805	28.88693	1211	-31.24346	28.89207
1072	-31.24634	28.87069	1107	-31.24531	28.87399	1142	-31.24463	28.88248	1177	-31.24859	28.88769	1212	-31.24346	28.89207
1073	-31.24633	28.87070	1108	-31.24531	28.87400	1143	-31.24463	28.88248	1178	-31.24859	28.88769	1213	-31.24345	28.89207
1074	-31.24633	28.87071	1109	-31.24522	28.87508	1144	-31.24530	28.88362	1179	-31.24904	28.88831	1214	-31.24344	28.89208
1075	-31.24632	28.87072	1110	-31.24492	28.87644	1145	-31.24530	28.88363	1180	-31.24922	28.88862	1215	-31.24343	28.89208
1076	-31.24632	28.87073	1111	-31.24466	28.87732	1146	-31.24531	28.88364	1181	-31.24941	28.88930	1216	-31.24342	28.89208
1077	-31.24632	28.87074	1112	-31.24395	28.87831	1147	-31.24532	28.88364	1182	-31.24923	28.89169	1217	-31.24341	28.89209
1078	-31.24632	28.87075	1113	-31.24395	28.87831	1148	-31.24532	28.88365	1183	-31.24911	28.89240	1218	-31.24341	28.89209
1079	-31.24632	28.87075	1114	-31.24394	28.87832	1149	-31.24533	28.88366	1184	-31.24876	28.89342	1219	-31.24340	28.89210
1080	-31.24621	28.87141	1115	-31.24394	28.87833	1150	-31.24621	28.88447	1185	-31.24807	28.89419	1220	-31.24339	28.89210
1081	-31.24621	28.87142	1116	-31.24393	28.87834	1151	-31.24621	28.88447	1186	-31.24730	28.89448	1221	-31.24338	28.89211
1082	-31.24621	28.87143	1117	-31.24393	28.87835	1152	-31.24621	28.88447	1187	-31.24605	28.89445	1222	-31.24338	28.89211
1083	-31.24620	28.87144	1118	-31.24393	28.87836	1153	-31.24680	28.88498	1188	-31.24499	28.89376	1223	-31.24338	28.89212
1084	-31.24621	28.87145	1119	-31.24392	28.87837	1154	-31.24695	28.88515	1189	-31.24470	28.89341	1224	-31.24337	28.89212
1085	-31.24621	28.87146	1120	-31.24392	28.87838	1155	-31.24694	28.88581	1190	-31.24470	28.89341	1225	-31.24337	28.89212

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1226	-31.24337	28.89213	1261	-31.24315	28.89383	1296	-31.24059	28.89656	1331	-31.23546	28.89972	1366	-31.23365	28.90085
1227	-31.24336	28.89214	1262	-31.24315	28.89384	1297	-31.24058	28.89657	1332	-31.23546	28.89972	1367	-31.23365	28.90086
1228	-31.24336	28.89215	1263	-31.24315	28.89385	1298	-31.24058	28.89658	1333	-31.23545	28.89972	1368	-31.23364	28.90087
1229	-31.24335	28.89216	1264	-31.24315	28.89386	1299	-31.24057	28.89659	1334	-31.23544	28.89972	1369	-31.23364	28.90088
1230	-31.24335	28.89217	1265	-31.24315	28.89387	1300	-31.24057	28.89660	1335	-31.23543	28.89972	1370	-31.23364	28.90088
1231	-31.24334	28.89218	1266	-31.24316	28.89434	1301	-31.24057	28.89661	1336	-31.23542	28.89972	1371	-31.23343	28.90162
1232	-31.24334	28.89219	1267	-31.24316	28.89434	1302	-31.24056	28.89662	1337	-31.23541	28.89973	1372	-31.23335	28.90180
1233	-31.24334	28.89220	1268	-31.24316	28.89435	1303	-31.24056	28.89662	1338	-31.23541	28.89973	1373	-31.23316	28.90202
1234	-31.24334	28.89221	1269	-31.24316	28.89436	1304	-31.24042	28.89730	1339	-31.23540	28.89974	1374	-31.23270	28.90219
1235	-31.24334	28.89222	1270	-31.24316	28.89437	1305	-31.23969	28.89829	1340	-31.23539	28.89974	1375	-31.23270	28.90219
1236	-31.24334	28.89223	1271	-31.24317	28.89438	1306	-31.23888	28.89860	1341	-31.23538	28.89975	1376	-31.23269	28.90219
1237	-31.24334	28.89224	1272	-31.24317	28.89438	1307	-31.23742	28.89842	1342	-31.23537	28.89975	1377	-31.23269	28.90220
1238	-31.24334	28.89225	1273	-31.24335	28.89499	1308	-31.23742	28.89842	1343	-31.23537	28.89976	1378	-31.23268	28.90220
1239	-31.24334	28.89226	1274	-31.24343	28.89530	1309	-31.23741	28.89842	1344	-31.23536	28.89977	1379	-31.23267	28.90221
1240	-31.24334	28.89227	1275	-31.24343	28.89553	1310	-31.23740	28.89842	1345	-31.23536	28.89977	1380	-31.23267	28.90221
1241	-31.24334	28.89228	1276	-31.24295	28.89607	1311	-31.23739	28.89842	1346	-31.23535	28.89978	1381	-31.23212	28.90264
1242	-31.24335	28.89229	1277	-31.24181	28.89604	1312	-31.23738	28.89842	1347	-31.23535	28.89978	1382	-31.23212	28.90265
1243	-31.24335	28.89230	1278	-31.24181	28.89604	1313	-31.23737	28.89843	1348	-31.23508	28.90021	1383	-31.23211	28.90265
1244	-31.24335	28.89230	1279	-31.24180	28.89604	1314	-31.23736	28.89843	1349	-31.23497	28.90033	1384	-31.23210	28.90266
1245	-31.24353	28.89271	1280	-31.24125	28.89606	1315	-31.23735	28.89843	1350	-31.23426	28.90047	1385	-31.23210	28.90267
1246	-31.24362	28.89291	1281	-31.24124	28.89606	1316	-31.23735	28.89844	1351	-31.23425	28.90047	1386	-31.23209	28.90267
1247	-31.24361	28.89343	1282	-31.24124	28.89606	1317	-31.23734	28.89844	1352	-31.23424	28.90047	1387	-31.23209	28.90268
1248	-31.24321	28.89373	1283	-31.24123	28.89606	1318	-31.23733	28.89845	1353	-31.23423	28.90047	1388	-31.23208	28.90269
1249	-31.24321	28.89373	1284	-31.24122	28.89606	1319	-31.23732	28.89845	1354	-31.23423	28.90048	1389	-31.23208	28.90270
1250	-31.24320	28.89374	1285	-31.24121	28.89607	1320	-31.23732	28.89846	1355	-31.23422	28.90048	1390	-31.23207	28.90271
1251	-31.24320	28.89375	1286	-31.24120	28.89607	1321	-31.23731	28.89847	1356	-31.23422	28.90048	1391	-31.23207	28.90272
1252	-31.24319	28.89375	1287	-31.24119	28.89607	1322	-31.23730	28.89848	1357	-31.23370	28.90079	1392	-31.23207	28.90273
1253	-31.24318	28.89376	1288	-31.24119	28.89608	1323	-31.23730	28.89848	1358	-31.23370	28.90079	1393	-31.23207	28.90274
1254	-31.24318	28.89377	1289	-31.24118	28.89608	1324	-31.23729	28.89849	1359	-31.23369	28.90080	1394	-31.23206	28.90275
1255	-31.24317	28.89378	1290	-31.24118	28.89608	1325	-31.23729	28.89850	1360	-31.23368	28.90081	1395	-31.23206	28.90276
1256	-31.24317	28.89379	1291	-31.24062	28.89653	1326	-31.23729	28.89851	1361	-31.23368	28.90081	1396	-31.23206	28.90277
1257	-31.24316	28.89379	1292	-31.24061	28.89653	1327	-31.23728	28.89851	1362	-31.23367	28.90082	1397	-31.23206	28.90277
1258	-31.24316	28.89380	1293	-31.24061	28.89654	1328	-31.23707	28.89902	1363	-31.23366	28.90083	1398	-31.23208	28.90381
1259	-31.24316	28.89381	1294	-31.24060	28.89654	1329	-31.23621	28.89974	1364	-31.23366	28.90083	1399	-31.23183	28.90420
1260	-31.24316	28.89382	1295	-31.24059	28.89655	1330	-31.23546	28.89972	1365	-31.23365	28.90084	1400	-31.23101	28.90435

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1401	-31.23101	28.90436	1436	-31.23090	28.90695	1471	-31.22736	28.91161	1506	-31.22313	28.91538	1541	-31.22117	28.91937
1402	-31.23100	28.90436	1437	-31.23090	28.90696	1472	-31.22735	28.91161	1507	-31.22313	28.91539	1542	-31.22117	28.91938
1403	-31.23099	28.90436	1438	-31.23091	28.90697	1473	-31.22735	28.91162	1508	-31.22312	28.91539	1543	-31.22117	28.91939
1404	-31.23098	28.90436	1439	-31.23091	28.90698	1474	-31.22734	28.91162	1509	-31.22312	28.91540	1544	-31.22117	28.91940
1405	-31.23097	28.90437	1440	-31.23091	28.90699	1475	-31.22733	28.91163	1510	-31.22312	28.91541	1545	-31.22117	28.91941
1406	-31.23097	28.90437	1441	-31.23091	28.90700	1476	-31.22732	28.91163	1511	-31.22312	28.91542	1546	-31.22117	28.91942
1407	-31.23075	28.90450	1442	-31.23092	28.90700	1477	-31.22732	28.91164	1512	-31.22295	28.91603	1547	-31.22117	28.91943
1408	-31.23075	28.90451	1443	-31.23105	28.90731	1478	-31.22731	28.91165	1513	-31.22219	28.91702	1548	-31.22117	28.91944
1409	-31.23074	28.90451	1444	-31.23122	28.90771	1479	-31.22730	28.91166	1514	-31.22219	28.91702	1549	-31.22117	28.91945
1410	-31.23073	28.90452	1445	-31.23084	28.90830	1480	-31.22730	28.91166	1515	-31.22218	28.91702	1550	-31.22118	28.91946
1411	-31.23073	28.90452	1446	-31.23083	28.90831	1481	-31.22730	28.91167	1516	-31.22218	28.91703	1551	-31.22118	28.91947
1412	-31.23072	28.90453	1447	-31.23083	28.90832	1482	-31.22687	28.91234	1517	-31.22217	28.91704	1552	-31.22118	28.91948
1413	-31.23071	28.90454	1448	-31.23083	28.90832	1483	-31.22585	28.91292	1518	-31.22217	28.91705	1553	-31.22119	28.91949
1414	-31.23071	28.90455	1449	-31.23083	28.90833	1484	-31.22585	28.91292	1519	-31.22217	28.91705	1554	-31.22119	28.91950
1415	-31.23070	28.90455	1450	-31.23066	28.90872	1485	-31.22584	28.91292	1520	-31.22200	28.91746	1555	-31.22120	28.91951
1416	-31.23070	28.90456	1451	-31.23050	28.90890	1486	-31.22583	28.91293	1521	-31.22184	28.91782	1556	-31.22120	28.91952
1417	-31.23069	28.90457	1452	-31.23050	28.90890	1487	-31.22583	28.91293	1522	-31.22184	28.91783	1557	-31.22120	28.91952
1418	-31.23069	28.90458	1453	-31.23049	28.90891	1488	-31.22527	28.91343	1523	-31.22183	28.91784	1558	-31.22197	28.92053
1419	-31.23069	28.90459	1454	-31.23048	28.90892	1489	-31.22475	28.91372	1524	-31.22183	28.91784	1559	-31.22217	28.92146
1420	-31.23069	28.90459	1455	-31.23048	28.90893	1490	-31.22474	28.91372	1525	-31.22183	28.91785	1560	-31.22217	28.92146
1421	-31.23046	28.90543	1456	-31.23048	28.90893	1491	-31.22474	28.91373	1526	-31.22182	28.91786	1561	-31.22217	28.92147
1422	-31.23046	28.90543	1457	-31.23018	28.90951	1492	-31.22473	28.91373	1527	-31.22182	28.91787	1562	-31.22217	28.92148
1423	-31.23045	28.90544	1458	-31.22981	28.91015	1493	-31.22472	28.91374	1528	-31.22172	28.91864	1563	-31.22239	28.92210
1424	-31.23045	28.90545	1459	-31.22932	28.91070	1494	-31.22472	28.91375	1529	-31.22164	28.91882	1564	-31.22273	28.92345
1425	-31.23045	28.90546	1460	-31.22882	28.91098	1495	-31.22471	28.91375	1530	-31.22148	28.91899	1565	-31.22274	28.92346
1426	-31.23045	28.90547	1461	-31.22881	28.91098	1496	-31.22471	28.91376	1531	-31.22148	28.91900	1566	-31.22274	28.92347
1427	-31.23045	28.90548	1462	-31.22881	28.91099	1497	-31.22419	28.91438	1532	-31.22121	28.91930	1567	-31.22274	28.92347
1428	-31.23045	28.90549	1463	-31.22880	28.91099	1498	-31.22371	28.91492	1533	-31.22121	28.91930	1568	-31.22275	28.92348
1429	-31.23045	28.90550	1464	-31.22879	28.91100	1499	-31.22317	28.91533	1534	-31.22120	28.91931	1569	-31.22275	28.92349
1430	-31.23046	28.90551	1465	-31.22879	28.91100	1500	-31.22317	28.91533	1535	-31.22120	28.91932	1570	-31.22275	28.92349
1431	-31.23046	28.90552	1466	-31.22829	28.91147	1501	-31.22316	28.91534	1536	-31.22119	28.91933	1571	-31.22306	28.92403
1432	-31.23046	28.90553	1467	-31.22739	28.91160	1502	-31.22316	28.91535	1537	-31.22119	28.91933	1572	-31.22316	28.92470
1433	-31.23046	28.90554	1468	-31.22739	28.91160	1503	-31.22315	28.91535	1538	-31.22118	28.91934	1573	-31.22316	28.92470
1434	-31.23047	28.90555	1469	-31.22738	28.91161	1504	-31.22314	28.91536	1539	-31.22118	28.91935	1574	-31.22316	28.92471
1435	-31.23082	28.90634	1470	-31.22737	28.91161	1505	-31.22314	28.91537	1540	-31.22118	28.91936	1575	-31.22316	28.92472

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1576	-31.22316	28.92472	1611	-31.22023	28.92694	1646	-31.21854	28.92936	1681	-31.21836	28.92985	1716	-31.22303	28.93334
1577	-31.22325	28.92502	1612	-31.22023	28.92694	1647	-31.21853	28.92936	1682	-31.21837	28.92986	1717	-31.22304	28.93335
1578	-31.22335	28.92594	1613	-31.22022	28.92694	1648	-31.21852	28.92937	1683	-31.21837	28.92986	1718	-31.22305	28.93336
1579	-31.22334	28.92655	1614	-31.22021	28.92695	1649	-31.21852	28.92937	1684	-31.21885	28.93013	1719	-31.22305	28.93337
1580	-31.22312	28.92729	1615	-31.22020	28.92695	1650	-31.21851	28.92938	1685	-31.21885	28.93013	1720	-31.22306	28.93337
1581	-31.22312	28.92729	1616	-31.22019	28.92696	1651	-31.21850	28.92939	1686	-31.21886	28.93014	1721	-31.22307	28.93338
1582	-31.22312	28.92730	1617	-31.22019	28.92696	1652	-31.21850	28.92939	1687	-31.21887	28.93014	1722	-31.22308	28.93338
1583	-31.22295	28.92790	1618	-31.22018	28.92697	1653	-31.21833	28.92961	1688	-31.21888	28.93014	1723	-31.22308	28.93338
1584	-31.22270	28.92819	1619	-31.22018	28.92697	1654	-31.21832	28.92961	1689	-31.21889	28.93014	1724	-31.22367	28.93372
1585	-31.22203	28.92817	1620	-31.22017	28.92698	1655	-31.21832	28.92962	1690	-31.21889	28.93014	1725	-31.22406	28.93403
1586	-31.22203	28.92817	1621	-31.22017	28.92698	1656	-31.21831	28.92963	1691	-31.22042	28.93029	1726	-31.22407	28.93403
1587	-31.22203	28.92817	1622	-31.22017	28.92698	1657	-31.21831	28.92964	1692	-31.22075	28.93055	1727	-31.22407	28.93403
1588	-31.22139	28.92819	1623	-31.22016	28.92699	1658	-31.21830	28.92965	1693	-31.22103	28.93153	1728	-31.22408	28.93404
1589	-31.22073	28.92711	1624	-31.22016	28.92700	1659	-31.21830	28.92966	1694	-31.22103	28.93153	1729	-31.22409	28.93404
1590	-31.22073	28.92710	1625	-31.22015	28.92701	1660	-31.21830	28.92967	1695	-31.22103	28.93154	1730	-31.22410	28.93405
1591	-31.22072	28.92710	1626	-31.22015	28.92702	1661	-31.21829	28.92968	1696	-31.22103	28.93155	1731	-31.22411	28.93405
1592	-31.22072	28.92709	1627	-31.22014	28.92703	1662	-31.21829	28.92969	1697	-31.22104	28.93156	1732	-31.22411	28.93405
1593	-31.22071	28.92708	1628	-31.22014	28.92704	1663	-31.21829	28.92970	1698	-31.22104	28.93157	1733	-31.22412	28.93405
1594	-31.22070	28.92708	1629	-31.22014	28.92705	1664	-31.21829	28.92971	1699	-31.22105	28.93158	1734	-31.22412	28.93405
1595	-31.22070	28.92707	1630	-31.22014	28.92705	1665	-31.21829	28.92972	1700	-31.22105	28.93159	1735	-31.22490	28.93416
1596	-31.22069	28.92706	1631	-31.21999	28.92776	1666	-31.21829	28.92973	1701	-31.22106	28.93159	1736	-31.22566	28.93429
1597	-31.22068	28.92706	1632	-31.21958	28.92835	1667	-31.21829	28.92974	1702	-31.22107	28.93160	1737	-31.22678	28.93468
1598	-31.22067	28.92705	1633	-31.21958	28.92835	1668	-31.21829	28.92975	1703	-31.22107	28.93161	1738	-31.22678	28.93469
1599	-31.22066	28.92705	1634	-31.21957	28.92836	1669	-31.21829	28.92976	1704	-31.22108	28.93161	1739	-31.22678	28.93469
1600	-31.22066	28.92705	1635	-31.21957	28.92837	1670	-31.21830	28.92977	1705	-31.22109	28.93162	1740	-31.22715	28.93479
1601	-31.22031	28.92694	1636	-31.21956	28.92838	1671	-31.21830	28.92978	1706	-31.22110	28.93162	1741	-31.22766	28.93510
1602	-31.22030	28.92694	1637	-31.21956	28.92839	1672	-31.21830	28.92979	1707	-31.22110	28.93163	1742	-31.22776	28.93587
1603	-31.22030	28.92694	1638	-31.21956	28.92840	1673	-31.21831	28.92980	1708	-31.22111	28.93163	1743	-31.22737	28.93652
1604	-31.22030	28.92693	1639	-31.21955	28.92841	1674	-31.21831	28.92980	1709	-31.22112	28.93163	1744	-31.22737	28.93652
1605	-31.22029	28.92693	1640	-31.21955	28.92841	1675	-31.21832	28.92981	1710	-31.22113	28.93164	1745	-31.22737	28.93653
1606	-31.22028	28.92693	1641	-31.21947	28.92880	1676	-31.21832	28.92982	1711	-31.22113	28.93164	1746	-31.22737	28.93654
1607	-31.22027	28.92693	1642	-31.21920	28.92911	1677	-31.21833	28.92983	1712	-31.22177	28.93176	1747	-31.22736	28.93655
1608	-31.22026	28.92693	1643	-31.21856	28.92935	1678	-31.21834	28.92983	1713	-31.22240	28.93235	1748	-31.22736	28.93656
1609	-31.22025	28.92693	1644	-31.21855	28.92935	1679	-31.21834	28.92984	1714	-31.22303	28.93333	1749	-31.22723	28.93695
1610	-31.22024	28.92693	1645	-31.21855	28.92935	1680	-31.21835	28.92985	1715	-31.22303	28.93334	1750	-31.22723	28.93696

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1751	-31.22723	28.93697	1786	-31.23105	28.93948	1821	-31.22956	28.94468	1856	-31.22890	28.94556	1891	-31.22969	28.95154
1752	-31.22723	28.93698	1787	-31.23105	28.93949	1822	-31.22904	28.94491	1857	-31.22890	28.94557	1892	-31.22968	28.95155
1753	-31.22722	28.93699	1788	-31.23106	28.93949	1823	-31.22904	28.94491	1858	-31.22891	28.94557	1893	-31.22968	28.95155
1754	-31.22722	28.93700	1789	-31.23107	28.93950	1824	-31.22903	28.94492	1859	-31.22892	28.94558	1894	-31.22942	28.95187
1755	-31.22722	28.93701	1790	-31.23107	28.93950	1825	-31.22903	28.94492	1860	-31.22893	28.94558	1895	-31.22941	28.95187
1756	-31.22722	28.93702	1791	-31.23142	28.93990	1826	-31.22902	28.94493	1861	-31.22893	28.94559	1896	-31.22941	28.95188
1757	-31.22722	28.93703	1792	-31.23143	28.93991	1827	-31.22901	28.94493	1862	-31.22894	28.94559	1897	-31.22940	28.95189
1758	-31.22723	28.93704	1793	-31.23143	28.93991	1828	-31.22901	28.94494	1863	-31.22895	28.94559	1898	-31.22940	28.95190
1759	-31.22723	28.93705	1794	-31.23144	28.93992	1829	-31.22900	28.94495	1864	-31.22896	28.94560	1899	-31.22939	28.95191
1760	-31.22723	28.93706	1795	-31.23145	28.93992	1830	-31.22899	28.94495	1865	-31.22897	28.94560	1900	-31.22939	28.95191
1761	-31.22723	28.93707	1796	-31.23146	28.93993	1831	-31.22899	28.94496	1866	-31.22898	28.94560	1901	-31.22914	28.95251
1762	-31.22724	28.93708	1797	-31.23147	28.93993	1832	-31.22898	28.94497	1867	-31.22898	28.94560	1902	-31.22896	28.95281
1763	-31.22724	28.93709	1798	-31.23147	28.93993	1833	-31.22898	28.94498	1868	-31.23069	28.94571	1903	-31.22896	28.95281
1764	-31.22725	28.93710	1799	-31.23238	28.94035	1834	-31.22897	28.94499	1869	-31.23131	28.94581	1904	-31.22896	28.95282
1765	-31.22725	28.93710	1800	-31.23272	28.94056	1835	-31.22897	28.94500	1870	-31.23218	28.94622	1905	-31.22896	28.95283
1766	-31.22726	28.93711	1801	-31.23314	28.94106	1836	-31.22897	28.94501	1871	-31.23265	28.94679	1906	-31.22895	28.95283
1767	-31.22726	28.93712	1802	-31.23292	28.94180	1837	-31.22897	28.94501	1872	-31.23264	28.94786	1907	-31.22887	28.95306
1768	-31.22727	28.93713	1803	-31.23292	28.94180	1838	-31.22886	28.94539	1873	-31.23264	28.94786	1908	-31.22886	28.95306
1769	-31.22728	28.93713	1804	-31.23292	28.94181	1839	-31.22885	28.94540	1874	-31.23264	28.94786	1909	-31.22886	28.95307
1770	-31.22728	28.93714	1805	-31.23292	28.94181	1840	-31.22885	28.94541	1875	-31.23265	28.94862	1910	-31.22886	28.95308
1771	-31.22729	28.93715	1806	-31.23278	28.94247	1841	-31.22885	28.94542	1876	-31.23255	28.94932	1911	-31.22886	28.95309
1772	-31.22730	28.93715	1807	-31.23213	28.94303	1842	-31.22885	28.94543	1877	-31.23236	28.94995	1912	-31.22885	28.95310
1773	-31.22730	28.93715	1808	-31.23161	28.94332	1843	-31.22885	28.94544	1878	-31.23198	28.95025	1913	-31.22885	28.95311
1774	-31.22809	28.93760	1809	-31.23111	28.94351	1844	-31.22885	28.94545	1879	-31.23198	28.95025	1914	-31.22885	28.95312
1775	-31.22810	28.93760	1810	-31.23110	28.94351	1845	-31.22885	28.94546	1880	-31.23197	28.95025	1915	-31.22885	28.95313
1776	-31.22810	28.93760	1811	-31.23110	28.94351	1846	-31.22885	28.94547	1881	-31.23155	28.95062	1916	-31.22885	28.95314
1777	-31.22811	28.93761	1812	-31.23017	28.94395	1847	-31.22885	28.94548	1882	-31.23057	28.95095	1917	-31.22886	28.95315
1778	-31.22812	28.93761	1813	-31.23017	28.94395	1848	-31.22886	28.94549	1883	-31.23057	28.95095	1918	-31.22886	28.95316
1779	-31.22813	28.93761	1814	-31.23016	28.94396	1849	-31.22886	28.94550	1884	-31.23056	28.95095	1919	-31.22886	28.95317
1780	-31.22814	28.93761	1815	-31.23015	28.94396	1850	-31.22886	28.94551	1885	-31.23055	28.95096	1920	-31.22886	28.95318
1781	-31.22955	28.93773	1816	-31.23015	28.94397	1851	-31.22887	28.94552	1886	-31.23054	28.95096	1921	-31.22887	28.95319
1782	-31.23007	28.93822	1817	-31.23014	28.94397	1852	-31.22887	28.94553	1887	-31.22971	28.95152	1922	-31.22887	28.95320
1783	-31.23007	28.93823	1818	-31.23013	28.94398	1853	-31.22888	28.94554	1888	-31.22971	28.95152	1923	-31.22888	28.95321
1784	-31.23007	28.93823	1819	-31.23012	28.94399	1854	-31.22888	28.94555	1889	-31.22970	28.95153	1924	-31.22888	28.95322
1785	-31.23047	28.93857	1820	-31.23012	28.94399	1855	-31.22889	28.94555	1890	-31.22969	28.95153	1925	-31.22889	28.95322

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
1926	-31.22889	28.95322	1961	-31.23077	28.95222	1996	-31.23463	28.95609	2031	-31.23522	28.95706	2066	-31.23720	28.95224
1927	-31.22889	28.95323	1962	-31.23078	28.95222	1997	-31.23463	28.95609	2032	-31.23546	28.95691	2067	-31.23720	28.95223
1928	-31.22890	28.95324	1963	-31.23079	28.95222	1998	-31.23463	28.95610	2033	-31.23547	28.95691	2068	-31.23721	28.95222
1929	-31.22890	28.95324	1964	-31.23080	28.95222	1999	-31.23463	28.95611	2034	-31.23548	28.95690	2069	-31.23721	28.95221
1930	-31.22891	28.95325	1965	-31.23080	28.95222	2000	-31.23463	28.95611	2035	-31.23548	28.95690	2070	-31.23721	28.95221
1931	-31.22891	28.95325	1966	-31.23124	28.95221	2001	-31.23482	28.95674	2036	-31.23549	28.95689	2071	-31.23734	28.95080
1932	-31.22892	28.95326	1967	-31.23148	28.95221	2002	-31.23482	28.95675	2037	-31.23550	28.95689	2072	-31.23734	28.95079
1933	-31.22893	28.95326	1968	-31.23147	28.95311	2003	-31.23482	28.95676	2038	-31.23550	28.95688	2073	-31.23734	28.95078
1934	-31.22894	28.95327	1969	-31.23147	28.95312	2004	-31.23483	28.95677	2039	-31.23551	28.95687	2074	-31.23734	28.95078
1935	-31.22895	28.95327	1970	-31.23147	28.95313	2005	-31.23483	28.95677	2040	-31.23551	28.95686	2075	-31.23731	28.94938
1936	-31.22895	28.95327	1971	-31.23147	28.95314	2006	-31.23484	28.95678	2041	-31.23552	28.95685	2076	-31.23734	28.94805
1937	-31.22896	28.95328	1972	-31.23147	28.95315	2007	-31.23484	28.95679	2042	-31.23552	28.95684	2077	-31.23767	28.94693
1938	-31.22897	28.95328	1973	-31.23147	28.95316	2008	-31.23485	28.95680	2043	-31.23553	28.95683	2078	-31.23767	28.94693
1939	-31.22898	28.95328	1974	-31.23147	28.95316	2009	-31.23485	28.95680	2044	-31.23553	28.95682	2079	-31.23767	28.94692
1940	-31.22899	28.95328	1975	-31.23157	28.95348	2010	-31.23506	28.95703	2045	-31.23553	28.95682	2080	-31.23767	28.94691
1941	-31.22899	28.95328	1976	-31.23157	28.95349	2011	-31.23507	28.95704	2046	-31.23582	28.95578	2081	-31.23767	28.94690
1942	-31.22957	28.95326	1977	-31.23158	28.95350	2012	-31.23507	28.95704	2047	-31.23620	28.95520	2082	-31.23767	28.94690
1943	-31.22957	28.95326	1978	-31.23158	28.95351	2013	-31.23507	28.95705	2048	-31.23620	28.95519	2083	-31.23780	28.94549
1944	-31.22958	28.95326	1979	-31.23158	28.95352	2014	-31.23508	28.95705	2049	-31.23621	28.95518	2084	-31.23819	28.94489
1945	-31.22959	28.95326	1980	-31.23159	28.95352	2015	-31.23509	28.95706	2050	-31.23621	28.95517	2085	-31.23820	28.94488
1946	-31.22960	28.95326	1981	-31.23159	28.95353	2016	-31.23510	28.95706	2051	-31.23622	28.95516	2086	-31.23820	28.94488
1947	-31.22961	28.95326	1982	-31.23160	28.95354	2017	-31.23510	28.95707	2052	-31.23622	28.95515	2087	-31.23821	28.94487
1948	-31.22962	28.95325	1983	-31.23161	28.95355	2018	-31.23511	28.95707	2053	-31.23622	28.95514	2088	-31.23821	28.94486
1949	-31.22963	28.95325	1984	-31.23161	28.95355	2019	-31.23512	28.95707	2054	-31.23622	28.95514	2089	-31.23821	28.94485
1950	-31.22963	28.95324	1985	-31.23162	28.95356	2020	-31.23513	28.95707	2055	-31.23642	28.95422	2090	-31.23821	28.94484
1951	-31.22964	28.95324	1986	-31.23163	28.95356	2021	-31.23514	28.95708	2056	-31.23669	28.95348	2091	-31.23822	28.94483
1952	-31.22965	28.95323	1987	-31.23164	28.95357	2022	-31.23515	28.95708	2057	-31.23669	28.95348	2092	-31.23822	28.94482
1953	-31.22965	28.95323	1988	-31.23164	28.95357	2023	-31.23516	28.95708	2058	-31.23669	28.95347	2093	-31.23822	28.94481
1954	-31.22966	28.95322	1989	-31.23165	28.95358	2024	-31.23516	28.95708	2059	-31.23670	28.95346	2094	-31.23822	28.94481
1955	-31.22967	28.95321	1990	-31.23261	28.95402	2025	-31.23517	28.95708	2060	-31.23670	28.95346	2095	-31.23832	28.94307
1956	-31.22967	28.95320	1991	-31.23334	28.95450	2026	-31.23518	28.95708	2061	-31.23678	28.95306	2096	-31.23836	28.94297
1957	-31.22968	28.95319	1992	-31.23335	28.95451	2027	-31.23519	28.95707	2062	-31.23719	28.95227	2097	-31.23857	28.94297
1958	-31.22968	28.95319	1993	-31.23335	28.95451	2028	-31.23520	28.95707	2063	-31.23719	28.95227	2098	-31.23948	28.94595
1959	-31.23031	28.95208	1994	-31.23353	28.95461	2029	-31.23521	28.95707	2064	-31.23719	28.95226	2099	-31.23948	28.94596
1960	-31.23076	28.95221	1995	-31.23451	28.95527	2030	-31.23522	28.95706	2065	-31.23720	28.95225	2100	-31.23948	28.94597

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
2101	-31.23949	28.94598	2136	-31.24108	28.94808	2171	-31.24255	28.94444	2206	-31.24400	28.93807	2241	-31.24180	28.93446
2102	-31.24051	28.94805	2137	-31.24108	28.94807	2172	-31.24256	28.94443	2207	-31.24400	28.93806	2242	-31.24155	28.93431
2103	-31.24051	28.94805	2138	-31.24109	28.94807	2173	-31.24256	28.94442	2208	-31.24400	28.93806	2243	-31.24156	28.93362
2104	-31.24052	28.94805	2139	-31.24141	28.94767	2174	-31.24256	28.94441	2209	-31.24400	28.93806	2244	-31.24211	28.93268
2105	-31.24052	28.94806	2140	-31.24184	28.94743	2175	-31.24256	28.94440	2210	-31.24399	28.93734	2245	-31.24259	28.93239
2106	-31.24052	28.94806	2141	-31.24184	28.94743	2176	-31.24256	28.94439	2211	-31.24399	28.93733	2246	-31.24374	28.93299
2107	-31.24053	28.94807	2142	-31.24185	28.94742	2177	-31.24256	28.94438	2212	-31.24399	28.93732	2247	-31.24374	28.93299
2108	-31.24053	28.94807	2143	-31.24186	28.94742	2178	-31.24256	28.94438	2213	-31.24399	28.93731	2248	-31.24375	28.93299
2109	-31.24053	28.94808	2144	-31.24187	28.94741	2179	-31.24256	28.94397	2214	-31.24399	28.93730	2249	-31.24376	28.93300
2110	-31.24054	28.94809	2145	-31.24187	28.94740	2180	-31.24256	28.94366	2215	-31.24361	28.93541	2250	-31.24377	28.93300
2111	-31.24054	28.94809	2146	-31.24188	28.94740	2181	-31.24256	28.94366	2216	-31.24361	28.93540	2251	-31.24378	28.93300
2112	-31.24055	28.94809	2147	-31.24189	28.94739	2182	-31.24256	28.94365	2217	-31.24360	28.93539	2252	-31.24378	28.93300
2113	-31.24055	28.94809	2148	-31.24189	28.94738	2183	-31.24255	28.94297	2218	-31.24360	28.93538	2253	-31.24379	28.93300
2114	-31.24055	28.94810	2149	-31.24190	28.94737	2184	-31.24256	28.94251	2219	-31.24360	28.93537	2254	-31.24380	28.93300
2115	-31.24056	28.94810	2150	-31.24190	28.94736	2185	-31.24273	28.94192	2220	-31.24359	28.93537	2255	-31.24552	28.93296
2116	-31.24057	28.94811	2151	-31.24191	28.94735	2186	-31.24273	28.94192	2221	-31.24359	28.93536	2256	-31.24613	28.93314
2117	-31.24058	28.94811	2152	-31.24191	28.94735	2187	-31.24273	28.94191	2222	-31.24316	28.93454	2257	-31.24670	28.93341
2118	-31.24058	28.94812	2153	-31.24191	28.94734	2188	-31.24274	28.94190	2223	-31.24316	28.93453	2258	-31.24670	28.93341
2119	-31.24059	28.94812	2154	-31.24191	28.94733	2189	-31.24274	28.94189	2224	-31.24315	28.93452	2259	-31.24671	28.93341
2120	-31.24060	28.94812	2155	-31.24192	28.94732	2190	-31.24274	28.94188	2225	-31.24315	28.93452	2260	-31.24672	28.93342
2121	-31.24061	28.94812	2156	-31.24192	28.94732	2191	-31.24274	28.94188	2226	-31.24314	28.93451	2261	-31.24673	28.93342
2122	-31.24062	28.94812	2157	-31.24201	28.94675	2192	-31.24284	28.94004	2227	-31.24313	28.93450	2262	-31.24674	28.93342
2123	-31.24063	28.94812	2158	-31.24218	28.94636	2193	-31.24378	28.93883	2228	-31.24313	28.93449	2263	-31.24674	28.93342
2124	-31.24063	28.94812	2159	-31.24218	28.94636	2194	-31.24379	28.93883	2229	-31.24312	28.93449	2264	-31.24828	28.93353
2125	-31.24099	28.94812	2160	-31.24219	28.94635	2195	-31.24379	28.93882	2230	-31.24311	28.93448	2265	-31.24894	28.93379
2126	-31.24100	28.94812	2161	-31.24219	28.94634	2196	-31.24380	28.93881	2231	-31.24310	28.93448	2266	-31.24894	28.93379
2127	-31.24101	28.94811	2162	-31.24219	28.94633	2197	-31.24380	28.93880	2232	-31.24310	28.93447	2267	-31.24895	28.93379
2128	-31.24101	28.94811	2163	-31.24220	28.94632	2198	-31.24381	28.93879	2233	-31.24309	28.93447	2268	-31.24896	28.93379
2129	-31.24102	28.94811	2164	-31.24220	28.94631	2199	-31.24381	28.93878	2234	-31.24308	28.93447	2269	-31.24897	28.93380
2130	-31.24103	28.94811	2165	-31.24220	28.94630	2200	-31.24381	28.93877	2235	-31.24307	28.93447	2270	-31.24898	28.93380
2131	-31.24104	28.94810	2166	-31.24229	28.94491	2201	-31.24381	28.93877	2236	-31.24306	28.93446	2271	-31.24898	28.93380
2132	-31.24105	28.94810	2167	-31.24254	28.94447	2202	-31.24400	28.93811	2237	-31.24305	28.93446	2272	-31.24899	28.93380
2133	-31.24106	28.94809	2168	-31.24254	28.94447	2203	-31.24400	28.93810	2238	-31.24304	28.93446	2273	-31.24900	28.93380
2134	-31.24106	28.94809	2169	-31.24255	28.94446	2204	-31.24400	28.93809	2239	-31.24304	28.93446	2274	-31.24901	28.93379
2135	-31.24107	28.94808	2170	-31.24255	28.94445	2205	-31.24400	28.93808	2240	-31.24242	28.93448	2275	-31.24902	28.93379

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
2276	-31.24903	28.93379	2311	-31.25615	28.93009	2346	-31.26286	28.91965	2381	-31.26004	28.91636	2416	-31.25861	28.91671
2277	-31.24904	28.93378	2312	-31.25700	28.92872	2347	-31.26286	28.91964	2382	-31.26003	28.91635	2417	-31.25861	28.91671
2278	-31.24904	28.93378	2313	-31.25700	28.92872	2348	-31.26287	28.91963	2383	-31.26003	28.91635	2418	-31.25860	28.91672
2279	-31.24905	28.93378	2314	-31.25701	28.92871	2349	-31.26287	28.91962	2384	-31.26002	28.91634	2419	-31.25859	28.91673
2280	-31.24933	28.93361	2315	-31.25825	28.92642	2350	-31.26287	28.91961	2385	-31.26001	28.91633	2420	-31.25859	28.91674
2281	-31.24949	28.93353	2316	-31.25894	28.92537	2351	-31.26287	28.91960	2386	-31.26001	28.91633	2421	-31.25858	28.91675
2282	-31.25086	28.93380	2317	-31.25894	28.92536	2352	-31.26288	28.91959	2387	-31.26000	28.91632	2422	-31.25858	28.91676
2283	-31.25086	28.93380	2318	-31.25972	28.92405	2353	-31.26288	28.91958	2388	-31.25999	28.91632	2423	-31.25858	28.91676
2284	-31.25087	28.93380	2319	-31.26028	28.92328	2354	-31.26288	28.91957	2389	-31.25999	28.91632	2424	-31.25817	28.91775
2285	-31.25088	28.93380	2320	-31.26086	28.92295	2355	-31.26288	28.91956	2390	-31.25972	28.91620	2425	-31.25754	28.91845
2286	-31.25089	28.93380	2321	-31.26106	28.92301	2356	-31.26288	28.91955	2391	-31.25972	28.91620	2426	-31.25664	28.91907
2287	-31.25090	28.93380	2322	-31.26107	28.92301	2357	-31.26287	28.91954	2392	-31.25971	28.91620	2427	-31.25533	28.91951
2288	-31.25090	28.93380	2323	-31.26107	28.92301	2358	-31.26287	28.91953	2393	-31.25970	28.91619	2428	-31.25532	28.91951
2289	-31.25091	28.93379	2324	-31.26108	28.92301	2359	-31.26287	28.91952	2394	-31.25969	28.91619	2429	-31.25531	28.91951
2290	-31.25092	28.93379	2325	-31.26109	28.92302	2360	-31.26287	28.91951	2395	-31.25968	28.91619	2430	-31.25530	28.91952
2291	-31.25093	28.93379	2326	-31.26110	28.92302	2361	-31.26286	28.91950	2396	-31.25967	28.91619	2431	-31.25530	28.91952
2292	-31.25094	28.93378	2327	-31.26110	28.92302	2362	-31.26286	28.91949	2397	-31.25967	28.91619	2432	-31.25529	28.91953
2293	-31.25094	28.93378	2328	-31.26111	28.92301	2363	-31.26285	28.91948	2398	-31.25966	28.91619	2433	-31.25528	28.91953
2294	-31.25188	28.93322	2329	-31.26112	28.92301	2364	-31.26285	28.91947	2399	-31.25965	28.91619	2434	-31.25527	28.91954
2295	-31.25311	28.93267	2330	-31.26113	28.92301	2365	-31.26284	28.91946	2400	-31.25964	28.91620	2435	-31.25527	28.91955
2296	-31.25311	28.93267	2331	-31.26114	28.92301	2366	-31.26284	28.91946	2401	-31.25963	28.91620	2436	-31.25526	28.91955
2297	-31.25312	28.93266	2332	-31.26115	28.92300	2367	-31.26284	28.91945	2402	-31.25962	28.91620	2437	-31.25526	28.91956
2298	-31.25422	28.93208	2333	-31.26115	28.92300	2368	-31.26283	28.91945	2403	-31.25961	28.91621	2438	-31.25525	28.91957
2299	-31.25422	28.93207	2334	-31.26116	28.92300	2369	-31.26283	28.91945	2404	-31.25961	28.91621	2439	-31.25525	28.91957
2300	-31.25423	28.93207	2335	-31.26116	28.92299	2370	-31.26282	28.91944	2405	-31.25960	28.91622	2440	-31.25477	28.92043
2301	-31.25424	28.93207	2336	-31.26117	28.92299	2371	-31.26282	28.91944	2406	-31.25960	28.91622	2441	-31.25448	28.92087
2302	-31.25558	28.93106	2337	-31.26118	28.92298	2372	-31.26281	28.91943	2407	-31.25922	28.91652	2442	-31.25395	28.92127
2303	-31.25558	28.93106	2338	-31.26119	28.92298	2373	-31.26280	28.91943	2408	-31.25867	28.91667	2443	-31.25327	28.92144
2304	-31.25559	28.93106	2339	-31.26119	28.92297	2374	-31.26279	28.91942	2409	-31.25867	28.91667	2444	-31.25230	28.92095
2305	-31.25560	28.93105	2340	-31.26120	28.92296	2375	-31.26279	28.91942	2410	-31.25866	28.91668	2445	-31.25230	28.92095
2306	-31.25560	28.93104	2341	-31.26120	28.92295	2376	-31.26165	28.91892	2411	-31.25865	28.91668	2446	-31.25229	28.92094
2307	-31.25561	28.93104	2342	-31.26121	28.92295	2377	-31.26096	28.91808	2412	-31.25864	28.91668	2447	-31.25228	28.92094
2308	-31.25562	28.93103	2343	-31.26121	28.92294	2378	-31.26005	28.91638	2413	-31.25863	28.91669	2448	-31.25227	28.92094
2309	-31.25562	28.93102	2344	-31.26286	28.91965	2379	-31.26005	28.91638	2414	-31.25863	28.91670	2449	-31.25227	28.92094
2310	-31.25562	28.93102	2345	-31.26286	28.91965	2380	-31.26005	28.91637	2415	-31.25862	28.91670	2450	-31.25226	28.92094

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
2451	-31.25225	28.92094	2486	-31.24212	28.92273	2521	-31.23682	28.92543	2556	-31.23395	28.93127	2591	-31.23065	28.92745
2452	-31.25224	28.92094	2487	-31.24212	28.92273	2522	-31.23681	28.92544	2557	-31.23395	28.93126	2592	-31.23082	28.92650
2453	-31.25223	28.92094	2488	-31.24165	28.92310	2523	-31.23680	28.92545	2558	-31.23394	28.93126	2593	-31.23118	28.92588
2454	-31.25222	28.92094	2489	-31.24103	28.92324	2524	-31.23680	28.92545	2559	-31.23360	28.93088	2594	-31.23118	28.92588
2455	-31.25221	28.92094	2490	-31.24103	28.92324	2525	-31.23679	28.92546	2560	-31.23352	28.93068	2595	-31.23118	28.92587
2456	-31.25220	28.92094	2491	-31.24102	28.92324	2526	-31.23679	28.92547	2561	-31.23354	28.92918	2596	-31.23119	28.92586
2457	-31.25220	28.92095	2492	-31.24061	28.92337	2527	-31.23678	28.92548	2562	-31.23354	28.92916	2597	-31.23119	28.92585
2458	-31.25219	28.92095	2493	-31.24061	28.92337	2528	-31.23678	28.92549	2563	-31.23354	28.92915	2598	-31.23119	28.92584
2459	-31.25218	28.92096	2494	-31.24060	28.92337	2529	-31.23678	28.92550	2564	-31.23354	28.92914	2599	-31.23120	28.92583
2460	-31.25217	28.92096	2495	-31.24059	28.92337	2530	-31.23678	28.92551	2565	-31.23354	28.92913	2600	-31.23120	28.92582
2461	-31.25217	28.92097	2496	-31.24058	28.92338	2531	-31.23677	28.92552	2566	-31.23354	28.92912	2601	-31.23120	28.92581
2462	-31.25216	28.92097	2497	-31.24058	28.92338	2532	-31.23677	28.92553	2567	-31.23353	28.92911	2602	-31.23120	28.92580
2463	-31.25109	28.92194	2498	-31.24057	28.92339	2533	-31.23677	28.92554	2568	-31.23353	28.92911	2603	-31.23120	28.92579
2464	-31.25056	28.92224	2499	-31.24056	28.92339	2534	-31.23677	28.92555	2569	-31.23353	28.92910	2604	-31.23120	28.92579
2465	-31.24978	28.92239	2500	-31.23932	28.92450	2535	-31.23677	28.92555	2570	-31.23352	28.92909	2605	-31.23118	28.92472
2466	-31.24978	28.92239	2501	-31.23904	28.92470	2536	-31.23679	28.92639	2571	-31.23352	28.92908	2606	-31.23118	28.92472
2467	-31.24884	28.92258	2502	-31.23838	28.92450	2537	-31.23669	28.92671	2572	-31.23351	28.92907	2607	-31.23118	28.92471
2468	-31.24715	28.92271	2503	-31.23837	28.92450	2538	-31.23669	28.92671	2573	-31.23350	28.92906	2608	-31.23118	28.92470
2469	-31.24489	28.92246	2504	-31.23837	28.92450	2539	-31.23669	28.92672	2574	-31.23350	28.92906	2609	-31.23118	28.92469
2470	-31.24489	28.92246	2505	-31.23836	28.92450	2540	-31.23669	28.92673	2575	-31.23349	28.92905	2610	-31.23118	28.92468
2471	-31.24488	28.92246	2506	-31.23835	28.92450	2541	-31.23669	28.92674	2576	-31.23348	28.92904	2611	-31.23117	28.92467
2472	-31.24487	28.92246	2507	-31.23835	28.92450	2542	-31.23669	28.92674	2577	-31.23348	28.92904	2612	-31.23117	28.92466
2473	-31.24486	28.92247	2508	-31.23816	28.92450	2543	-31.23660	28.92788	2578	-31.23347	28.92903	2613	-31.23116	28.92465
2474	-31.24486	28.92247	2509	-31.23816	28.92450	2544	-31.23630	28.92868	2579	-31.23346	28.92903	2614	-31.23116	28.92464
2475	-31.24402	28.92261	2510	-31.23815	28.92450	2545	-31.23630	28.92868	2580	-31.23345	28.92903	2615	-31.23115	28.92463
2476	-31.24294	28.92272	2511	-31.23814	28.92451	2546	-31.23630	28.92869	2581	-31.23344	28.92902	2616	-31.23115	28.92462
2477	-31.24220	28.92270	2512	-31.23813	28.92451	2547	-31.23630	28.92870	2582	-31.23343	28.92902	2617	-31.23017	28.92330
2478	-31.24218	28.92270	2513	-31.23812	28.92451	2548	-31.23629	28.92871	2583	-31.23343	28.92902	2618	-31.23019	28.92183
2479	-31.24218	28.92271	2514	-31.23811	28.92451	2549	-31.23629	28.92871	2584	-31.23342	28.92902	2619	-31.23019	28.92183
2480	-31.24217	28.92271	2515	-31.23811	28.92452	2550	-31.23612	28.92975	2585	-31.23342	28.92902	2620	-31.23019	28.92183
2481	-31.24216	28.92271	2516	-31.23810	28.92452	2551	-31.23568	28.93076	2586	-31.23174	28.92889	2621	-31.23018	28.92115
2482	-31.24215	28.92271	2517	-31.23809	28.92452	2552	-31.23511	28.93158	2587	-31.23140	28.92863	2622	-31.23019	28.92067
2483	-31.24214	28.92272	2518	-31.23684	28.92541	2553	-31.23480	28.93175	2588	-31.23140	28.92863	2623	-31.23067	28.92039
2484	-31.24213	28.92272	2519	-31.23683	28.92542	2554	-31.23450	28.93175	2589	-31.23140	28.92862	2624	-31.23169	28.92041
2485	-31.24213	28.92273	2520	-31.23682	28.92542	2555	-31.23419	28.93156	2590	-31.23109	28.92839	2625	-31.23264	28.92116

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
2626	-31.23264	28.92116	2661	-31.23618	28.92225	2696	-31.24085	28.91569	2731	-31.24578	28.91304	2766	-31.24446	28.90516
2627	-31.23265	28.92117	2662	-31.23618	28.92224	2697	-31.24163	28.91475	2732	-31.24578	28.91303	2767	-31.24446	28.90515
2628	-31.23266	28.92117	2663	-31.23618	28.92224	2698	-31.24228	28.91414	2733	-31.24578	28.91302	2768	-31.24446	28.90515
2629	-31.23267	28.92118	2664	-31.23619	28.92224	2699	-31.24311	28.91391	2734	-31.24578	28.91301	2769	-31.24501	28.90472
2630	-31.23267	28.92118	2665	-31.23620	28.92223	2700	-31.24311	28.91391	2735	-31.24577	28.91300	2770	-31.24579	28.90454
2631	-31.23268	28.92118	2666	-31.23620	28.92223	2701	-31.24312	28.91391	2736	-31.24577	28.91299	2771	-31.24617	28.90465
2632	-31.23269	28.92118	2667	-31.23620	28.92222	2702	-31.24378	28.91368	2737	-31.24576	28.91298	2772	-31.24701	28.90536
2633	-31.23326	28.92135	2668	-31.23663	28.92136	2703	-31.24504	28.91356	2738	-31.24576	28.91297	2773	-31.24701	28.90536
2634	-31.23442	28.92187	2669	-31.23724	28.92102	2704	-31.24504	28.91356	2739	-31.24575	28.91296	2774	-31.24702	28.90536
2635	-31.23443	28.92187	2670	-31.23724	28.92102	2705	-31.24505	28.91356	2740	-31.24575	28.91295	2775	-31.24728	28.90557
2636	-31.23444	28.92188	2671	-31.23725	28.92102	2706	-31.24506	28.91356	2741	-31.24574	28.91295	2776	-31.24770	28.90593
2637	-31.23445	28.92188	2672	-31.23726	28.92101	2707	-31.24507	28.91355	2742	-31.24573	28.91294	2777	-31.24771	28.90594
2638	-31.23445	28.92188	2673	-31.23726	28.92101	2708	-31.24508	28.91355	2743	-31.24573	28.91294	2778	-31.24771	28.90594
2639	-31.23524	28.92201	2674	-31.23727	28.92100	2709	-31.24508	28.91355	2744	-31.24573	28.91293	2779	-31.24772	28.90595
2640	-31.23569	28.92219	2675	-31.23781	28.92049	2710	-31.24571	28.91321	2745	-31.24537	28.91266	2780	-31.24773	28.90595
2641	-31.23569	28.92219	2676	-31.23781	28.92049	2711	-31.24571	28.91321	2746	-31.24477	28.91208	2781	-31.24773	28.90596
2642	-31.23570	28.92219	2677	-31.23782	28.92048	2712	-31.24572	28.91320	2747	-31.24441	28.91144	2782	-31.24868	28.90636
2643	-31.23570	28.92219	2678	-31.23782	28.92048	2713	-31.24573	28.91320	2748	-31.24441	28.91144	2783	-31.24868	28.90637
2644	-31.23605	28.92229	2679	-31.23828	28.91992	2714	-31.24573	28.91319	2749	-31.24441	28.91144	2784	-31.24868	28.90637
2645	-31.23606	28.92229	2680	-31.23828	28.91992	2715	-31.24574	28.91318	2750	-31.24336	28.90968	2785	-31.24912	28.90653
2646	-31.23607	28.92230	2681	-31.23829	28.91991	2716	-31.24575	28.91318	2751	-31.24335	28.90967	2786	-31.24956	28.90671
2647	-31.23607	28.92230	2682	-31.23830	28.91990	2717	-31.24575	28.91317	2752	-31.24335	28.90966	2787	-31.24956	28.90671
2648	-31.23608	28.92230	2683	-31.23830	28.91989	2718	-31.24576	28.91316	2753	-31.24334	28.90965	2788	-31.24957	28.90671
2649	-31.23609	28.92230	2684	-31.23830	28.91989	2719	-31.24576	28.91315	2754	-31.24334	28.90965	2789	-31.24958	28.90671
2650	-31.23610	28.92230	2685	-31.23919	28.91802	2720	-31.24577	28.91314	2755	-31.24290	28.90916	2790	-31.24959	28.90671
2651	-31.23611	28.92229	2686	-31.23959	28.91724	2721	-31.24577	28.91314	2756	-31.24249	28.90790	2791	-31.24960	28.90671
2652	-31.23612	28.92229	2687	-31.23960	28.91723	2722	-31.24578	28.91313	2757	-31.24235	28.90740	2792	-31.24961	28.90671
2653	-31.23613	28.92229	2688	-31.24007	28.91630	2723	-31.24578	28.91312	2758	-31.24236	28.90715	2793	-31.24962	28.90671
2654	-31.23613	28.92229	2689	-31.24050	28.91597	2724	-31.24578	28.91311	2759	-31.24253	28.90677	2794	-31.24963	28.90671
2655	-31.23614	28.92228	2690	-31.24050	28.91597	2725	-31.24578	28.91310	2760	-31.24312	28.90611	2795	-31.24963	28.90671
2656	-31.23615	28.92228	2691	-31.24050	28.91597	2726	-31.24579	28.91309	2761	-31.24391	28.90558	2796	-31.24964	28.90671
2657	-31.23616	28.92227	2692	-31.24083	28.91571	2727	-31.24579	28.91308	2762	-31.24391	28.90558	2797	-31.24965	28.90671
2658	-31.23617	28.92226	2693	-31.24084	28.91570	2728	-31.24579	28.91307	2763	-31.24392	28.90558	2798	-31.24966	28.90670
2659	-31.23617	28.92226	2694	-31.24084	28.91570	2729	-31.24579	28.91306	2764	-31.24392	28.90557	2799	-31.24967	28.90670
2660	-31.23617	28.92226	2695	-31.24085	28.91569	2730	-31.24579	28.91305	2765	-31.24419	28.90536	2800	-31.24968	28.90669

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
2801	-31.24968	28.90669	2836	-31.25322	28.90394	2871	-31.25334	28.90370	2906	-31.25277	28.89989	2941	-31.25421	28.89138
2802	-31.24969	28.90668	2837	-31.25323	28.90394	2872	-31.25333	28.90369	2907	-31.25277	28.89988	2942	-31.25421	28.89137
2803	-31.24970	28.90668	2838	-31.25324	28.90394	2873	-31.25333	28.90368	2908	-31.25278	28.89987	2943	-31.25421	28.89136
2804	-31.24970	28.90667	2839	-31.25325	28.90393	2874	-31.25332	28.90368	2909	-31.25278	28.89986	2944	-31.25421	28.89134
2805	-31.24971	28.90666	2840	-31.25326	28.90393	2875	-31.25332	28.90368	2910	-31.25363	28.89801	2945	-31.25420	28.89133
2806	-31.24972	28.90665	2841	-31.25326	28.90393	2876	-31.25251	28.90260	2911	-31.25364	28.89800	2946	-31.25420	28.89133
2807	-31.24972	28.90664	2842	-31.25327	28.90392	2877	-31.25238	28.90228	2912	-31.25364	28.89799	2947	-31.25404	28.89059
2808	-31.24973	28.90664	2843	-31.25327	28.90392	2878	-31.25265	28.90166	2913	-31.25364	28.89798	2948	-31.25407	28.88859
2809	-31.24973	28.90663	2844	-31.25328	28.90392	2879	-31.25266	28.90165	2914	-31.25365	28.89797	2949	-31.25471	28.88845
2810	-31.24973	28.90662	2845	-31.25329	28.90392	2880	-31.25266	28.90164	2915	-31.25365	28.89796	2950	-31.25600	28.88848
2811	-31.24974	28.90661	2846	-31.25330	28.90391	2881	-31.25266	28.90163	2916	-31.25365	28.89795	2951	-31.25692	28.88884
2812	-31.24974	28.90660	2847	-31.25330	28.90390	2882	-31.25267	28.90162	2917	-31.25365	28.89794	2952	-31.25783	28.88948
2813	-31.24974	28.90659	2848	-31.25331	28.90390	2883	-31.25267	28.90161	2918	-31.25365	28.89793	2953	-31.25783	28.88948
2814	-31.24974	28.90658	2849	-31.25332	28.90389	2884	-31.25267	28.90160	2919	-31.25365	28.89792	2954	-31.25784	28.88949
2815	-31.24974	28.90657	2850	-31.25332	28.90388	2885	-31.25267	28.90159	2920	-31.25365	28.89791	2955	-31.25785	28.88949
2816	-31.24974	28.90657	2851	-31.25333	28.90388	2886	-31.25267	28.90158	2921	-31.25365	28.89790	2956	-31.25785	28.88950
2817	-31.24984	28.90474	2852	-31.25333	28.90387	2887	-31.25267	28.90157	2922	-31.25365	28.89789	2957	-31.25786	28.88950
2818	-31.25006	28.90423	2853	-31.25334	28.90386	2888	-31.25267	28.90156	2923	-31.25364	28.89788	2958	-31.25787	28.88950
2819	-31.25085	28.90369	2854	-31.25334	28.90385	2889	-31.25267	28.90155	2924	-31.25364	28.89787	2959	-31.25787	28.88950
2820	-31.25178	28.90342	2855	-31.25335	28.90384	2890	-31.25267	28.90154	2925	-31.25364	28.89786	2960	-31.25815	28.88956
2821	-31.25236	28.90369	2856	-31.25335	28.90384	2891	-31.25266	28.90153	2926	-31.25364	28.89786	2961	-31.25815	28.88956
2822	-31.25237	28.90370	2857	-31.25335	28.90383	2892	-31.25266	28.90152	2927	-31.25335	28.89722	2962	-31.25816	28.88956
2823	-31.25237	28.90370	2858	-31.25335	28.90382	2893	-31.25266	28.90151	2928	-31.25324	28.89684	2963	-31.25817	28.88956
2824	-31.25238	28.90370	2859	-31.25335	28.90381	2894	-31.25265	28.90151	2929	-31.25326	28.89570	2964	-31.25818	28.88956
2825	-31.25272	28.90380	2860	-31.25336	28.90380	2895	-31.25265	28.90150	2930	-31.25369	28.89358	2965	-31.25819	28.88956
2826	-31.25289	28.90390	2861	-31.25336	28.90379	2896	-31.25264	28.90149	2931	-31.25369	28.89358	2966	-31.25820	28.88956
2827	-31.25289	28.90390	2862	-31.25336	28.90378	2897	-31.25264	28.90148	2932	-31.25369	28.89357	2967	-31.25821	28.88956
2828	-31.25290	28.90390	2863	-31.25336	28.90377	2898	-31.25263	28.90147	2933	-31.25385	28.89221	2968	-31.25821	28.88955
2829	-31.25291	28.90390	2864	-31.25336	28.90376	2899	-31.25263	28.90147	2934	-31.25419	28.89144	2969	-31.25822	28.88955
2830	-31.25292	28.90391	2865	-31.25335	28.90375	2900	-31.25226	28.90106	2935	-31.25419	28.89144	2970	-31.25823	28.88955
2831	-31.25292	28.90391	2866	-31.25335	28.90374	2901	-31.25219	28.90080	2936	-31.25420	28.89143	2971	-31.25824	28.88954
2832	-31.25293	28.90391	2867	-31.25335	28.90373	2902	-31.25253	28.90016	2937	-31.25420	28.89142	2972	-31.25825	28.88954
2833	-31.25294	28.90391	2868	-31.25335	28.90372	2903	-31.25276	28.89990	2938	-31.25420	28.89141	2973	-31.25825	28.88953
2834	-31.25321	28.90394	2869	-31.25335	28.90372	2904	-31.25276	28.89990	2939	-31.25420	28.89140	2974	-31.25826	28.88952
2835	-31.25321	28.90394	2870	-31.25334	28.90371	2905	-31.25276	28.89989	2940	-31.25421	28.89139	2975	-31.25827	28.88952

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
2976	-31.25827	28.88951	3011	-31.25599	28.88685	3046	-31.25428	28.88193	3081	-31.25424	28.88129	3116	-31.25019	28.87518
2977	-31.25828	28.88950	3012	-31.25598	28.88685	3047	-31.25429	28.88192	3082	-31.25423	28.88129	3117	-31.25019	28.87518
2978	-31.25828	28.88949	3013	-31.25598	28.88684	3048	-31.25430	28.88192	3083	-31.25422	28.88129	3118	-31.25093	28.87460
2979	-31.25829	28.88948	3014	-31.25597	28.88684	3049	-31.25430	28.88191	3084	-31.25421	28.88129	3119	-31.25120	28.87439
2980	-31.25829	28.88948	3015	-31.25597	28.88684	3050	-31.25431	28.88190	3085	-31.25420	28.88128	3120	-31.25225	28.87399
2981	-31.25830	28.88947	3016	-31.25506	28.88650	3051	-31.25431	28.88189	3086	-31.25419	28.88128	3121	-31.25225	28.87399
2982	-31.25830	28.88946	3017	-31.25447	28.88615	3052	-31.25432	28.88189	3087	-31.25418	28.88128	3122	-31.25226	28.87399
2983	-31.25830	28.88945	3018	-31.25447	28.88615	3053	-31.25432	28.88188	3088	-31.25418	28.88129	3123	-31.25227	28.87398
2984	-31.25830	28.88944	3019	-31.25446	28.88614	3054	-31.25433	28.88187	3089	-31.25417	28.88129	3124	-31.25227	28.87398
2985	-31.25830	28.88943	3020	-31.25446	28.88614	3055	-31.25433	28.88186	3090	-31.25416	28.88129	3125	-31.25289	28.87361
2986	-31.25831	28.88942	3021	-31.25445	28.88614	3056	-31.25433	28.88185	3091	-31.25352	28.88148	3126	-31.25289	28.87360
2987	-31.25831	28.88941	3022	-31.25336	28.88578	3057	-31.25433	28.88184	3092	-31.25237	28.88129	3127	-31.25290	28.87360
2988	-31.25831	28.88940	3023	-31.25268	28.88496	3058	-31.25433	28.88183	3093	-31.25237	28.88129	3128	-31.25291	28.87359
2989	-31.25830	28.88939	3024	-31.25267	28.88495	3059	-31.25434	28.88182	3094	-31.25236	28.88129	3129	-31.25292	28.87359
2990	-31.25830	28.88938	3025	-31.25267	28.88495	3060	-31.25434	28.88181	3095	-31.25088	28.88114	3130	-31.25292	28.87358
2991	-31.25830	28.88937	3026	-31.25198	28.88418	3061	-31.25434	28.88180	3096	-31.25051	28.88102	3131	-31.25293	28.87357
2992	-31.25830	28.88936	3027	-31.25190	28.88388	3062	-31.25433	28.88144	3097	-31.24965	28.88062	3132	-31.25293	28.87356
2993	-31.25830	28.88935	3028	-31.25190	28.88373	3063	-31.25433	28.88143	3098	-31.24965	28.88062	3133	-31.25294	28.87356
2994	-31.25829	28.88934	3029	-31.25204	28.88340	3064	-31.25433	28.88142	3099	-31.24910	28.88037	3134	-31.25294	28.87355
2995	-31.25829	28.88933	3030	-31.25306	28.88294	3065	-31.25433	28.88141	3100	-31.24858	28.87944	3135	-31.25295	28.87354
2996	-31.25828	28.88932	3031	-31.25306	28.88293	3066	-31.25432	28.88140	3101	-31.24839	28.87864	3136	-31.25295	28.87353
2997	-31.25828	28.88932	3032	-31.25307	28.88293	3067	-31.25432	28.88139	3102	-31.24879	28.87795	3137	-31.25296	28.87352
2998	-31.25780	28.88848	3033	-31.25307	28.88293	3068	-31.25432	28.88138	3103	-31.24879	28.87795	3138	-31.25296	28.87351
2999	-31.25779	28.88848	3034	-31.25308	28.88292	3069	-31.25432	28.88137	3104	-31.24879	28.87794	3139	-31.25296	28.87350
3000	-31.25779	28.88847	3035	-31.25309	28.88291	3070	-31.25431	28.88136	3105	-31.24880	28.87793	3140	-31.25296	28.87349
3001	-31.25778	28.88846	3036	-31.25310	28.88291	3071	-31.25431	28.88135	3106	-31.24880	28.87792	3141	-31.25296	28.87348
3002	-31.25778	28.88846	3037	-31.25310	28.88290	3072	-31.25430	28.88135	3107	-31.24881	28.87791	3142	-31.25296	28.87347
3003	-31.25724	28.88786	3038	-31.25310	28.88290	3073	-31.25430	28.88134	3108	-31.24881	28.87790	3143	-31.25296	28.87346
3004	-31.25723	28.88785	3039	-31.25355	28.88236	3074	-31.25429	28.88133	3109	-31.24881	28.87789	3144	-31.25296	28.87345
3005	-31.25723	28.88785	3040	-31.25399	28.88211	3075	-31.25428	28.88132	3110	-31.24881	28.87788	3145	-31.25296	28.87344
3006	-31.25722	28.88784	3041	-31.25399	28.88211	3076	-31.25428	28.88132	3111	-31.24881	28.87788	3146	-31.25296	28.87343
3007	-31.25722	28.88784	3042	-31.25399	28.88211	3077	-31.25427	28.88131	3112	-31.24891	28.87692	3147	-31.25279	28.87265
3008	-31.25671	28.88745	3043	-31.25426	28.88195	3078	-31.25426	28.88130	3113	-31.24903	28.87652	3148	-31.25279	28.87235
3009	-31.25600	28.88686	3044	-31.25427	28.88194	3079	-31.25425	28.88130	3114	-31.24955	28.87562	3149	-31.25305	28.87191
3010	-31.25600	28.88686	3045	-31.25428	28.88194	3080	-31.25425	28.88130	3115	-31.25018	28.87518	3150	-31.25381	28.87138

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
3151	-31.25456	28.87126	3186	-31.25679	28.86970	3221	-31.26066	28.86531	3256	-31.26115	28.86267	3291	-31.25965	28.86130
3152	-31.25555	28.87156	3187	-31.25680	28.86969	3222	-31.26067	28.86531	3257	-31.26115	28.86266	3292	-31.25945	28.86118
3153	-31.25556	28.87156	3188	-31.25680	28.86968	3223	-31.26068	28.86531	3258	-31.26116	28.86265	3293	-31.25906	28.86070
3154	-31.25556	28.87156	3189	-31.25681	28.86967	3224	-31.26069	28.86530	3259	-31.26116	28.86264	3294	-31.25873	28.85839
3155	-31.25557	28.87156	3190	-31.25681	28.86966	3225	-31.26070	28.86530	3260	-31.26117	28.86263	3295	-31.25873	28.85838
3156	-31.25558	28.87156	3191	-31.25681	28.86965	3226	-31.26071	28.86530	3261	-31.26117	28.86262	3296	-31.25873	28.85838
3157	-31.25559	28.87156	3192	-31.25682	28.86964	3227	-31.26072	28.86530	3262	-31.26117	28.86261	3297	-31.25839	28.85682
3158	-31.25560	28.87156	3193	-31.25682	28.86963	3228	-31.26072	28.86529	3263	-31.26117	28.86260	3298	-31.25839	28.85682
3159	-31.25561	28.87156	3194	-31.25682	28.86962	3229	-31.26073	28.86529	3264	-31.26117	28.86259	3299	-31.25838	28.85681
3160	-31.25562	28.87156	3195	-31.25682	28.86961	3230	-31.26074	28.86528	3265	-31.26117	28.86258	3300	-31.25838	28.85680
3161	-31.25563	28.87155	3196	-31.25682	28.86960	3231	-31.26075	28.86528	3266	-31.26117	28.86258	3301	-31.25794	28.85546
3162	-31.25563	28.87155	3197	-31.25682	28.86959	3232	-31.26075	28.86527	3267	-31.26116	28.86214	3302	-31.25763	28.85434
3163	-31.25564	28.87155	3198	-31.25682	28.86958	3233	-31.26076	28.86527	3268	-31.26116	28.86213	3303	-31.25764	28.85367
3164	-31.25565	28.87154	3199	-31.25682	28.86957	3234	-31.26077	28.86526	3269	-31.26116	28.86212	3304	-31.25792	28.85272
3165	-31.25566	28.87154	3200	-31.25682	28.86956	3235	-31.26077	28.86525	3270	-31.26116	28.86211	3305	-31.25838	28.85202
3166	-31.25566	28.87153	3201	-31.25681	28.86955	3236	-31.26078	28.86524	3271	-31.26116	28.86210	3306	-31.25881	28.85153
3167	-31.25567	28.87152	3202	-31.25681	28.86954	3237	-31.26079	28.86524	3272	-31.26116	28.86209	3307	-31.25998	28.85138
3168	-31.25567	28.87152	3203	-31.25641	28.86841	3238	-31.26079	28.86523	3273	-31.26115	28.86208	3308	-31.25999	28.85138
3169	-31.25568	28.87152	3204	-31.25657	28.86712	3239	-31.26079	28.86522	3274	-31.26115	28.86207	3309	-31.26000	28.85138
3170	-31.25568	28.87151	3205	-31.25680	28.86635	3240	-31.26080	28.86521	3275	-31.26115	28.86206	3310	-31.26000	28.85138
3171	-31.25568	28.87151	3206	-31.25749	28.86528	3241	-31.26080	28.86520	3276	-31.26114	28.86205	3311	-31.26001	28.85137
3172	-31.25569	28.87150	3207	-31.25802	28.86488	3242	-31.26080	28.86519	3277	-31.26114	28.86204	3312	-31.26002	28.85137
3173	-31.25569	28.87149	3208	-31.25897	28.86475	3243	-31.26081	28.86518	3278	-31.26113	28.86204	3313	-31.26003	28.85137
3174	-31.25570	28.87148	3209	-31.25988	28.86496	3244	-31.26081	28.86517	3279	-31.26113	28.86203	3314	-31.26004	28.85136
3175	-31.25570	28.87147	3210	-31.26024	28.86524	3245	-31.26081	28.86516	3280	-31.26112	28.86202	3315	-31.26004	28.85136
3176	-31.25571	28.87147	3211	-31.26024	28.86524	3246	-31.26081	28.86515	3281	-31.26111	28.86201	3316	-31.26005	28.85135
3177	-31.25571	28.87147	3212	-31.26024	28.86525	3247	-31.26081	28.86514	3282	-31.26110	28.86201	3317	-31.26006	28.85134
3178	-31.25571	28.87146	3213	-31.26025	28.86525	3248	-31.26081	28.86513	3283	-31.26110	28.86200	3318	-31.26006	28.85134
3179	-31.25602	28.87053	3214	-31.26026	28.86526	3249	-31.26081	28.86512	3284	-31.26109	28.86200	3319	-31.26007	28.85133
3180	-31.25614	28.87027	3215	-31.26027	28.86526	3250	-31.26080	28.86511	3285	-31.26108	28.86199	3320	-31.26007	28.85133
3181	-31.25677	28.86973	3216	-31.26028	28.86526	3251	-31.26080	28.86510	3286	-31.26108	28.86199	3321	-31.26022	28.85113
3182	-31.25677	28.86973	3217	-31.26029	28.86526	3252	-31.26053	28.86402	3287	-31.26018	28.86161	3322	-31.26022	28.85112
3183	-31.25677	28.86972	3218	-31.26029	28.86527	3253	-31.26046	28.86361	3288	-31.25992	28.86145	3323	-31.26022	28.85112
3184	-31.25678	28.86971	3219	-31.26030	28.86527	3254	-31.26114	28.86268	3289	-31.25992	28.86145	3324	-31.26023	28.85112
3185	-31.25679	28.86971	3220	-31.26066	28.86531	3255	-31.26115	28.86268	3290	-31.25992	28.86145	3325	-31.26023	28.85111

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
3326	-31.26024	28.85110	3361	-31.25931	28.84950	3396	-31.25512	28.84384	3431	-31.24906	28.84158	3466	-31.24335	28.84437
3327	-31.26024	28.85110	3362	-31.25930	28.84949	3397	-31.25512	28.84383	3432	-31.24905	28.84158	3467	-31.24335	28.84438
3328	-31.26024	28.85109	3363	-31.25929	28.84949	3398	-31.25511	28.84382	3433	-31.24904	28.84158	3468	-31.24334	28.84439
3329	-31.26024	28.85108	3364	-31.25928	28.84949	3399	-31.25511	28.84381	3434	-31.24904	28.84158	3469	-31.24334	28.84440
3330	-31.26025	28.85107	3365	-31.25927	28.84949	3400	-31.25510	28.84381	3435	-31.24800	28.84146	3470	-31.24334	28.84441
3331	-31.26025	28.85106	3366	-31.25926	28.84948	3401	-31.25510	28.84380	3436	-31.24800	28.84146	3471	-31.24320	28.84559
3332	-31.26025	28.85105	3367	-31.25926	28.84948	3402	-31.25509	28.84379	3437	-31.24799	28.84145	3472	-31.24310	28.84626
3333	-31.26025	28.85104	3368	-31.25925	28.84948	3403	-31.25508	28.84379	3438	-31.24798	28.84146	3473	-31.24310	28.84626
3334	-31.26025	28.85103	3369	-31.25924	28.84949	3404	-31.25508	28.84378	3439	-31.24797	28.84146	3474	-31.24310	28.84627
3335	-31.26025	28.85102	3370	-31.25794	28.84963	3405	-31.25507	28.84377	3440	-31.24796	28.84146	3475	-31.24310	28.84628
3336	-31.26025	28.85101	3371	-31.25692	28.84973	3406	-31.25506	28.84377	3441	-31.24796	28.84146	3476	-31.24310	28.84629
3337	-31.26025	28.85100	3372	-31.25593	28.84940	3407	-31.25505	28.84376	3442	-31.24796	28.84146	3477	-31.24311	28.84685
3338	-31.26025	28.85099	3373	-31.25535	28.84832	3408	-31.25504	28.84376	3443	-31.24657	28.84179	3478	-31.24302	28.84769
3339	-31.26024	28.85098	3374	-31.25465	28.84642	3409	-31.25504	28.84376	3444	-31.24656	28.84179	3479	-31.24302	28.84770
3340	-31.26024	28.85097	3375	-31.25457	28.84531	3410	-31.25503	28.84376	3445	-31.24655	28.84180	3480	-31.24294	28.84915
3341	-31.26024	28.85096	3376	-31.25518	28.84425	3411	-31.25502	28.84375	3446	-31.24655	28.84180	3481	-31.24282	28.84953
3342	-31.26024	28.85096	3377	-31.25518	28.84425	3412	-31.25501	28.84375	3447	-31.24521	28.84234	3482	-31.24282	28.84953
3343	-31.26024	28.85096	3378	-31.25519	28.84424	3413	-31.25500	28.84375	3448	-31.24520	28.84234	3483	-31.24282	28.84954
3344	-31.26006	28.85056	3379	-31.25519	28.84423	3414	-31.25499	28.84375	3449	-31.24519	28.84234	3484	-31.24282	28.84955
3345	-31.25990	28.84998	3380	-31.25520	28.84422	3415	-31.25498	28.84375	3450	-31.24519	28.84234	3485	-31.24282	28.84956
3346	-31.25990	28.84998	3381	-31.25520	28.84422	3416	-31.25497	28.84376	3451	-31.24454	28.84274	3486	-31.24282	28.84957
3347	-31.25990	28.84997	3382	-31.25520	28.84421	3417	-31.25497	28.84376	3452	-31.24401	28.84304	3487	-31.24282	28.84958
3348	-31.25989	28.84996	3383	-31.25520	28.84420	3418	-31.25496	28.84376	3453	-31.24401	28.84304	3488	-31.24282	28.84959
3349	-31.25989	28.84996	3384	-31.25520	28.84419	3419	-31.25369	28.84419	3454	-31.24400	28.84304	3489	-31.24282	28.84960
3350	-31.25988	28.84995	3385	-31.25520	28.84418	3420	-31.25292	28.84417	3455	-31.24399	28.84305	3490	-31.24282	28.84961
3351	-31.25988	28.84994	3386	-31.25521	28.84417	3421	-31.25135	28.84294	3456	-31.24398	28.84306	3491	-31.24282	28.84962
3352	-31.25987	28.84993	3387	-31.25521	28.84416	3422	-31.25135	28.84294	3457	-31.24398	28.84306	3492	-31.24296	28.85027
3353	-31.25987	28.84992	3388	-31.25521	28.84415	3423	-31.25135	28.84294	3458	-31.24397	28.84307	3493	-31.24269	28.85108
3354	-31.25986	28.84992	3389	-31.25520	28.84414	3424	-31.25051	28.84230	3459	-31.24397	28.84308	3494	-31.24209	28.85153
3355	-31.25985	28.84991	3390	-31.25520	28.84413	3425	-31.25050	28.84229	3460	-31.24396	28.84308	3495	-31.24121	28.85214
3356	-31.25985	28.84990	3391	-31.25520	28.84412	3426	-31.25049	28.84229	3461	-31.24395	28.84309	3496	-31.23995	28.85232
3357	-31.25984	28.84990	3392	-31.25520	28.84411	3427	-31.25049	28.84229	3462	-31.24395	28.84310	3497	-31.23933	28.85208
3358	-31.25933	28.84951	3393	-31.25513	28.84386	3428	-31.24907	28.84159	3463	-31.24395	28.84310	3498	-31.23913	28.85172
3359	-31.25932	28.84951	3394	-31.25513	28.84386	3429	-31.24907	28.84159	3464	-31.24336	28.84436	3499	-31.23913	28.85172
3360	-31.25932	28.84950	3395	-31.25513	28.84385	3430	-31.24906	28.84159	3465	-31.24335	28.84436	3500	-31.23912	28.85172

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
3501	-31.23837	28.85050	3536	-31.23942	28.84157	3571	-31.24043	28.83582	3606	-31.23982	28.83604	3641	-31.23321	28.83049
3502	-31.23823	28.84840	3537	-31.23942	28.84156	3572	-31.24043	28.83581	3607	-31.23963	28.83617	3642	-31.23218	28.83030
3503	-31.23823	28.84839	3538	-31.23940	28.84052	3573	-31.24042	28.83580	3608	-31.23897	28.83538	3643	-31.23218	28.83029
3504	-31.23823	28.84838	3539	-31.23941	28.84016	3574	-31.24042	28.83579	3609	-31.23865	28.83480	3644	-31.23217	28.83029
3505	-31.23823	28.84837	3540	-31.23967	28.83925	3575	-31.24042	28.83578	3610	-31.23848	28.83367	3645	-31.23216	28.83029
3506	-31.23823	28.84836	3541	-31.23967	28.83925	3576	-31.24041	28.83577	3611	-31.23848	28.83366	3646	-31.23351	28.90985
3507	-31.23823	28.84836	3542	-31.23967	28.83924	3577	-31.24041	28.83576	3612	-31.23848	28.83365	3647	-31.23415	28.91014
3508	-31.23803	28.84770	3543	-31.23968	28.83923	3578	-31.24040	28.83576	3613	-31.23848	28.83364	3648	-31.23460	28.91052
3509	-31.23823	28.84726	3544	-31.23968	28.83922	3579	-31.24040	28.83575	3614	-31.23848	28.83363	3649	-31.23461	28.91053
3510	-31.23823	28.84726	3545	-31.23968	28.83921	3580	-31.24040	28.83575	3615	-31.23847	28.83362	3650	-31.23461	28.91053
3511	-31.23823	28.84725	3546	-31.23968	28.83920	3581	-31.24039	28.83574	3616	-31.23847	28.83361	3651	-31.23503	28.91083
3512	-31.23823	28.84724	3547	-31.23968	28.83920	3582	-31.24038	28.83573	3617	-31.23846	28.83360	3652	-31.23528	28.91104
3513	-31.23824	28.84723	3548	-31.23967	28.83874	3583	-31.24038	28.83573	3618	-31.23846	28.83360	3653	-31.23529	28.91105
3514	-31.23824	28.84723	3549	-31.23969	28.83763	3584	-31.24038	28.83573	3619	-31.23845	28.83359	3654	-31.23529	28.91105
3515	-31.23832	28.84683	3550	-31.23983	28.83730	3585	-31.24037	28.83572	3620	-31.23845	28.83358	3655	-31.23586	28.91145
3516	-31.23841	28.84662	3551	-31.23999	28.83712	3586	-31.24036	28.83572	3621	-31.23844	28.83357	3656	-31.23614	28.91202
3517	-31.23841	28.84662	3552	-31.23999	28.83712	3587	-31.24035	28.83571	3622	-31.23843	28.83357	3657	-31.23618	28.91288
3518	-31.23842	28.84661	3553	-31.24000	28.83711	3588	-31.24035	28.83571	3623	-31.23843	28.83356	3658	-31.23618	28.91288
3519	-31.23842	28.84660	3554	-31.24000	28.83710	3589	-31.24034	28.83570	3624	-31.23842	28.83356	3659	-31.23617	28.91289
3520	-31.23842	28.84659	3555	-31.24001	28.83709	3590	-31.24033	28.83570	3625	-31.23841	28.83355	3660	-31.23617	28.91290
3521	-31.23843	28.84658	3556	-31.24001	28.83709	3591	-31.24032	28.83570	3626	-31.23841	28.83355	3661	-31.23616	28.91291
3522	-31.23843	28.84657	3557	-31.24035	28.83642	3592	-31.24031	28.83570	3627	-31.23718	28.83286	3662	-31.23616	28.91292
3523	-31.23843	28.84656	3558	-31.24035	28.83642	3593	-31.24030	28.83569	3628	-31.23659	28.83244	3663	-31.23615	28.91292
3524	-31.23843	28.84655	3559	-31.24036	28.83641	3594	-31.24030	28.83569	3629	-31.23591	28.83185	3664	-31.23593	28.91335
3525	-31.23843	28.84654	3560	-31.24036	28.83640	3595	-31.24029	28.83569	3630	-31.23591	28.83184	3665	-31.23556	28.91361
3526	-31.23841	28.84567	3561	-31.24036	28.83639	3596	-31.24028	28.83570	3631	-31.23590	28.83184	3666	-31.23463	28.91346
3527	-31.23870	28.84422	3562	-31.24037	28.83638	3597	-31.24027	28.83570	3632	-31.23590	28.83183	3667	-31.23441	28.91303
3528	-31.23919	28.84255	3563	-31.24037	28.83637	3598	-31.24026	28.83570	3633	-31.23449	28.83097	3668	-31.23441	28.91302
3529	-31.23919	28.84255	3564	-31.24037	28.83636	3599	-31.24025	28.83570	3634	-31.23449	28.83097	3669	-31.23440	28.91302
3530	-31.23919	28.84254	3565	-31.24043	28.83587	3600	-31.24024	28.83571	3635	-31.23448	28.83096	3670	-31.23422	28.91272
3531	-31.23941	28.84161	3566	-31.24043	28.83587	3601	-31.24024	28.83571	3636	-31.23447	28.83096	3671	-31.23396	28.91220
3532	-31.23941	28.84161	3567	-31.24043	28.83586	3602	-31.24023	28.83572	3637	-31.23447	28.83096	3672	-31.23377	28.91118
3533	-31.23942	28.84160	3568	-31.24043	28.83585	3603	-31.24022	28.83572	3638	-31.23323	28.83049	3673	-31.23377	28.91118
3534	-31.23942	28.84159	3569	-31.24043	28.83584	3604	-31.24022	28.83572	3639	-31.23322	28.83049	3674	-31.23377	28.91117
3535	-31.23942	28.84158	3570	-31.24043	28.83583	3605	-31.24022	28.83572	3640	-31.23321	28.83049	3675	-31.23377	28.91116

Point	East	South	Point	East	South	Point	East	South	Point	East	South	Point	East	South
3676	-31.23339	28.91006												
3677	-31.23351	28.90985												
3678	-31.24411	28.89370												
3679	-31.24385	28.89379												
3680	-31.24396	28.89401												
3681	-31.24415	28.89405												
3682	-31.24411	28.89370												
3683	-31.23627	28.91198												
3684	-31.23596	28.91134												
3685	-31.23536	28.91092												
3686	-31.23510	28.91069												
3687	-31.23468	28.91040												
3688	-31.23421	28.91000												
3689	-31.23345	28.90966												
3690	-31.23324	28.91005												
3691	-31.23364	28.91122												
3692	-31.23383	28.91225												
3693	-31.23410	28.91281												
3694	-31.23429	28.91311												
3695	-31.23455	28.91360												
3696	-31.23559	28.91377												
3697	-31.23603	28.91346												
3698	-31.23627	28.91300												
3699	-31.23632	28.91296												
3700	-31.23627	28.91198												