JULY 2018

AMARAVATI FLOOD MITIGATION WORKS

ENVIRONMENTAL IMPACT ASSESSMENT – ENVIRONMENT MANAGEMENT PLAN REPORT

AMARAVATI DEVELOPMENT CORPORATION LIMITED
ANDHRA PRADESH CAPITAL REGION DEVELOPMENT AUTHORITY

TABLE OF CONTENTS

List of Tables:

List of Figures:

List of Annexures

List of Abbreviations

AD	Anaerobic Digestion
ADCL	Amaravati Development Corporation Ltd.
APCRDA	Andhra Pradesh Capital Region Development Authority
APMDP	Andhra Pradesh Municipal Development Project
APPCB	Andhra Pradesh Pollution Control Board
AWWA	American Water Works Association
BAT	Best Available Technology / Techniques
BOD	Biological Oxygen Demand
CA	Capital Area
CETP	Common Effluent Treatment Plant
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CTE	Consent to Establish
CTO	Consent to Operate
D.G	Diesel Generator
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environmental Management Plan
EPA	Environmental (Protection) Act
HIG	High Income Group
IMD	India Meteorological Department
ISWMF	Integrated Solid Waste Management Facility
KV	Kondaveeti Vagu
LA	Land Acquisition
LPG	Liquefied Petroleum Gas
LPS	Land Pooling Scheme
LA&RR	Land Acquisition & Rehabilitation & Resettlement
MIS	Management Information System
MoEF	Ministry of Environment, Forest and Climate Change
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NEERI	National Environmental Engineering Research Institute
NEP	National Environment Policy
NIHL	Noise Induced Hearing Loss
NIO	National Institute of Oceanography
PIU	Project Implementation Unit
PMC	Project Management Consultants
PP	Project Proponent
PUC	Pollution Under Control
PV	Pala Vagu
RAP	Resettlement Action Plan
SEAC	State Expert Appraisal Committee
SEIAA	State Environmental Impact Assessment Authority
SPCB	State Pollution Control Board
SS	Suspended Solids
STP	Sewage Treatment Plant
TDS	Total Dissolved Solids
TMC	Thousand Million Cubic Feet
ULB	Urban Local Body
USEPA	United States Environmental Protection Agency
WPCF	Water Pollution Control Federation

WTE	Waste to Energy
WTP	Water Treatment Plant

EXECUTIVE SUMMARY

PROJECT BACKGROUND

The Government of Andhra Pradesh has enacted Andhra Pradesh Capital Region Development Authority Act 2014 (Act No. 11 of 2014) and it got assent of the Governor of the state which was given on 29-12-2014 and it came into force w.e.f., from 30 December 2014. Section 3 of the Act enables the State Government to declare by Notification the "Capital Region" and "Capital City Area" for the State of Andhra Pradesh. The Government of Andhra Pradesh has formed a separate company for development of capital city, namely Amravati Development Corporation Limited (ADCL) formerly known as Capital City Development and Management Corporation Limited (CCDMC).

The Government of Andhra Pradesh in its efforts to build a World Class Capital city have considered all the measures pertaining to city resilience. With regards to the Flood Management works in Amaravati, the Government through Amaravati Development Corporation (ADC) has appointed Blue Consultant for the Flood Management Works in Amaravati Capital City. The Blue Consultant has studied historical occurrence of floods in River Krishna and corresponding rainfall recorded in Kondaveeti Vagu and it's in falling drains.

NEED FOR THE PROJECT

The capital city area is well drained by several canal systems of which Kondaveeti Vagu(KV) and Pala Vagu(PV) are the most important water canal system. The major streams of KV and PV flow across the Capital city area, currently cause floods due to inadequate sizes of cross drainage structures, sharp bends of streams, meanders near Krishnayapalem and absence of bunds at few places. Based on the ground reality and to mitigate the current flood situation the flood management works as proposed to be taken up.

PURPOSE OF THE PROJECT

The purposes of the project are to (i) to widen, deepen and extend the KV, PV and its in-falling drains to accommodate the excess runoff generated due to change in the land use from agriculture to urban and handle 1/100 year return period flood (ii) Building inherent safety systems in coherence with the flash floods by having detention reservoirs

SCOPE OF ENVIRONMENTAL ASSESSMENT (EA)

The environmental assessment scope includes screening and scoping, environmental assessment and environmental management plans for the project. The EA process also envisages to develop a comprehensive environmental management frame work for the entire project. The scope of EIA takes into account the applicable regulatory compliance requirements of Capital City Environmental Clearance and the Judgement of National Green Tribunal.

BASELINE ENVIRONMENT

The baseline environmental studies encompassed the disciplines/ environmental attributes of air, water, noise, soil, land-use, terrestrial and aquatic ecology and socio-economic components.

Analysis of Baseline data is based on the fieldwork conducted from March to May, 2015 in EIA-EMP of Amaravati Capital City (September 2015), Preliminary design documents of proposed sub-projects; Institutional interactions. The land use changes in 2017 were taken into consideration for the environmental assessment. The study shows that Air and Noise quality at all the locations is within the Standards.

STAKEHOLDER CONSULTATION

Consultation meetings were organized in Mandadam, Thullur, Neerukonda and Krishnayapalem villages in the month of January 2018. The participants included: land owners, landless, women, labour in the village, local villagers, prominent persons of the village and Vasavya Mahila Mandali (Bank appointed NGO). Prior to the consultation meetings, the draft EIA and EMP were disclosed on the APCRDA website (January 2018). The key concerns expressed by the participants include: expected floods during rainy season, Simultaneous floods in the Krishna River and Kondaveeti Vagu, implementation of NGT judgement, reservoir bunds and strength, development of green buffer, recording the participation of public meetings and etc. The ADCL/APCRDA provided clarifications including the importance of flood mitigation works, design considerations, EC/NGT compliance, minutes of the meetings to be part of the RAP and development proposals about the green and blue envisaged in the city.

ANALYSIS OF ALTERNATIVES/OPTIONS

With the available historical rainfall data, the peak discharge is estimated through hydraulic modelling for a 1 in 100 year event, as 222 mm precipitation in one day.
For efficient discharge of floodwater from Amaravati, three options have been considered

- Option 1: Flood discharge at Undavalli and Vykuntapuram
- Option 2: Flood discharge at Undavalli and proposed government complex
- Option 3: Flood discharge at Undavalli

With reference to detailed analysis, assessment of alternatives pros and cons, discussions and deliberations with relevant sectoral officials, technical expert committee and other relevant stakeholders, Option 1 i.e., Flood discharge at Undavalli and Vykuntapuram has been finalised for implementation and within this option, only Phase-I activities as noted below are being taken up now and part of proposed Bank project. The Phase-I activities on a stand-alone basis are designed / envisaged to deliver the flood mitigation outcomes.

PROJECT COMPONENTS & OTHER ACTIVITIES

Proposed Components to be implemented with the World Bank (Phase-I)	***Phase-II Activities (not part of Project) to be initiated after some years***
1. Widening and Deepening of Kondaveeti Vagu (From Anathavaram to Krishnayapalem) 2. Widening and Deepening of Pala Vagu (From Dondapadu to Krishnayapalem) 3. Construction of Gravity Canal (From Nekkallu to Pichikalapalem) 4. Construction of Sakhamuru Reservoir	1. Widening and Deepening of Kondaveeti Vagu (From Krishnayapalem to Undavalli) 2. Lining works for Kondaveeti Vagu, Pala Vagu and gravity canal 3. Second stage pumping station at Undavalli & Pumping station at Vykuntapuram

Proposed Components to be implemented with the World Bank (Phase-I)	*Phase-II Activities (not part of Project) to be initiated after some years*
5. Construction of Krishnayapalem Reservoir 6. Construction of Neerukonda Reservoir	4. Construction of weirs and mechanical related works of Sakhamuru, Krishnayapalem and Neerukonda Reservoirs 5. Construction of Three (03) reservoirs (Outside Capital City - Lam, Pedaparimi & Vykuntapuram) 6. Feeder Canals from upper catchment to Kondaveeti Vagu and Gravity Canal

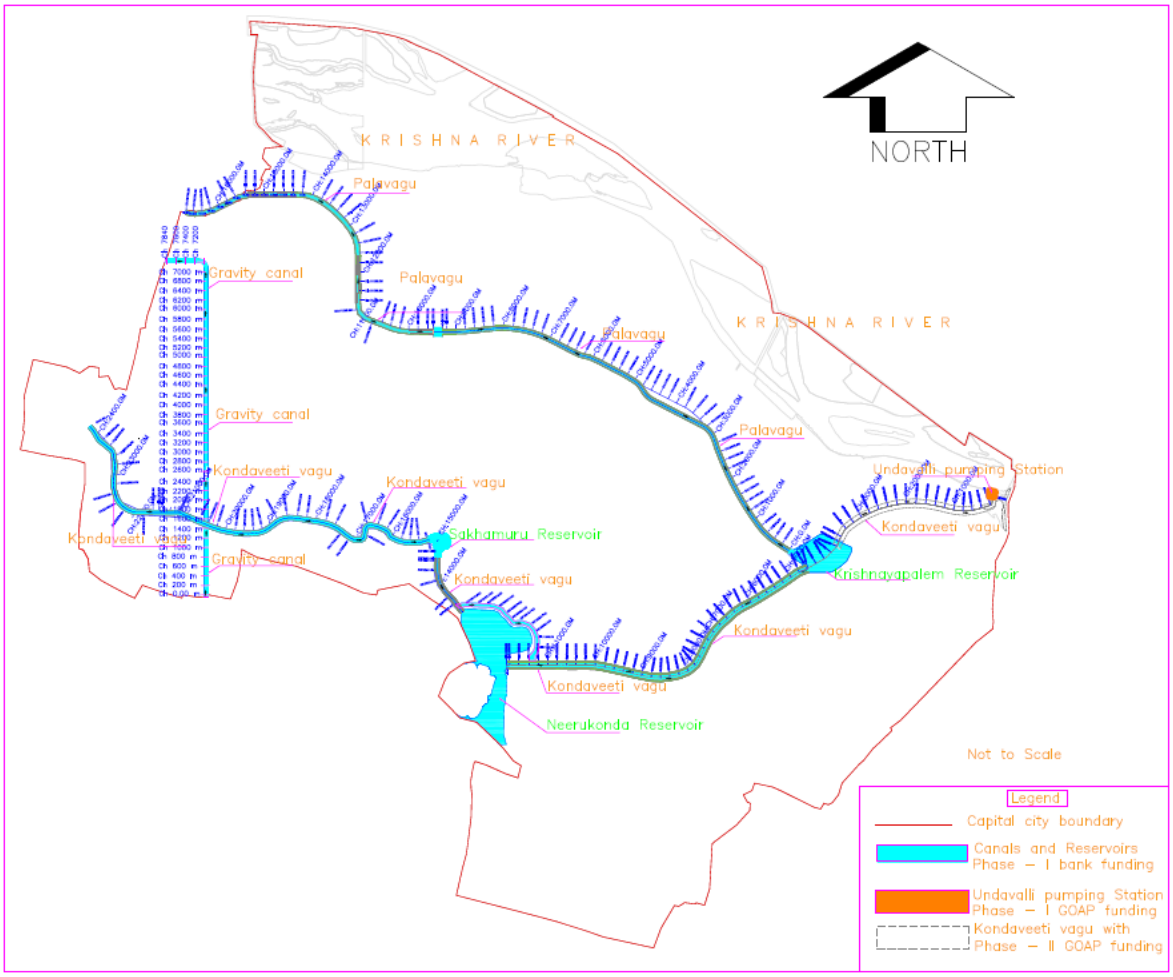


Figure 1: Phase-I Project Details

ASSESSMENT OF IMPACTS

The project is expected to have positive impacts in terms of flood mitigation in the new capital city, generation of employment in the villages associated with the project (Annexure-XXX) activity throughout the project implementation and operation and increase in the vegetation thereby green cover in the city. However, the expected environmental impacts of concern due to

flood mitigation measures have been measured by the activities in the implementation and operation stage.

Impacts due to Earthwork and Embankments

- *Spoil Disposal*: The total quantity of earthwork (excavation) involved in all these works is 41,427,813 Cu.m. (about 41.5 Mil.Cu.m.). Out of this quantity, 444,800 Cu.m. is needed for earthwork in filling at reservoirs, and about 475,000 top soil need to be protected. Given this, about 38.20 Mil.Cu.m. need to be disposed in the sites selected for filling in the Capital City. *Potential air and noise quality impacts* due to fugitive dust emissions at settlements/villages which are within 500 meters radius from the disposal sites including: (i) Nidamarru; (ii) Sakhamuru; (iii) Rayapudi; and (iv) Lingayapalem. In addition, there could be marginal air quality impacts on other villages adjacent to the access roads.
- *Sludge on Natural Stream Bed:* The flows in the streams are intermittent and most part of the year remain dry in the current conditions. The irrigation authorities as part of the routine maintenance works, prior to monsoon, desilt the stream bed which is conventionally utilized by the farmers in the nearby fields. The sludge/silt mostly comprises of alluvial deposits during flash floods occurring during monsoon.
- *Traffic Impacts*: Carting of excavated material will lead to significant increase in traffic on the access roads to the disposal sites for a temporary period of about 9 to 12 months. The relevant access roads include: E3, E8, E10, E14, N4, N9, N14, and N16. These roads have already been constructed as part of capital city's trunk infrastructure development as arterial and sub-arterial roads. No other village roads need to be used as all the disposal sites are next the above referred trunk roads. However, the settlements immediately next to the above referred roads include: (i) Uddandarayapalem; (ii) Venkatapalem; (iii) Mandadam; (iv) Malkapuram; and (v) Velagapudi would be subjected to potential road safety risks and fugitive dust and noise pollution.
- Erosion of disposal sites: This impact is not expected as the disposal sites will be utilized for different land uses as per the master plan.
- *Top Soil*: earthwork excavations would generate about 475,000 Cu.m. of top soil from all the sites. In order to prevent the loss of top soil, the design considerations have already factored to use this quantity within the 30m green buffer on either sides of the canal.
- *Stone Aggregate for Reservoir Lining:* The reservoir embankment uses about 444,800 Cu.m. Soil for raising about 2m from ground level. In addition, about 114,260 Cu.m. of stone will be used for gabion lining. The potential quarries sites approved by Mines and Geology Department, GoAP include Ananthavaram, Endroy, Lemalla and Karlapudi. Development of the quarry sites may lead to environment impacts.
- *Dewatering*: In addition to the above impacts, earthwork excavation along the canal would require dewatering as some parts of the canal would encounter low ground water table. This aspect was analyzed in detail and it is observed that the ground water table is below 6 to 7 meters. However, the dewatering requirement cannot be ruled out as some of the sections encounter areas of shallow water table.
- *Drainage Pattern*: would not be affected with the proposed interventions as the discharges from different sub-streams and area flows will still drain in to the proposed canals.

- *Loss of Vegetation*: Out of the total canal length of 48 km., about 28 km. is in the barren area. Rest of the canal length has about 758 trees on either side. Out of these, about 529 will be affected and an estimated 106 trees can be transplanted in the Green buffer.

Impacts due to Construction Facilities

The construction facilities and the activities could lead to range of impacts including the following

- *Labor Influx: The proposed construction activities at Amaravati is likely to lead to influx of workers to the project site as the local labor is mostly related to agriculture workers with limited or no skill for construction works. While this could lead to some demand triggering local skill base development in the long term, there could be short term adverse social impacts on the local communities. Also, the labor influx could cause impacts relating to public health, socio-economic changes, competing demand for community resources, etc.*
- *Occupational Health and Safety*: The construction activities could lead to occupational health and safety issues if necessary care is not taken to integrate the safety management systems in to the work protocols.
- *Construction Related Pollution*: The construction phase would lead to significant air, noise and water pollution if necessary precautionary measures are not taken up. The villages along the canal include: (a) Krishnayapalem; (b) Mandadam; (c) Malkapuram; (d) Velagapudi; (e) Sakhamuru; and (f) Neerukonda are expected to be impacted.
- *Wastes*: The construction activities will include storage, handling and disposal of petroleum based products such as lubricants, hydraulic fluids, or fuels. Storage/usage and/or disposal could not only cause impacts but also lead to hazards/risks of potential leakage and contamination. Similarly, there would be several other waste which may not be hazardous but could lead to in-sanitary or disorderly conditions in and around construction sites. These include: solid and liquid wastes generated from construction camps, construction waste which is not systematically disposed causing cess pools and associated disease burden, etc.
- *Social Impacts:* The total land requirement for flood mitigation works for a length of about 48.4 Kms and reservoirs (as per the Blue Network DPR) is 1998.86 acres comprising (LPS – 1131.30 acres; 75.46 acres under LA, 781.72 (5.3 acres of land is occupied by encroachers) under Government lands) and 10.38 acres under R1 Zone in Village Habitation). A total of 1913.02 acres of lands are already available with CRDA through LPS corresponding to 1754 landowners who gave lands under LPS and as lands covered in existing blue network (streams), 75.46 acres of land to be acquired under LARR, 10.38 acres within village habitation (R1 zone) to be acquired under Negotiated Settlement policy. LARR Act and Negotiated Settlement Policy are expected to impact [137] families. Among these, 27 families will be physically displaced.
- *Impact on Common property Sites*: Three common property resources including, one temple in Mandadam, one burial ground in Sakhamuru and one burial ground in Mandadam will be affected. The specific details in this regard are detailed out in RAP for flood mitigation works.

Environmental Impacts – Operation and Maintenance

- The proposed commissioning of Canals and Reservoirs is not expected to lead to any major impacts as these structures are not expected to hold significant volume of water above ground level. The green buffer, if not managed as per the design standards, could lead to canal side degradation including encroachments, disposal of municipal waste, construction debris, etc. Discharge of untreated effluents, silt & debris, and solid waste through natural storm water drains could occur. In such an event the aesthetics and the physical environment could be seriously affected. These impacts could be effectively managed since Amaravati City has elaborate waste management strategies integrated in to city development plans. Given open canal configuration, there is potential risk of safety. This aspect has been addressed as part of the design measures by providing access control and safety railing at all the settlement locations.

ENVIRONMENTAL MANAGEMENT PLAN

- **Environmental management plan**

  Environmental Management Plan (EMP) deals with the implementation procedure of the guidelines and measures recommended to avoid, minimize and mitigate environmental impacts of the project. It also includes management of measures suggested for enhancement of the environmental quality along the highways.

  The institutional arrangement made under project will look into the implementation of project as well as EMP and the various legal settings applicable to the project are briefly stated in chapter 2**.**

  The avoidance, mitigation & enhancement measures for protection of the environment have been discussed in detail in this chapter. Social environmental elements have been separately dealt in separate volume namely, Resettlement and Rehabilitation Action Plan (RAP).

- **Objective of EMP**

  The EMP is a plan of action for mitigation / management / avoidance of the negative impacts of the project and enhancement of the project corridor. For each measure to be taken, its location, timeframe, implementation and overseeing / supervision responsibilities are listed. These components of the EMP have been given in Chapter 8 which explains the environmental issues and the avoidance/ mitigation/ minimization or enhancement measures adopted and/or to be adopted during different phases of the project. It also provides the references for the suggested measures, responsible agency for its implementation/ management as well as its timeframe.

- **Cost estimates for environmental management**

  Mitigation measures proposed in the EMP will be implemented by the Contractor. The works to be undertaken by the Contractor have been quantified and the quantities included in the respective BOQ items such as earth works, slope protection, noise barriers, safety features, and shrub plantation. Provisional quantities have also been included for additional measures that may be identified during construction and for fencing which will depend on the

Contractors work methods and site locations. Items and quantities have also been included for enhancement measures.

More general environmental management measures to be followed by the contractor have been included in the specifications and this EMP. These cannot be quantified and are to be included in the contract rates.

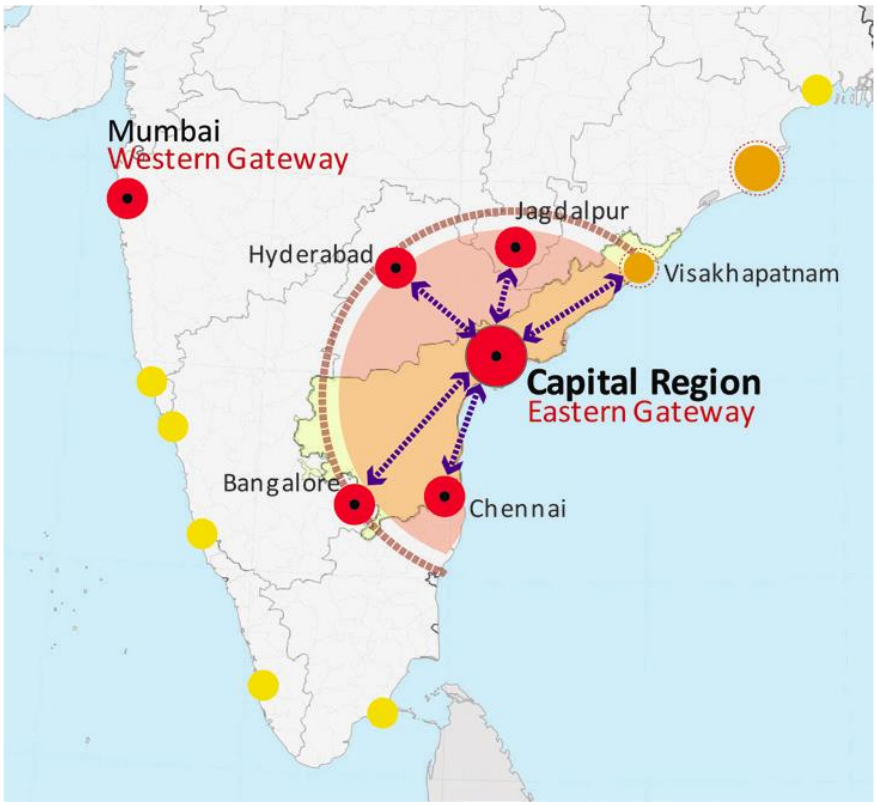
INSTITUITONAL STRUCTURE

To implement the project there is a project implementation unit established in the ADCL. Under the PIU there would be environmental management cell comprising the Chief Engineer, Superintendent Engineer, Executive Engineer, Deputy E.E, Head of the Department (Infrastructure Planning & Design), Environmental Engineer, Environmental Planner, Social Expert. The Environmental Unit of APCRDA would be working closely with ADCL PIU in the implementation, monitoring of the project. ADCL's Project Management Consultant would overview the project activities. The PIU would coordinate with the Contractor and local level officials of ADCL and APCRDA

CHAPTER 1: INTRODUCTION

1.1 Project Background

Government of Andhra Pradesh (GoAP) has embarked 'Amaravati', as a world class capital city for the newly formed State. The Government has enacted Andhra Pradesh Capital Region Development Authority Act 2014 (Act No. 11 of 2014) and it got assent of the Governor of Andhra Pradesh which was given on 29-12-2014 and it came into force w.e.f., from 30 December 2014. Section 3 of the Act enables the State Government to declare by Notification the "Capital Region" and "Capital City Area" for the State of Andhra Pradesh.



The Government of Andhra Pradesh has formed a separate company for development of capital city, namely Amravati Development Corporation Limited (ADCL) formerly known as Capital City Development and Management Corporation Limited (CCDMC). The capital city development is proposed to be over an area of about 217 km^2. The capital city area is bestowed with rich natural features including hillocks, river islands, abundant water, fertile soil and greenery. While abundance of water is a boon for the capital city, seasonal flooding driven by Kondaveeti Vagu and river Krishna poses a threat to the city.

1.2 Project Location

The proposed project is for the Amaravati Capital City. The Government of AP has decided to establish the new capital city as a livable, environmentally sustainable and people's capital. For this purpose, the location of the capital was identified between Vijayawada and Guntur cities upstream of Prakasam Barrage on the right bank of river Krishna. The proposed capital city Amaravati is named after historic site of Amaravati known for its Buddhist culture that flourished from 400 BC to 1100 AD.

The geographical coordinates of the capital city site are 16.54^o N latitude & 80.52^o E Longitude. Figure 1-1 below presents the location of the project (Annexure -I).

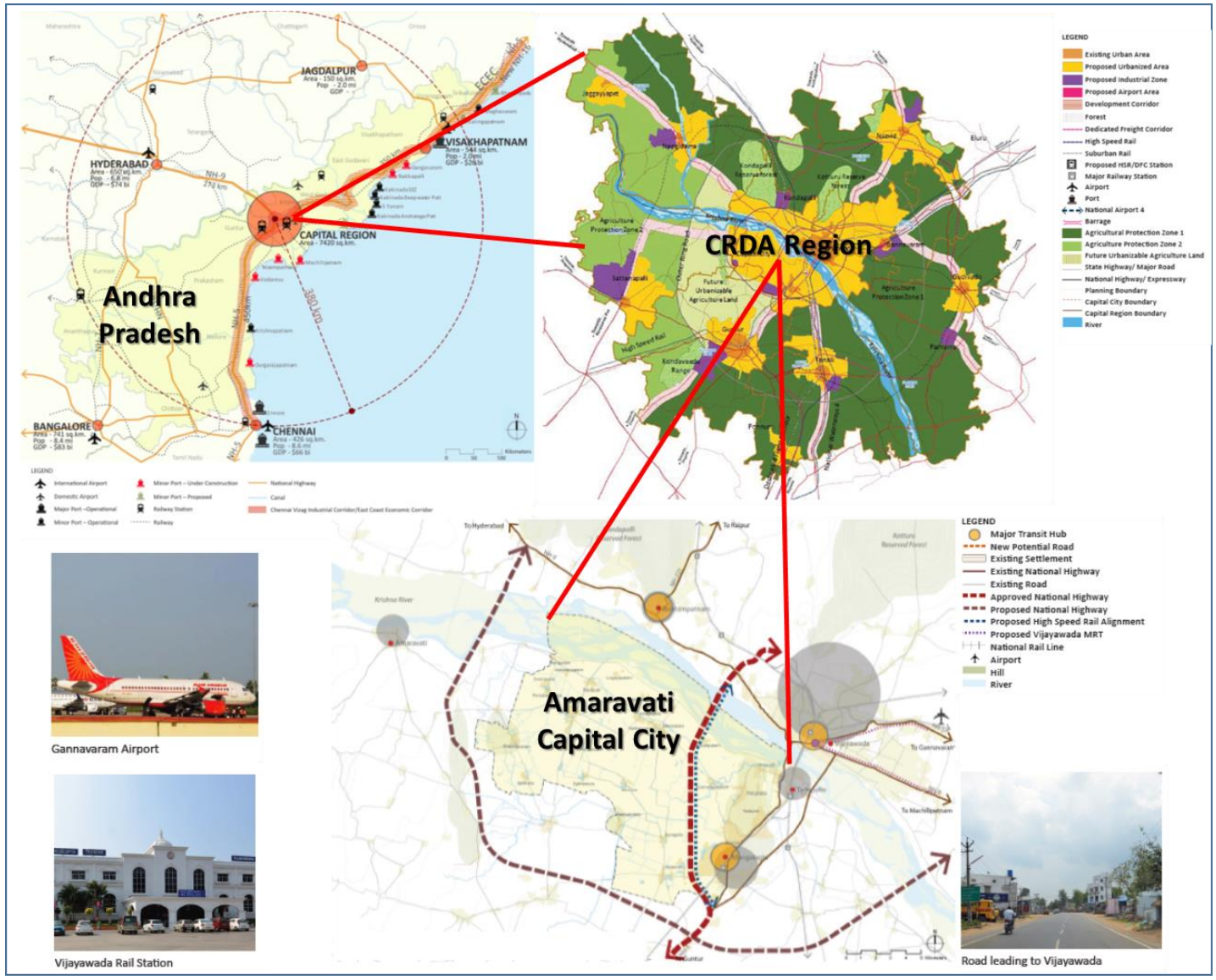


Figure 1-1: Centrally Located Capital Region and Capital City

1.3 Vision for the Capital City

The New Capital of Andhra Pradesh is envisioned to be the pioneer Smart City of India. It aims to be World Class and at par with the standards set forth by countries such as Singapore. The new capital will be an economic powerhouse that will create a range of jobs for existing resident villagers by upgrading their skills, as well as provide high-tech and knowledge based industry jobs to be globally competitive. Housing will be at the core of its planning and will aim to provide affordable and quality homes to all its residents. It will demonstrate global quality of life standards to offer high levels of convenience to people of all ages. The concept will capitalize on the rich heritage possessed by the region and utilize it to create a unique identity for the new capital. Sustainability and efficient management of resources will form another important pillar of this new capital.

The capital city aims to provide best in class infrastructure, with about 30% green spaces to all its citizens. Existing habitations are largely retained avoiding large scale displacement and associated social impacts which is considered as a vital accomplishment in the city development.

1.4 Amaravati City – Land use Plan

The existing land use of the site is consisting of - agriculture, land for grazing, fruit and flower plantations, village settlements and village ponds etc. The existing village settlements covers about 5.7% of the city.

The proposed land use plan of the Amaravati Capital City proposes the following development strategies within city area of 217 Sq. Km.

The city master plan takes into account only 40.53% of the total area of the Capital city for developing residential, commercial, and institutional and other built up spaces. Out of these spaces, as per Development Control Regulations only 30-4050% will be utilized for built up purpose. That implies a ground cover of about 12-1620-25% of the total capital city area only will be utilized for ground coverage. The land use plan of the proposed project is shown in Annexure-II.

1.5 Context of the Project

The capital city area is well drained by several canal systems of which Kondaveeti Vagu (KV) and Pala Vagu (PV) are the most significance. The KV originates in Kondaveeti hills near Pericherla village and the stream passes through Achampeta, Tadikonda, Amaravathi and Mangalagiri mandals and confluences into the Krishna River, upstream Prakasam Barrage. Other streams Pala Vagu, Ayanna Vagu and Kottela Vagu etc. join the KV at different points. The KV catchment location and its boundary are shown in Figure 1-2.

The catchment area of KV is about 421 sq.km approximately and extends beyond the capital city area. The approximate length of the main channel of KV is 31.15 Km and enters capital city at Neerukonda. The current bed widths of KV vary between 6m to 30m and bed slopes range from 1 in 1700 to 1 in 6500, from Lam village to Krishna River outfall. The catchment has steep slopes at the upstream location of Kondaveeti hills at Pericherla (origin, 20 Kms away from capital city boundary). The slopes fall quickly within the middle catchment area at Tadikonda and become very flat in the lower catchment area from Neerukonda.

Pala Vagu (PV), a tributary, joins KV at Krishnayapalem and there is considerable back water effect on this stream from KV during floods. The length of this stream is about 23.85 Km. Total length of in-falling tributary drains within KV catchment is 70 Km approximately and they are as follows with their approximate lengths.

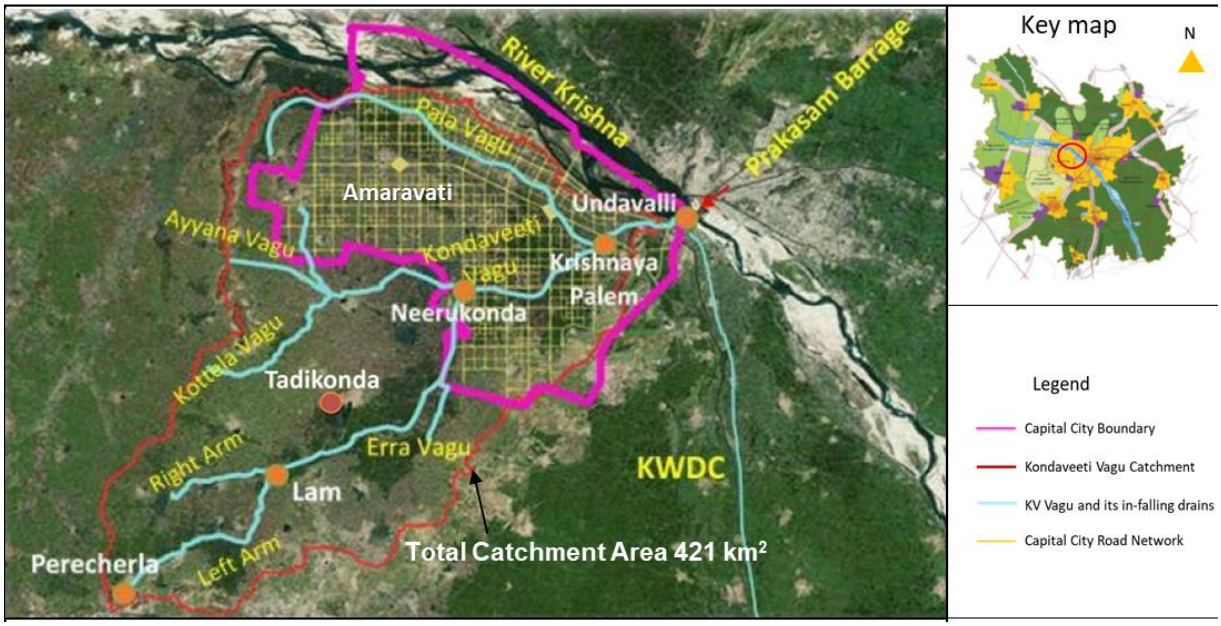


Figure 1-2 Kondaveeti Vagu Catchment Area and capital city area

1.5.1 Existing flood situation

The major streams of KV and PV flow across the Capital city area, currently cause floods in its surrounding region during the times of heavy rains and cause inundation in low lying areas in the city.

This is due to inadequate sizes of cross drainage structures, sharp bends of streams, meanders near Krishnayapalem and absence of bunds at few places along the alignment, which makes the vagus to burst its banks and cause inundation in adjacent areas/fields and overtopping of several causeways.

There is an outfall sluice on KV at Krishna River confluence. The sluice gates at Undavalli are normally in closed condition to prevent the back flow from Krishna River flooding. When River Krishna is in floods and to relieve the flooding situation within KV, there is an escape regulator to divert the part flood flow to Krishna Western Delta Canal (KWDC) with a design capacity 170 cumecs (6000 cusecs). The design capacity of KWDC is 232 cumecs (8200 cusecs). It is observed that even on Oct 5, 2009, when heaviest flood in over a hundred years hit the Prakasam barrage on Krishna River, the capital city area was not flooded thanks to the existing bund between Seethanagarm hill and Vykunthapuram hill on the right bank side of the river and the sluice arrangements.

1.5.2 Future flood situation based on hydraulic modelling

In the context of change of land use envisaged in the city, it is expected that development would increase the amount of impervious surfaces which would reduce natural infiltration and interception of rainfall resulting in increased runoff volumes and peak flow rates.

Based on the existing flood situation and to mitigate the future flood scenario due to the predicted change, a hydraulic model has been carried out. The model predicts flood discharge of 5650 cusec at Vykuntapuram, discharge of 12350 cusec at Undavalli and discharge of 4000 cusec through KWD canal in a 1/100 year return period flood. Based on the model, mitigation measures are defined such as widening, deepening and extending the canal/vagus in the city and construction of detention reservoirs to protect the city from 1/100 year return period flood.

1.6 Purposes and Benefits of the Project

1.6.1 Purposes of the Project

The purposes of the project are (i) to widen, deepen and extend the KV, PV and its in-falling drains to accommodate the excess runoff generated due to change in the land use from agriculture to urban and handle 1/100 year return period flood (ii) Building inherent safety systems in coherence with the flash floods by having detention reservoirs.

1.6.2 Benefits of the Project

The main benefits of the project are to reduce the extent of loss caused by seasonal flooding in the capital city area and protect low lying areas from inundation. Other benefits include promotion of inland water transport, water conservation through the proposed reservoirs, augmenting drinking water arrangements for the capital city.

1.7 Objectives & Scope of Environmental and Social Impact Assessment (EIA) Study:

The objective of this study is to develop an environmental management plan (EMP) for the identified flood mitigation works in the Amaravati Capital City. The study has been carried out duly following MoEF guidelines and World Bank guidelines. The scope of EIA takes into account the applicable regulatory compliance requirements of Capital City Environmental Clearance and the Judgement of National Green Tribunal.

To achieve this objective, the following specific tasks have been undertaken

1) To describe biophysical and social environment, including the existing status of the KV catchment and its in-falling drains;
2) To identify potential environmental and social issue/risks associated with the proposed interventions;
3) To develop a plan for mitigating environmental and social risks associated with construction and operation of the project activities in consultation with the relevant public and government agencies;
4) To identify feasible and cost-effective measures that may reduce potentially significant adverse environmental and social impacts to acceptable levels;
5) To develop a time-bound plan for mitigating environmental and social risks associated with the project;
6) To identify monitoring objectives and specify the type of monitoring with linkages to the impacts assessed and the mitigation measures described above;
7) To provide a specific description of institutional arrangement: the agencies responsible for carrying out the mitigation and monitoring activities;
8) To provide the expected capital and recurrent cost estimates and sources of funds for implementing the EMP as well as inform accordingly the design consultants so that these costs are duly taken into consideration in the Bill of Quantities (BoQs).

1.8 Approach and Methodology

The available secondary data from Irrigation Department, ADCL and APCRDA were collected by the Blue consultant during June-July, 2016 for the entire stretch of Krishna River from Vykuntapuram to Prakasam Barrage, the stretch of Pala Vagu and Kondaveeti Vagu and all the rivulets and canals in and around of the proposed capital city. Field work was undertaken in October 2016 in the project area. The site visit report of the Blue Consultant is placed at **Annexure XVI**.

The EIA study for flood mitigation works is based on the following available reports:

- EIA Study for Amaravati Capital city, 2015, which included master plan proposal for flood mitigation

- DPR for flood management works of Amravati Capital City, 2017

The step wise methodology is as follows:

Phase 1: Review of documents including EIA Study for Amaravati Capital city, 2015, DPR, Environmental Clearance (EC) to Greenfield Capital City Amaravati (October 2015), applicable laws and regulations, etc.

Phase 2: Conducted the reconnaissance survey for the entire stretch of Krishna river from Prakasam Barrage to Vykuntapuram (October 2016).

Phase 3: Analysis of Baseline data from field work conducted from March to May, 2015 in EIA-EMP of Amaravati Capital City (September 2015), Preliminary design documents of proposed sub-projects; Institutional interactions. The land use changes in 2017 were taken into consideration for the environmental assessment. The baseline environmental studies encompassed the disciplines/ environmental attributes of air, water, noise, soil, land-use, terrestrial and aquatic ecology and socio-economic components. The baseline studies in the project site and study area were conducted for air, noise, water, soil, ecology and social aspects during the summer season. The study shows that Air quality at all the locations (10) is within the NAAQ Standards.

Phase 4: Preparation of Draft Final EIA Report based on the design interventions suggested for flood mitigation works, selection of best suitable option, analysing impacts on the environment and preparation of environmental management plan, focus group discussions, public consultations with the key stakeholders, comments from APCRDA/ ADC and reference of relevant World Bank projects including the APCRDA Project.

Phase 5: Disclosure of the Draft EIA Report. Public Consultation is carried out for the Draft EIA Report.

Phase 6: Finalization of EIA Report considering inputs from stakeholder consultations. Disclosure of the Final EIA Report on APCRDA, ADC and World Bank websites, and in APCRDA offices.

The field data given in the Capital City EIA Report of 2015 has been used to gauge the baseline status of the area, identify impacts of the proposed project on natural resources/ community access and predict likely impacts due to the proposed activities, identify mitigation measures and monitoring requirements.

1.9 Structure of the Report

The entire EIA report comprises of eight (8) Chapters. The broad level chapter contents of the EIA Report are as follows:

Chapter 1.0 Introduction

This chapter provides background information of the project proposal, need for the project, scope, methodology and organization of the study.

Chapter 2.0 Policy, Legal and Administrative Framework

The various regulatory framework in terms of Acts, Laws, Policies and National and International treaties to which India is signatory applicable to the project and their respective implications are detailed in this chapter.

Chapter 3.0 Flood Hazard Modeling & Analysis of Mitigation Options
This chapter presents the background information of the present flood conditions in the city and future predictions using the hydraulic model, analysing different options for flood mitigation and selection of the best option for the same.

Chapter 4.0 Project Description
This chapter highlights on the selected option of flood mitigation, components of the flood mitigation, phasing of the mitigation works and risks involved in the mitigation works.

Chapter 5.0 Environment Baseline
The baseline environmental studies encompassed the disciplines/ environmental attributes of air, water, noise, soil, land-use, terrestrial and aquatic ecology and socio-economic components.

Chapter 6.0 Environmental Impacts and Mitigation Measures
Prediction of impacts using available information, assessment of impact of the proposed project activities and identification of areas of concern, which need to be mitigated.

Chapter 7.0 Public Consultation
Outlines the findings of the Stakeholder's view and perception through informal and formal public consultation meetings.

Chapter 8.0 Environmental Management Plan
Outlines of the mitigation measures, institutional arrangements and budgetary provision for implementation of the proposed environmental management plan to check the efficacy of the environmental mitigation measures proposed.

Chapter 9.0 Conclusion
The chapter contains the findings of the Environmental Impact Assessment (EIA) and recommendations for implementation to reduce any significant impact of the project on the environment.

CHAPTER 2: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A review of the existing institutions and legislations relevant to the environmental issues for the flood mitigation works is presented in this chapter. The regulations concerning procedures and requirements that may directly concern the waterways sub project, have been also addressed in this chapter.

World Bank is financing to implement the sub-project guided by the World Bank OP/ BP 4.01 Environment Assessment policy and 'The Environment (Protection) Act', 1986 Govt. of India. Environmental Assessment evaluates - 'project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA considers natural and social aspects in an integrated way.

The development of flood mitigation and urban waterways would be governed by various Acts, Rules and regulations enforced by Ministry of Environment, Forest and Climate Change (MoEF) at the Central level and other regulatory agencies at the State and local levels. Various environmental standards, specifications and guidelines of Central Pollution Control Board (CPCB) and state level agencies will also be applicable. The present chapter focuses on the rules and regulations pertaining to and applicable for the proposed project. A regulatory framework has been developed covering the applicability and, where possible, the project specific requirements of relevant legislation. An Environmental Management Plan (EMP) has been formulated to ensure compliance with these acts.

The Environmental Clearance (EC) for new capital city is already obtained and the present project of Flood management works is the part of overall capital city development.

ADCL has prepared project implementation unit for the components funded by the World Bank and the same is placed at Annexure XXVII.

2.1 Environmental Framework

The Article 48-A of the Constitution of India states that the every State shall endeavour to protect and improve the environment to safeguard the forest and wildlife of the country. At the same time, it shall be the fundamental duty of every citizen of India under Article 51-A (g) of the Constitution of India, to protect and improve the natural environment including forests, lakes, rivers and wild life.

Over the years, the Government of India has framed several policies and promulgated number of Acts, Rules and Notifications aimed at management and protection of the environment. As a result, our country now has a fairly complex body of environmental legislation aimed at ensuring that the development process meets the overall objective of promoting sustainability in the long run.

The present chapter focuses on the rules and regulations pertaining to and applicable for the proposed project. A regulatory framework has been developed covering the applicability and, where possible, the project specific requirements of relevant legislation. An Environmental Management Plan (EMP) has been formulated to ensure compliance with these acts.

2.1.1 Environmental policies

Several environmental policy statements have been formulated in the last few decades as a part of the Government's approach to integrate environmental and developmental aspects of planning. The policies reflect a gradual shift in emphasis from pollution abatement and control to proactive and voluntary approaches for pollution prevention in keeping with global paradigm shifts and trends in environment management.

Following are some of the key policies that have been laid down by the Central Government:

- National Forest Policy, 1988;
- National Conservation Strategy and Policy Statement on Environment and Development, 1992;
- Policy Statement on Abatement of Pollution, 1992.

Despite these policy documents a need for a comprehensive policy statement had been evident for some time in order to infuse a common approach to the various sectoral and cross-sectoral, approaches to environmental management. As a result, a National Environment Policy (NEP, 2006) has been drawn up as a response to our national commitment to a clean environment, mandated in the Constitution in Articles 48A and 51A (g), strengthened by judicial interpretation of Article 21. The National Environment Policy is intended to be a guide to action: in regulatory reform, programs and projects for environmental conservation; and review and enactment of legislation, by agencies of the Central, State, and Local Governments.

2.1.1.1 Legal Provisions for Environment for Proposed Development

The proposed project would be governed by various Acts, Rules and regulations enforced by Ministry of Environment, Forest and Climate Change (MoEF) at the Central level and other regulatory agencies at the State and local levels. Various environmental standards, specifications and guidelines of Central Pollution Control Board (CPCB) and state level agencies will also be applicable.

The various environmental regulations as applicable to the project are briefly described in the following sections below:

2.1.2 Clearance Required

Environmental Impact Assessment Notification, 2006

The project for Flood Control measure doesn't require prior Environmental Clearance, however, the entire Capital City has taken EC in year 2015.

Forest (Conservation) Rules, 2003

As per this rule, every user agency, who wants to use any forest land for non-forest purposes, shall make his proposal in the appropriate form to the concerned nodal officer authorized on this behalf by the State Government, along with requisite information and documents, complete in all respects, well in advance of taking up any non-forest activity on the forest land.

Implication: The entire area of Capital city is in possession of Govt. of Andhra Pradesh and there is no forest land involved for flood mitigation work. This rule is not applicable for the present development.

2.1.2.1 Compliance to the Environmental Clearance (EC) Conditions and NGT:

The EC compliance for the Amaravati Capital city is given at **Annexure XVIII.** Additional conditions given by National Green Tribunal (NGT) is also complied and detail is given at **Annexure XIX.**

2.1.3 Environmental Acts

2.1.3.1 The Environment (Protection) Act, 1986

The Government of India (GOI) has framed an 'Umbrella Act' called the Environment (Protection) Act, 1986 which is designed to provide a framework for the coordination of central and state authorities established under Water and Air Act. The Environment (Protection) Act, 1986 is established by the GOI to fulfil its commitment to protect and improve the human environment. It is applicable to the entire country. From time to time the central government has issued notifications under the EPA, Act 1986 for the protection of ecologically-sensitive areas or issues guidelines for matters under the EPA.

It empowers the Central Government to take necessary measures for the purpose of protecting and improving environmental quality and preventing, controlling and abating environmental pollution. Important powers of the Central Government include laying down standards for environmental quality and emission/ discharge of environmental pollution from various sources. These powers define procedures and establish safeguards for handling of hazardous substances, and establish rules to regulate environmental pollution.

Separate Noise regulations for DG sets of various capacities were introduced in 2002 vide notification of MoEF of 17th May 2002 under the Environmental (Protection) Second Amendment Rules 2002. This requires that all DG sets should be provided with exhaust muffler with insertion loss of minimum 25 dB (A). All DG sets manufactured on or after 1 July 2003 shall comply with these regulations.

Implication: All the applicable rules and regulations will be followed for the Flood control project. The project may require adherence to the DG Set rules during construction phase of the project. For all the activities to be undertaken for the project; the maximum allowable limits of concentration of various environmental pollutants will be followed as per the standards of quality of air, water, or soil for various areas and purposes.

2.1.3.2 The Water (Prevention & Control of Pollution) Act, 1974 (Water Act)

The purpose of this act is to prevent and control water pollution and to maintain or restore the quality of water. In order to achieve its goals this act empowers the CPCB and SPCB and defines their functions.

This Act requires any new development, industries, local bodies and agencies engaged in any trade to obtain consent from the SPCB for discharge of effluent into water bodies. The SPCBs have the authority to enforce this Act, if any projects discharge effluent in water bodies, land or sea.

The Environment (Protection) Rules under the EPA also lay down specific standards for quality of water effluents to be discharged into different type of water bodies (sewers, surface water bodies like lakes and rivers, marine discharge).

Implication: The project has elaborate planning and design to maintain the water quality in all the Vagus through periodical clearing of water in the canals for every three days and intake of fresh water from River Krishna. A constant flow would be maintained in lean season in the Vagus and streams to avoid any odour due to water stagnation.

2.1.3.3 The Air (Prevention and Control of Pollution) Act, 1981

The purpose of this act is to prevent, and control air pollution including noise pollution and preserve air quality. In order to achieve its goals, this act empowers the CPCB and SPCB and defines their functions. An important function of the CPCB is to establish Environmental standards.

This Act requires industries, local bodies and agencies engaged in any trade to obtain consent from the SPCB prior to releasing emissions into air. The SPCBs have the authority to enforce this Act.

Implication: For any activities such as Ready Mix plant or machinery etc. falling under categories as per Andhra Pradesh (AP) Pollution Control Board (APPCB), Consent to Establish (CTE) will be obtained before starting the construction and Consent to Operate (CTO) before commissioning the project.

2.1.3.4 Solid Wastes Management Rules, 2016

Ministry of Environment, Forest and Climate Change under the provisions of the Environmental Protection Act, 1986 issued the Solid Waste Management (SWM) Rule, 2016 on 8th April 2016 for management of Municipal Solid Waste. Some of the key functions to ensure adherence include:

- Provide infrastructure and services for collection, storage, segregation, transportation, treatment and disposal of MSW
- Obtain authorization/ technical clearance from the state pollution control board to set up waste processing and disposal facilities
- Criteria are for setting up processing and treatment facility & actions for hilly areas and waste to energy process.
- Publish annual reports of compliance to conditions laid down in the SWM Rules, 2016.
- Reporting of any accidents at the site during managing of MSW as per Form VI in SWM Rules 2016.
- The implication of SWM Rules 2016 is for waste generated from Labour camps during construction phase. During operation phase of the project, the waste from Vagus and Rivulets needs to be treated and disposed of as per the provisions of these rules.

2.1.3.5 Hazardous Wastes and Management Rules, 2016

These Rules were notified on 8th April 2016, under the Environment Protection Act, 1986. They aim at controlling the generation, collection, treatment, transportation, and disposal of hazardous wastes. Hazardous waste generated during construction & operation phase are covered under the ambit of this act. The project proponents are required to obtain prior authorization from the SPCB for handling, treatment, storage and disposal of Hazardous Wastes.

2.1.3.6 Construction and Demolition (C&D) Waste Rules 2016

C&D waste means 'the waste comprising of building materials, debris and rubble resulting from construction, re-modelling, repair and demolition of any civil structure. The rules apply to every waste resulting from construction, re-modelling, repair and demolition of any civil structure of individual or organisation or authority who generates construction and demolition waste such as building materials, debris, rubble. Every C&D waste generator shall:

→ ensure C&D waste not get mixed with solid waste (MSW)
→ prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated
→ shall pay for collection, transportation, processing and disposal
→ Submit waste management plan to local authorities.

Implication: This rule is very much applicable to the present project. The C&D waste generated during the project to be used for filling of low lying areas within the project boundary and any extra material to be disposed of at designated place as per requirement of C&D Waste Rules 2016.

2.1.3.7 Ancient Monuments and Archaeological Sites and Remains Act 1958 and Ancient Monuments and Archaeological Sites and Remains Rules, 1959

This Act provides for the preservation of ancient and historical monuments and archaeological sites and remains of national importance and for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects. According to this Act, areas within

the radii of 100m and 300m from the "protected property" are designated as "protected areas" and "controlled areas" respectively. No development activity (including building, mining, excavating, blasting) is permitted in the "protected areas". Development activities likely to damage the protected property are not permitted in the "controlled areas" without prior permission from the Archaeological Survey of India (ASI) if the site/remains/ monuments are protected by ASI or the State Directorate of Archaeology.

Implication: Undavalli caves are one of the important archaeological and heritage sites within the Capital region. In the capital region development plan, this monument is going to be conserved in its original way and integrated with the overall development plan. It is planned that no activities/ construction to be carried out in the 300m radii of the caves under Flood mitigation projects.

2.1.4 Andhra Pradesh Water, Land and Trees Act – 2002 (APWALTA – 2002)

This act came into force on 19 April 2002 by State government with following Objectives:

- To promote water conservation and Tree cover.
- For protection and Conservation of water sources ,land and matters connected there with
- To regulate the exploitation and use of ground and surface water.

Implication: This Act has comprehensively covered the requirement of ground water uses and recharge such as Rainwater Harvesting (RWH) etc. Tree cutting and compensatory tree plantation is also given.

All the tree cutting permission for the project needs to be taken under WALTA Act 2002. The APWALTA -2002 is attached at **Annexure – XXVIII.**

2.2 National Institutional Framework

India's environmental regulatory framework is based on a system of shared central government/ state pollution control administration. Since the passage of the Environment Act of 1986, the enforcement and oversight role of the central government, and particularly of Ministry of Environment, Forest and Climate Change, has been strengthened considerably. At the national level, the Central Pollution Control Board administers air and water regulatory efforts. This board is responsible for coordination of activities and guidance in formulation of standard for its state counterparts. The State Pollution Control Boards are responsible for enforcing the regulations. The states may adopt standards that are more restrictive than those of the CPCB, but they may not relax them.

2.2.1 Ministry of Environment, Forest and Climate Change

Ministry of Environment, Forest and Climate Change (MoEF) plays a pivotal role in environmental management for sustained development and for all environmental matters in the country. The major responsibilities of MoEF include:

- Environmental resource conservation and protection, including environmental impact assessment of developmental projects.
- Co-ordination with the other ministries and agencies, voluntary organizations and professional bodies on environmental action plans.
- Policy-planning.
- Promotion of research and development, manpower planning and training and creation of environmental awareness.
- Liaison and coordination with international agencies involved in environmental matters.

Project proponents who are planning to undertake developmental activities have been mandated by MoEF to submit Environmental Impact Statements to establish that they have planned to

install adequate pollution monitoring equipment in order to comply with the relevant statutes and regulations as applicable to their scope of activities.

2.2.2 Central & State Pollution Control Boards

The Central Pollution Control Board is directly responsible for pollution control throughout the boundaries of the country. In addition to the control of air, noise and water pollution it is also responsible for ensuring effective control on disposal of hazardous wastes and storage and handling of hazardous chemicals and substances.

Additionally, with the enactment of air and water pollution laws, states have set-up their own Pollution Control Boards (SPCBs) to monitor industrial emissions and effluents and to approve the operation of new industries after careful scrutiny. The functions of the SPCBs include:

- The planning of comprehensive state programs for the prevention and control of air and water pollution and to ensure the implementation thereof;
- Inspection of control equipment, industrial plants, etc.;
- Establishing norms in consultation with the APPCB with respect to National Ambient Air Quality Standards, gaseous emission standards from industrial plants, automobiles, etc. Different emission standards may be laid down for different industrial plants, with respect to the quantity and composition of emissions into the atmosphere from such plants and the general pollution levels in the area;
- Advising the State Government on siting of new polluting industry.

2.2.3 National Green Tribunal

The National Green Tribunal has been established under the National Green Tribunal Act 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The Tribunal shall be guided by principles of natural justice. The Tribunal's dedicated jurisdiction in environmental matters shall provide speedy environmental justice.

The Tribunal shall consist of full time Chairperson, 10 – 20 full time judicial members, 10-20 full time expert members. The Tribunal may invite any one or more persons having specialized knowledge and experience in a particular case before the Tribunal to assist the Tribunal. Presently the Tribunal is operating out of the Principal Bench in Delhi, four zonal benches and four circuit benches. The Tribunal while passing any order or decision or Award applies the principles of sustainable development, the precautionary principle and the polluter-pays principle. The Award, decision or order of the Tribunal may be contested before the Hon'ble Supreme Court. The Award or order or Decision of the Tribunal shall be executable by the Tribunal as a decree of a civil court and for this purpose, the Tribunal shall have all the powers of a Civil Court.

Implication: NGT in its order Dt. 17-11-2017 has stipulated certain conditions / directions pertaining to streams, water bodies, storm water drains, etc. These directions are suitably incorporated in the preparation of the plans, designs and mitigation measures.

Applicable clearances at project implementation stage has been exhibited in the Table 2-1.

Table 2-1: Applicable Clearances at project Implementation Stage

Sr. No.	Clearances	Applicability	Regulatory/ coordinating authority	Indicative Time Frame	Responsibility		Remarks
					Implementation	Supervision	
1	Consent to Establish and Consent to Operate under Air, Water & Environment Act and noise rules.	For establishment of batching plant, hot mix plant, WMM plant, Crusher etc.	Andhra Pradesh State Pollution Control Board (APPCB)	Construction stage (Prior to initiation of any work.	The Contractor	ADC/ APCRDA	Provide a copy of all necessary clearances to the ADC/ APCRDA ❖ Adhere to all clearance terms and conditions ❖ Obtain written permission from private landholders to use their land for construction activities, prior to commencing any works.
2	Explosive License	For storing fuel oil, lubricants, diesel etc. at the project site	Chief Controller of Explosives/ as applicable		The Contractor	ADC/ APCRDA	
3	Permission for storage of hazardous chemical	Manufacture storage and Import of Hazardous Chemical	Andhra Pradesh State Pollution Control Board (APPCB)		The Contractor	ADC/ APCRDA	
4	Quarry Lease Deed and Quarry License	Quarry operation (for new quarry)	State Department of Mines and Geology		The Contractor	ADC/ APCRDA	
5	Permission/ NOC from State Ground Water department.	For extraction of ground water	State Ground Water department		The Contractor	ADC/ APCRDA	
6	Permission/ NOC for Withdrawal of Surface Water from Rivers, Nala, Water harvesting structure/ Reservoirs/ Ponds/ Irrigation canals	For Withdrawal of Surface water	State Irrigation Department. (The concept for flood mitigation is approved by Irrigation dept.)		The Contractor	ADC/ APCRDA	

Sr. No.	Clearances	Applicability	Regulatory/ coordinating authority	Indicative Time Frame	Responsibility		Remarks
					Implementation	Supervision	
7	Labor license from labor commissioner office	Engagement of Labor	Office of the labor Commissioner		The Contractor	ADC/ APCRDA	
8	Permission under Ancient Monuments & Archeological Sites and Remains Act (1958 & 1959)	Applicable for carrying out construction within 300m of the ancient monuments, Ancient Monuments & Archeological Sites and Remains notified by ASI.	Director General, ASI		The Contractor	ADC/ APCRDA	
9	Tree felling Permission	Applicable, if any tree needs to be felled.	District Administration/ Forest Department	Construction stage (Prior to initiation of any work	The Contractor	ADC/ APCRDA	The tree felling requirement would be in stages of the project. Permission would be sought for tree felling under WALTA Act 2002 at later stage of the project.
10	Environmental Clearance for Borrow Areas	Applicable for Borrow Area	District Level Environmental Impact Assessment Authority (DEIAA)	Prior to operation of borrow area	The Contractor	ADC/ APCRDA	Clearance from the APCRDA/Mines Department

Sr. No.	Clearances	Applicability	Regulatory/ coordinating authority	Indicative Time Frame	Responsibility		Remarks
					Implementation	Supervision	
11	Provision for collection and disposal of Construction & Demolition (C&D) Waste as per C&D Waste Management Rules, 2016	Work Site	State Pollution Control Board		The Contractor	ADC/ APCRDA	Clearance to be taken from SPCB for collection and disposal of C&D waste at authorized site as identified in consultation with local municipal body.
12	Provision for collection and disposal of Solid wastes	Works site/ Camp Site	Municipal Corporation		The Contractor	ADC/ APCRDA	This to be arranged through local municipal body for treatment and disposal.
13	Provision of Building & other construction workers (Regulation of Employment and condition of service) Act 1996	Applicable for health and safety issues of labours	State Labour Department		The Contractor	ADC/ APCRDA	Authorization has to be taken from State Labor Dept.
14	Certificate of Pollution Under Control (PUC) for Vehicles	Applicable for vehicle engaged in construction activities	State Transport Authority	Construction Phase	The Contractor	ADC/ APCRDA	

The various environmental requirements of World Bank, GOI for the project are described below.

2.3 Applicability of various WB Safe Guard Policies

The World Bank has ten safeguard policies; the details and applicability of the safe guard policies to the project (Phase I) are provided in the Table 2-2.

Environmental requirements of the World Bank are specified in detail in its Operational Policy (OP) 4.01 and other related Operation Policies. In instances in which the procedural and regulatory requirements differ, the more stringent applies. The World Bank environmental requirements are based on a three-part classification system.

- Category A- projects require a full Environmental Assessment (EA).
- Category B-projects require a lesser level of environmental investigation.
- Category C-projects require no environmental analysis.

The Amravati Sustainable Capital City Development Project (ASCCDP), supported by the World Bank, involves green-field development of selected urban infrastructure (roads, flood mitigation) and is categorized as Category A. Considering the fact that some of the sub-projects under the ASCCDP are to be designed during the course of its implementation, an Environmental and Social Management Framework (ESMF) was developed.

As specified in the ESMF, the flood mitigation sub-project requires an EIA to be undertaken and an EMP to be developed and implemented. The EIA and EMP will go through an independent technical review by third party agency engaged by ADC.

Table 2-2: Applicability of World Bank Safe Guard Policies

Safeguard Policies Triggered by the Project	Yes	No	Remarks on applicability
Environmental Assessment OP/ BP 4.01	×		As required by this policy, and as specified in the ESMF of the Amaravati Sustainable Capital City Development Project, an EIA has been undertaken for the flood mitigation works and an EMP has been developed.
Natural Habitats OP/ BP 4.04		×	This policy states that the Bank does not support projects that involve the significant conversion or degradation of critical natural habitats (such as protected areas). Proposed flood mitigation works doesn't encompass any natural habitats/endangered flora and fauna species. Hence, there is no impact envisaged to any natural habitats or critical natural habitats such as protective areas from the proposed flood mitigation works. Thereby, the OP4.04 doesn't apply.
Forests OP/ BP 4.36		×	This policy requires that the Bank does not support projects that involve the significant conversion or degradation of critical forest areas. This policy is not applicable as the flood mitigation works do not involve any critical forest areas.
Pest Management OP 4.09		×	This policy is not applicable as there is no pest management activity involved
Physical Cultural Resources OP/ BP 4.11	×		This policy addresses physical cultural resources, which are objects, sites, structures, etc., that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Three cultural/religious structures including, one temple in Mandadam, one burial ground in Sakhamuru and one burial ground in Mandadam will be affected – these are covered as part of RAP with necessary consultations. In addition, at one point, the flood mitigation works are near the Undavalli Cave Temple at a distance of 300 meters at the closest point, which is listed as a

Safeguard Policies Triggered by the Project	Yes	No	Remarks on applicability
			'protected monument' by the Archaeological Survey of India. This site is outside the prohibited and regulated area as per the Handbook of Conservation of Heritage Buildings published by CPWD. The capital region master plan has integrated this monument in its overall plan for capital region development. The monument is identified to be considered in its original entity with specific plans in place. Although there is no impact on PCRs, the applicability of OP 4.11 is considered to facilitate effective management in the event of chance finds during project works. Also, this would help inclusion of relevant construction stage management measures including systematic monitoring to be deployed to rule out any impacts. No physical cultural resources management plan is prepared in addition to these requirements.
Safety of Dams OP/ BP 4.37		×	There are three dams upstream of Prakasam Barrage, which is located near Amaravati City on Krishna River in Andhra Pradesh. These include Srisailam Dam – 215 TMC, Nagarjuna Sagar Dam – 408 TMC, and Pulichintala Dam – 45 TMC. These are located at a distance of about 294 Km, 200 km and 85 Km respectively from Prakasam Barrage. The unlikely event of failure of these dams will not pose serious risk to the project supported infrastructure as the downstream dams have adequate storage and discharge capacities. Further, dam safety mechanisms are in place which render the event of dam failure unlikely. Details are provided in the accompanying footnote[1]. Considering the above, 0P4.37 is not applied.

[1] There are three dams upstream of Prakasam Barrage which is near Amaravati City on Krishna River in Andhra Pradesh. These include Srisailam Dam – 215 TMC, Nagarjuna Sagar Dam – 408 TMC, and Pulichintala Dam – 45 TMC. These are located at a distance of about 294 Km, 200 km and 85 Km respectively from Prakasam Barrage.

In the event of failure of Srisailam Dam, the flows can be withheld at Nagarjuna Sagar Dam. Also, there are regular safety review protocols followed by the Water Resources Department, GoAP and hence the failure is a remote possibility.

In case of Nagarjuna Sagar, Government of Andhra Pradesh has constituted a Dam Safety Review Panel under World Bank financed Andhra Pradesh Water Sector Improvement Project (APWSIP). The panel periodically undertakes comprehensive review of the dam safety and recommends implementation measures. Details of the Committee are placed at Annexure XXXI.

In the unlikely event of failure of the Pulichintala Dam, the 45 TMC water translates to discharge of about 0.5 million cusecs which would not have any impact on Amaravati City as the Prakasam Barrage can handle discharges upto 1.2million cusecs (about 109 TMC per day).

In a 100-year peak rainfall of 222mm in Amaravati City, the total water to be discharged from Amaravati into River Krishna is 0.016 Million Cusecs, this discharge is just 1.5% of Prakasham Barrage daily discharge.

Even in the simultaneous event of failure of Pulichintala Dam (0.52 Million Cusecs) and 100-year flood rain fall in Amaravati, the total water that need to be discharged is 0.54 Million Cusecs (0.52+0.016), which is app. 49% of Prakasham Barrage daily discharge.

Schematic Map with capacities of the Srisailam, Nagarjuna Sagar, Pulichintala, Proposed Vykuntapuram and Prakasham Barrage with respect to Amaravati City has been presented in the Annexure XXXII

From the above analysis, it is evident that failure of dams would not result in any inundation in the Amaravati City.

It is also important to mention here that GoAP is planning to construct a new barrage near Vykuntapuram (upstream of Amaravati City) which is approximately 23 kms from Prakasham Barrage. The proposed Barrage will have a capacity of 13 TMC, which will play a vital role in protecting Amaravati City in case of above-mentioned Dam failure events.

Further, in the event of failure of dams in the upstream of the city, flood mitigation provisions proposed under Amaravati City Development, facilitate cutting off the City from the River Krishna. Hence, there is no chance of damage to canals/reservoirs in the City.

CHAPTER 3: FLOOD HAZARD MODELLING & ANALYSIS OF MITIGATION OPTIONS

In efforts to build a world-class capital city, GoAP have considered all the measures pertaining to city resilience. Blue Consultant was entrusted the task of assessing the flood magnitude that needs to be considered for capital city and to suggest remedial measures to mitigate the flood in a safe manner. A map showing the catchment boundary of Kondaveeti Vagu and extent of the proposed capital city area is shown in Figure 1-2.

3.1 Description of the Current Flood Situation

The major streams of KV and PV flow across the Capital city area, currently cause floods in its surrounding region during the times of heavy rains and submerge low lying areas in the city for brief periods. This is due to inadequate size of cross drainage structures, sharp bends of streams, meanders near Krishnayapalem and absence of bunds at few places. The result of the same makes the vagus to burst its banks to flood adjacent areas/fields and overtopping of several causeways to result in the hindrance to traffic and also loss of life due to wash away during the floods.

Existing Flood scenarios in capital city with different flooding conditions are briefed here.

(a) **KV Vagu flood:** Kondaveeti Vagu is a minor stream joining River Krishna, just upstream of Prakasam Barrage. It originates from Kondaveeti hill ranges near Pericherla village in Guntur district and drains a total catchment of about 421 km^2. Kondaveeti Vagu has a steep gradient for a short length, i.e., in its upper reaches and is mostly flat for rest of the catchment. Other minor streams like Pala Vagu, Erra Vagu, Kottela Vagu, etc. join the Kondaveeti Vagu It joins River Krishna through Undavalli sluice outlet.

The flood discharge of Kondaveeti Vagu is entirely dependent on the magnitude of rainfall occurring over the catchment area. Hence, a review of observed rainfall data in the catchment vis-a-visa peak annual flood discharge of Krishna River recorded at Prakasam Barrage, Vijayawada is made considering the recent 25 years period (i.e., 1990-91 to 2014-15).

The rainfall data at Thullur and Tadikonda rain gauge stations which represent significantly the catchment and are located within the catchment of Kondaveeti Vagu is considered for the above stated purpose.

(b) **River Krishna flood:** The Krishna is the second largest Eastward draining River in Peninsular India covering vast area in the States of Maharashtra, Karnataka and Andhra Pradesh. The basin drains an area of 2,58,948 km2. This is nearly 8 % of the total geographical area of India. Based on review of historical flood records of Krishna River at Prakasam Barrage at Vijayawada for the recent 25 years period, a maximum flood discharge of 31,447 m3/s (which corresponds to 100 year peak flood of Krishna River) was observed on 05th October 2009. The corresponding rainfall recorded at Thullur and Tadikonda rain gauge stations on the above date is nil (i.e., 0 mm).

(c) **Simultaneous occurrence of both (a) and (b)**: It is observed from the rainfall data, the rainfall in Kondaveeti Vagu catchment is either nil or marginal when there is peak flood in Krishna river for all years, except for 2005-06. During 2005-06, the peak flood observed in Krishna river is about 20,545 m^3/s (which is about 65% of 100 year flood of Krishna river) and the corresponding average rainfall in Kondaveeti Vagu catchment is about 162 mm (which is less than the 100 year rainfall of 222 mm considered in the design).

From the above, it can be concluded that simultaneous occurrence of peak floods in Krishna River and Kondaveeti Vagu catchment (capital city) has a low probability. Since, flood management of

capital city is regulated with pumping stations; its relevance is only in design of pumping stations. The pumping station will be designed to cater to the above condition. The points briefed in (a), (b) and (c) are discussed in details in DPR- Flood Management.

Future contribution of capital city storm water and wastewater drains to flood is described below.

One of the main constraints encountered in designing the flood management system was the storm water drains in the capital city, which was designed to cater 1 in 5 years storm. Several discussions took place with the Infrastructure Consultant responsible for the design of the same. As per the results of the High Flood levels (HFLs) obtained from the model studies were reduced from RL 17.0m to RL 15.0m[2], especially in the lower reaches at Undavalli. This also resulted in the constraint of having the pumping at Undavalli necessary not only during floods but also at times where the water level in Kondaveeti and Pala Vagu and their in-falling drains need to be brought down to RL 15.0m to facilitate the discharge of storm water from the city surroundings to the canals by gravity. Identification of low-lying areas in the capital city, proposed land-use in the low-lying areas, implications for flood and its management.

The Land used Map is placed at Annexure II. The low laying areas in the Capital City can be identified from the Inundation Map also shown in the Figure 3-5.

3.1.1 Details on Current Floods:

A) During monsoon season, some area of land remains submerged by the flood discharges of Kondaveeti Vagu every year. Currently, the flood discharges of Kondaveeti Vagu cannot be drained directly into River Krishna due to high flood level of Krishna River. To prevent backflow of Krishna River during high floods, Kondaveeti Vagu floods are regulated through an outlet structure located near Undavalli. In order to minimize the inundation, flood discharges of Kondaveeti Vagu are diverted to Krishna Western Delta (KWD) canal through an escape regulator. The hydraulic design capacities of KWD escape regulator and KWD canal are 170 m^3/s (6000 Cusecs) and 232 m^3/s (8200 Cusecs) respectively.

B) During non-monsoon season, the gates of Undavalli sluice outlet are opened to enable drawl of water from Prakasam Barrage to the Guntur canal in order to meet irrigation and drinking water requirements of surrounding areas. This causes inundation within Kondaveeti Vagu catchment as the ground levels in the eastern side of the catchment are lower than the Full Reservoir Level (FRL = RL 17.39 m) of Prakasam Barrage.

Natural discharge from regional water systems as the Kondaveeti Vagu is hindered by the existing bund and its regulating works as well as the regime of the Prakasam Barrage.

Effect of 2009 Flood:

During October 2009, heavy floods exceeding the record of once in 100 years were witnessed in the Krishna River Basin, temporally isolating 350 villages and causing millions homeless (not in the Capital City area). This was an unprecedented event which resulted in heavy damage across the states including the then Andhra Pradesh State. Kurnool, Mahbubnagar, Guntur, Krishna and Nalgonda Districts in Andhra Pradesh were among the effected districts in the state. The Kurnool

[2] Integrating the existing villages has been identified as one of vital components of the Capital City Development's vision. To protect the existing settlements which are constraint for the infrastructure development in Capital City, Amaravati storm water modelling and flood modelling has been undertaken. Model has resulted the RL as 15 at Undavalli in order to discharge the storm water through gravity from these villages as well as other parts of the Capital City.

city was submerged with 3-4 m deep water for nearly 3 days as reported in the National Rainfed Area Authority, Planning Commission in its 2011 report[3].

The details on flood occurred in Oct 5th, 2009 and its severity, reported loss of life, property etc. was widely published in newspapers. The team had discussions with the officials of WRD department, GoAP to confirm on the damage occurred during this event. The details as per the discussions are described below. It was found that the heaviest flood in over a hundred years hit the Prakasam barrage on Krishna River threatening several villages downstream.

It was also mentioned that due to this event a record of 11.03 lakh cusecs of floodwater reached Prakasam barrage. However, there was no threat to human lives as 2.5 lakh people of Krishna and Guntur districts have already been shifted to relief camps.

With nearly 11 lakh cusecs of water in the swollen Krishna cascading from the Prakasam barrage, there was a concern on the ability of the flood banks to withstand the fierce pounding by the swirling river. This is the heaviest flood in more than 106 years as the previous record was 10.30 lakh cusecs in 1903, irrigation authorities said.

The water level touched 21.9 feet as all the 72 sluice gates were lifted to let out the excess waters.

3.2 Kondaveeti Vagu Catchment - Future Scenario

Under current conditions flooding occurs during the monsoon. Change of land use from agriculture to urban environment (due to development of capital city) increases peak runoff resulting in a faster discharge of pluvial water and subsequent higher water levels downstream. As a result the normative condition, i.e. the conditions determining the maximum flood levels, is determined by the future situation in which the city is fully developed. This also implies that the water system has to be defined according to this fully developed situation. The future flooding scenario has been built based on rainfall analysis.

3.3 Rainfall Analysis

The modelling of the Kondaveeti Vagu (KV) catchment is a necessity in the process of flood management works. With the hydraulic model, water levels in the Kondaveeti Vagu catchment can be predicted in different design scenarios. For the model design, conditions are defined as a once in a hundred years precipitation event.

3.3.1 Rainfall Data

Observed daily rainfall data of Thullur and Tadikonda rain gauge stations, which are located within the boundary of Kondaveeti Vagu catchment area have been considered in the study to establish 100 year return period peak rainfall event. Further, hourly rainfall data at Gannavaram rain gauge station has been considered to disaggregate daily rainfall data into hourly rainfall data. A map showing the location of above three rain gauge stations along with catchment boundary of Kondaveeti Vagu is given in Figure 3-1.

[3] http://nraa.gov.in/pdf/krbasin_2009.pdf

Figure 3-1 Location of Rain Gauge Stations

The rainfall observations at Thullur and Tadikonda stations are being carried out by Government of Andhra Pradesh (GoAP) through non-recording and automatic rain gauge stations. Typical photograph showing the type of rain gauge stations used for rainfall measurements at Thullur station is shown in Figure 3-2.

Figure 3-2 Rain Gauge Station at Thullur

Daily rainfall data at Thullur and Tadikonda rain gauge stations for the recent 26 years period during 1989-2014 was collected and the same has been considered for further studies. The average annual rainfall observed at the above stations in 26 years period is found to be about 990 mm and 945 mm respectively. Table 3-1 below exhibits the recorded average annual rainfall in these two stations.

Table 3-1: Recorded Rainfall Details

Station	Avg. Annual Rainfall (mm)	Maximum Daily Rainfall (mm)
Thullur	990	183
Tadikonda	945	140

The observations at Gannavaram rain gauge station are made by Indian Meteorological Department (IMD), Government of India by means of automatic recording type rain-gauge station. Hourly rainfall data at Gannavaram rain gauge station for a period of 29 years (1969-70 to 1997-98) was collected and the same has been considered to disaggregate daily rainfall data into hourly rainfall data for estimation of flood. The average annual rainfall at Gannavaram station for the above period has been found to be about 900 mm.

As per Table 3-1, the variation in average annual rainfall between the three stations is marginal (i.e., about 5-10%). From Figure 3-1 and 3-2, it is seen that Thullur and Tadikonda rain gauge stations are located within the catchment boundary and Gannavaram rain gauge station is located outside the catchment boundary. As per IS 4987:1994 *(Recommendations for Establishing Network of Rain Gauge Stations)*, one rain gauge upto 500 km^2 shall be sufficient in plains. Hence, rainfall data at Thullur and Tadikonda rain gauge stations are considered to adequately represent the rainfall variation within the catchment and therefore, considered for further studies.

3.3.2 Estimation of 100-Year Peak Rainfall

General Extreme Value (Gumbel's) distribution has been found to be the best-fit distribution for the rainfall data. Rainfall frequency analysis has been carried out considering maximum 1-day rainfall for the 26 years period using Gumbel's distribution. Based on the existing 25-year rainfall data, the KV catchment, the highest recorded rainfall at Tadikonda is 140mm and at Thullur is 183 mm (average is about 162 mm). A check has been made to verify the estimated 100 year rainfall event established from data at Thullur and Tadikonda stations with that of the value estimated from observed rainfall data at Gannavaram station. Based on studies carried out, it is found that 100 year peak rainfall estimated using Gannavaram data is almost same as that obtained from Tadikonda and Thullur stations.

The same has been reviewed and recommended by Technical Expert Committee constituted by the Government of Andhra Pradesh consisting Chief Engineers and experts in the sector. Further the same has been discussed with World Bank technical team and WRD, GoAP.

Accordingly, the 100-year peak rainfall of 222 mm in 24 hours has been considered for further studies.

3.3.3 Validation of Available Rainfall Data

Available rainfall data from the rain gauge stations in the Kondaveeti Vagu catchment is further validated for its authenticity by making a comparison of the same with the available meteorological data from the Indian Meteorological Department (IMD). On a review of the data it is observed that the daily rainfall intensity lies between 260 and 280 mm for the area under consideration. However, isopluvial maps cover considerably large area than the Capital City. Given this, the 100 year peak rainfall in the capital, referred above has been considered.

3.3.4 Conclusions on Rainfall data

Based on the existing rainfall data in the Kondaveeti Vagu catchment and the important effective rain gauge data among them and comparison of the factor to be used for extrapolation of the current available rainfall data to 100 year return period following conclusions can be drawn:

1) A 24h T100 rainfall event does not show intensities over 30mm/hour
2) A 24h T100 rainfall event does have a 90% upper limit of 175 to 180mm based on Gumbell Distribution.
3) Raw rainfall data at Guntur region results in an isolated rainfall event of 260 to 280 mm

Considering the above conclusions a rainfall event of 222 mm in 24 hours is used for all calculations of flood flow.

3.4 Flood Hazard Modelling

SOBEK[4] 2.14.001 rural package has been used to undertake Kondaveeti Vagu Catchment flood hazard modeling. From this modelling package the Rainfall Runoff (RR) and 1 dimensional flow (1D-FLOW) modules are used to model this catchment. Initially, the current situation is modeled to determine the competence of the model. After a successful reproduction and analysis of the T100 flood discharge the model can be adapted to simulate the functioning of the water system in the Amaravati Capital City Master Plan.

3.4.1 Flood Hazard Model for Amaravati Capital City with Current Flood Mitigation

The model is based on the available GIS data. Using the DEM the Kondaveeti Vagu catchment is calculated with ArcGIS software. The Catchment area of Kondaveeti Vagu is about 421 km^2 with elevations between 17m and 30m above mean sea level.

3.4.1.1 Cross-Sections

The cross-sections of all channels in the current situation are based on the DEM. For all channels, approximately every 500 m. apart, a transverse line 400 m. long is created. All these lines are then converted to points, 10 m. apart. These points are then assigned the elevation of the DEM pixel on which they lay. The center 2 points are lowered 2.0 m. artificially creating a 20 m. wide channel with a bottom level 2 m. below ground level. All cross-sections are imported to SOBEK (with the tool Turtle[5]) and checked. Irregular cross-sections are deleted. The model contains 172 cross sections.

3.4.1.2 Rainfall Runoff

To accurately include the surface runoff of precipitation, the Kondaveeti Vagu catchment is divided in sub-catchments. All channels are cut into segments of approximately 2000 m resulting in 61 segments. For each segment a sub-catchment is calculated based on the DEM using the DTM2CAT tool. For each channel segment a point is imported to SOBEK. On this point rainfall runoff flows into the channel from unpaved and paved nodes. For each sub-catchment the area and the mean elevation are calculated. In the current situation 95% of a sub-catchment area is appointed to unpaved nodes and 5% to the paved nodes. The model contains 61 unpaved area nodes and 61 paved area nodes.

Due to land use change from agricultural use to urban area there will be an increased paved surface. To include this change in the model the areas represented by paved and unpaved areas are changed.

Within city boundaries the paved area is set to 64% and unpaved set to 36% considering the City Master Plan (parks and open spaces 19%, water bodies 10% and other open spaces 7%).

3.4.1.3 Downstream Boundaries

[4] https://www.deltares.nl/en/software/sobek/

[5] http://www.modelwalhalla.nl/cgi-bin/wiki/view/Tools/TurtleRural

At the downstream end of the Kondaveeti Vagu, the Undavalli outfall and the Krishna Western Delta Canal are the downstream boundaries of this hydrological model. The water level at the Undavalli outfall can be modified to represent low (FRL of Prakasam barrage) or high (HFL of Prakasam Barrage) in the Krishna River just upstream of the Prakasam barrage. In case the water levels are high, pump is used to discharge the water from the Kondaveeti Vagu.[6]

3.4.1.4 Meteorological Input

Modelling is done using daily measurements from the stations in KV catchment, stations Thullur and Tadikonda. To simulate a T100 event a rainfall event is created using the data of a wet monsoon combined with the T100 values. Further analysis of the effect of rainfall data includes the use of the Gannavaram hourly rainfall data. These are normalized for daily totals to obtain hourly distributed rainfall. Analysis shows that hourly rainfall distribution at T100 reaches a simulated peak intensity of 36mm/ hour[3] thus causing minimal differences with daily values.

3.4.1.5 Calibration

With SOBEK it is possible to include evapotranspiration in the model as daily evaporation values. Also soil processes are used in the modelling process. In order to obtain a valid simulation result the parameters in the model need to be adjusted to match model outcome with measured water levels and volumes. In the KV catchment no water levels or discharge measurements are available.

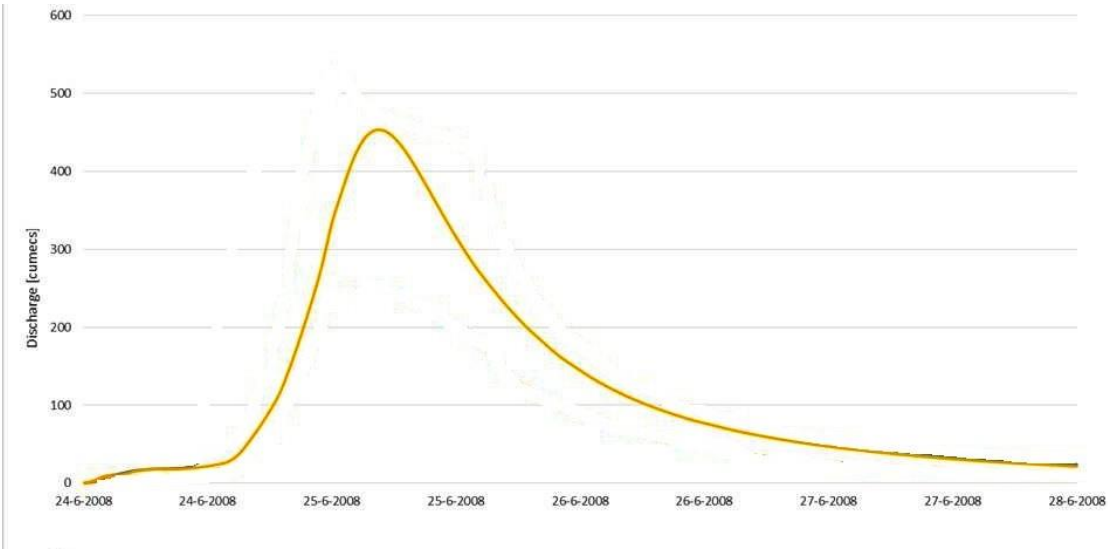


Figure 3-3: Flood Hydrograph (Current Scenario)

The only calibration value is a maximum discharge of 460 cumecs at the confluence point of KV with River Krishna. The resulting flood hydrograph of Kondaveeti Vagu at outfall point (i.e., Undavalli outlet) is shown in Figure 3-3.

The 100 year peak flood discharges modeled at various locations along the KV considering the current flood mitigation scenario is shown in Figure 3-4.

[6]Report on Flood modeling & management measures of Kondaveeti Vagu, M/s. Aarvee Associates, May 2016

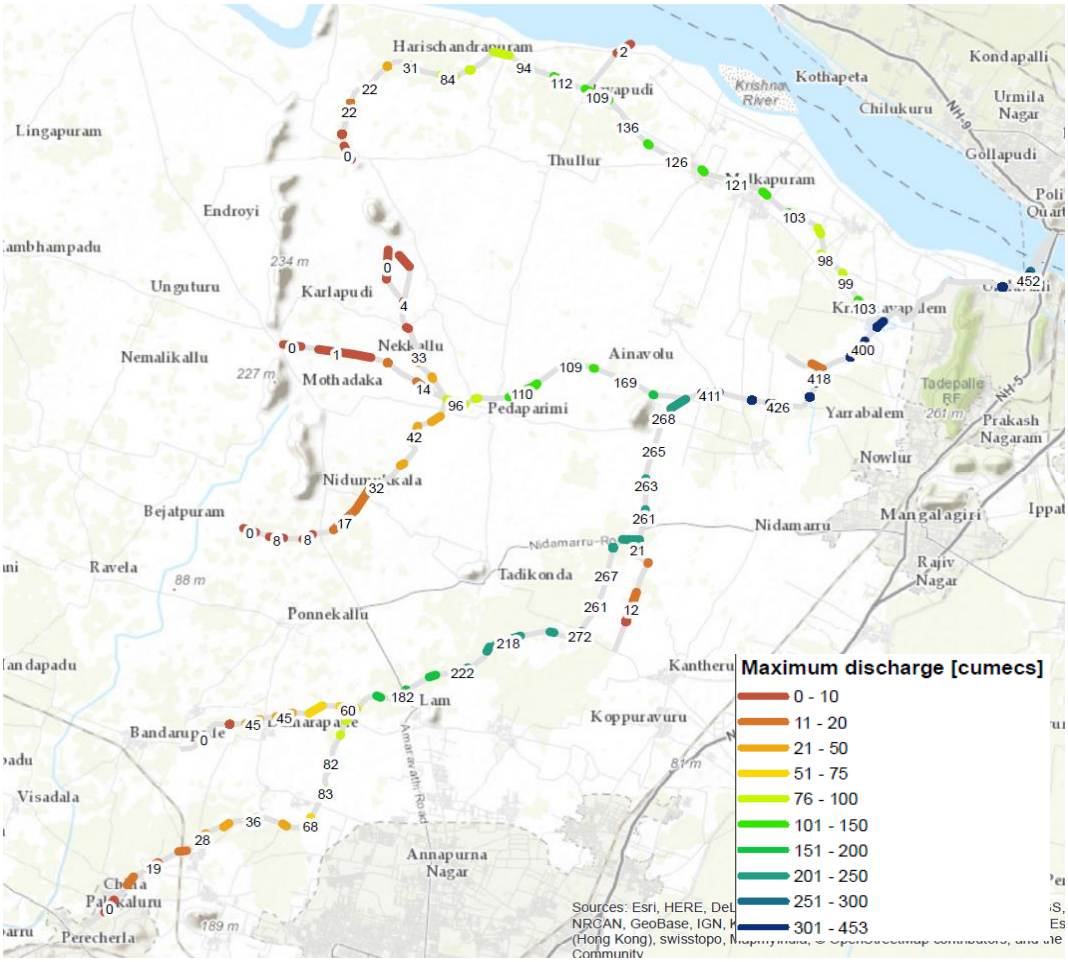


Figure 3-4: Peak Discharges at Various Locations of KV (Current Scenario)

3.4.1.6 Dimensional Modelling

Since the model of the current situation predicts there would be no inundations, a coupled 1D/2D model was made using a 100 by 100m grid based on the DEM. The results show large inundated areas and low peak discharge due to the huge amount of water that is stored at surface level. For the construction of the design model, the Amaravati Master Plan V4 is used. Within city boundaries, the existing channels are removed and the waterways from the master plan are included in the model. The simulated situation is the T100 design flood.

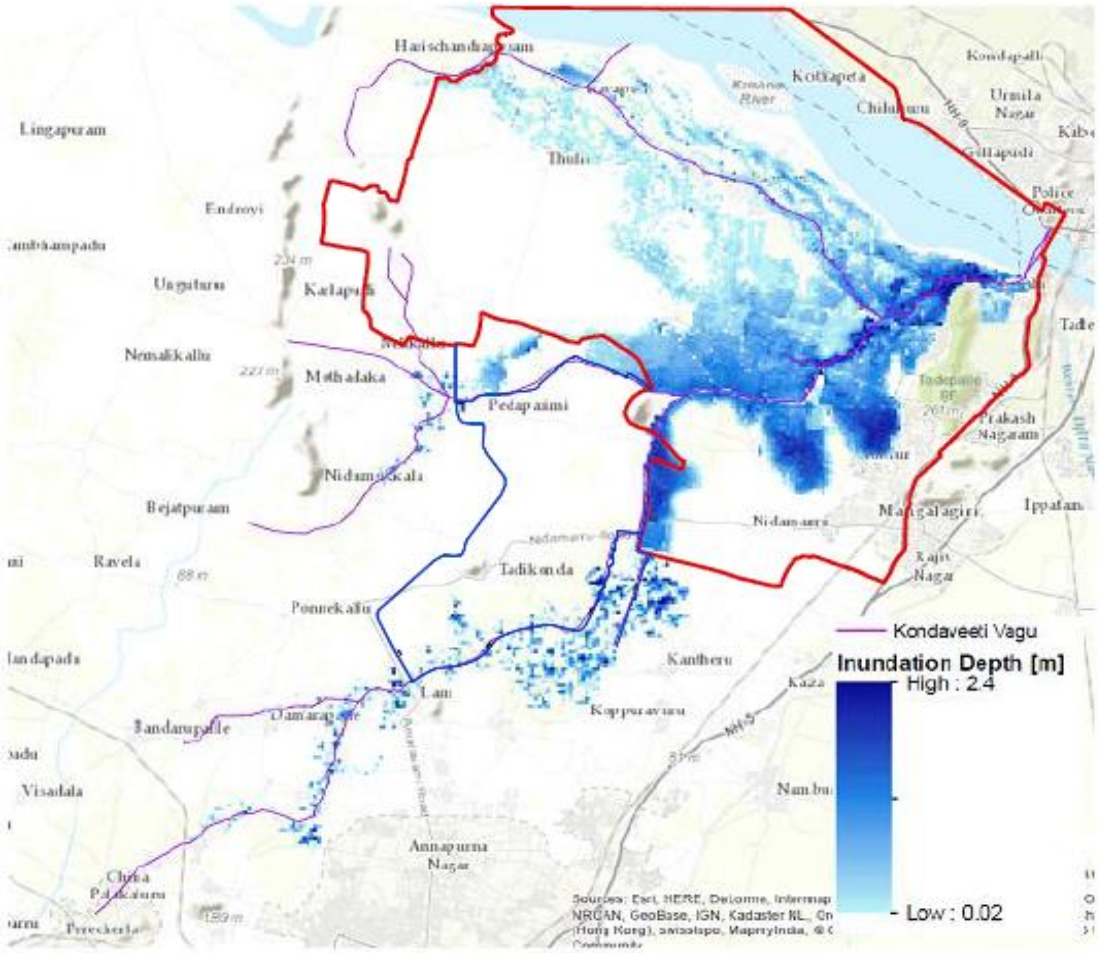


Figure 3-5 Maximum Inundation Levels for T100 Flood Under Current Flood

3.5 Inundation Details:

- Western Area - No inundation
- Southern Area - Marginal/No Inundation
- Northern Area - No inundation
- Eastern Area - Expected depths - 0 to 2.4 m (predominantly in the eastern part of city along the Kondaveeti Vagu).

3.6 Flood Mitigation Options

The spatial restrictions implied by the city design do limit optimization of the water system design. More space for water reservoirs and storage areas has been emphasized in earlier studies. Even with the added room for green areas and water storage areas the need for pumping stations remains. This also has to do with the natural characteristics of the area. The need for permanent pumping capacity is clear and cannot be avoided. The needed capacity can be optimized, with active control of water levels in the reservoirs and a flood early warning system. A conflict of functions occurs as the reservoirs are also designed for water storage/ water conservation. By allowing active water level management during the monsoon with restrictions near the end of the monsoon period a functioning system with optimized pumping capacity can be realized.

Based on study of available data and the discussions held with various stakeholders like ADC, APCRDA, Technical Expert Committee, three flood management works options have been

identified for the capital city. Flood modelling studies have been carried out for the three options and the details of study are summarized in the following sections.

3.6.1.1 Option-1

As shown in Figure 3-6 based on the flood discharges computed, this option involves flood discharge of 5650 cusecs (160 m^3/s) being disposed at Vykuntapuram and a flood discharge of12350 cusecs (350 m^3/s) at Undavalli and 4000 cusecs (113 m^3/s) being discharged through Krishna Western Delta (KWD) Canal.

The discharge from the upper catchment is realized through a gravity canal taking off from Lam Reservoir upto the Vykuntapuram Reservoir via another Reservoir located at Pedaparimi. Thus the upper catchment area of Kondaveeti Vagu is catered to by a gravity canal and three new reservoirs, namely Lam (existing), Pedaparimi and Vykuntapuram Reservoirs.

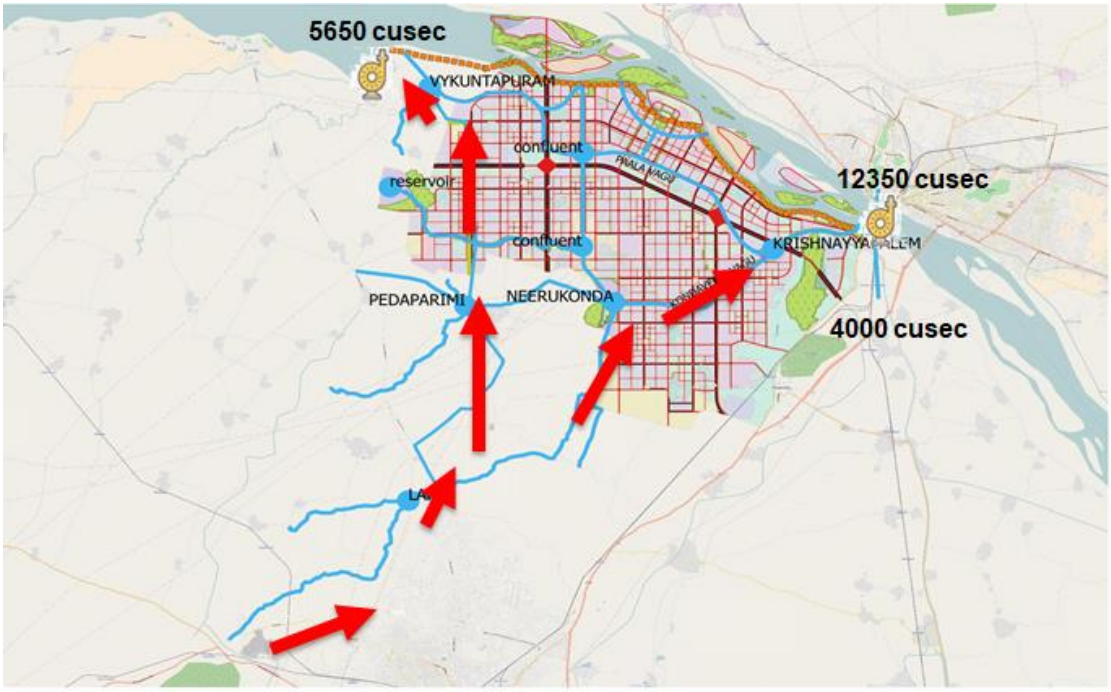


Figure 3-6: Option-1 for Flood Disposal

The lower catchment of the Kondaveeti Vagu catchment in this option is catered to by Kondaveeti Vagu and Pala Vagu and its in-falling drains draining in to Undavalli where the flood water is pumped at Undavalli Pumping Station.

The advantages of this option are as follows:

- The entire catchment is delineated into two sections – upper catchment and lower catchment, easing the burden of works involved;
- The chances of the capital city getting flooded for a 1 in 100 year event gets reduced since the upper catchment flood flow is disposed-off by means of the gravity canal proposed for this purpose that incidentally lies outside the capital city.
- The pumping capacity for a 1 in 100 year event estimated as 470 m^3/s gets distributed as two pumping stations - one at Vykuntapuram corresponding to a flow of 160 m^3/s and the other at Undavalli corresponding to 350 m^3/s is planned. This lessens the burden of having a pumping station of large capacity at one location.

3.6.1.2 Option-2

As indicated in Figure 3-7, there is no gravity canal planned outside the capital city as in Option-1 but instead the flood flow corresponding to 5650 cusecs is planned to be disposed of through the proposed Secretariat Canal starting from Neerukonda Reservoir till the Secretariat Area before disposing to River Krishna. This Option does not involve any new land acquisition for the gravity canal as in Option-1 but since the same is planned through the capital city and that too through the Government Complex of the city, the same is uncalled for.

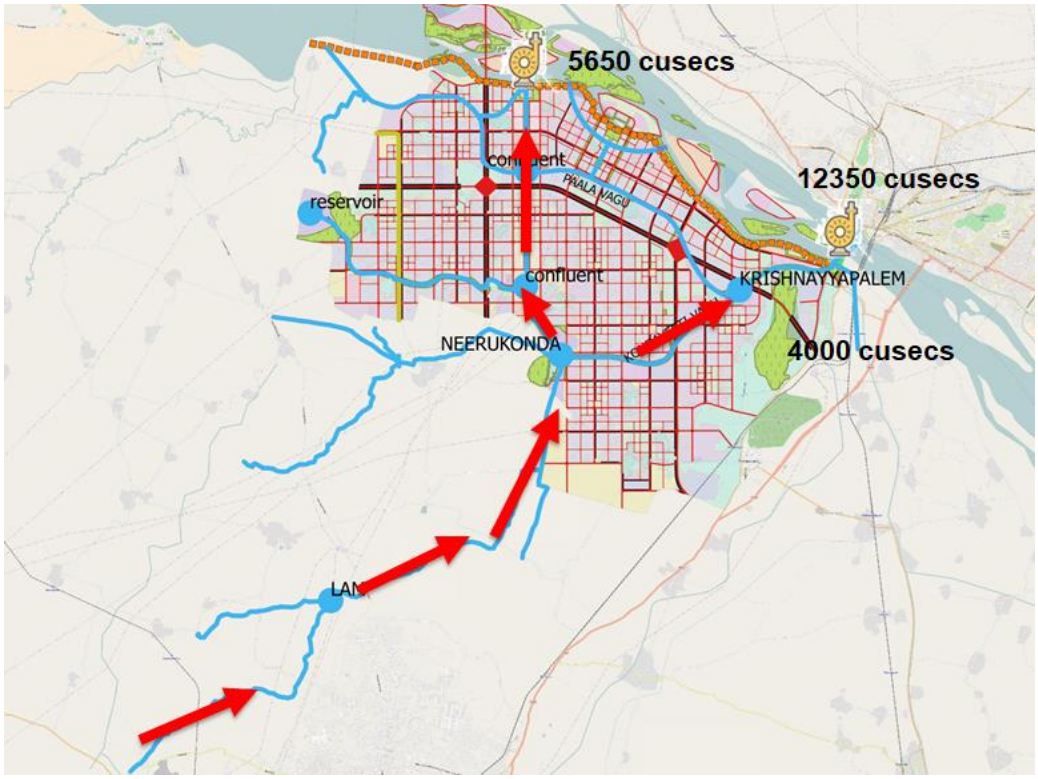


Figure 3-7: Option-2 for Flood Disposal

3.6.1.3 Option-3

This Option for flood disposal involves pumping the entire flood flow of 1 in 100 year storm event corresponding to 18,000 cusecs at a single location at Undavalli. This Option for flood disposal involves pumping the entire flood flow of 1 in 100 year storm event corresponding to 18,000 cusecs at a single location at Undavalli.

The option doesn't require any new canal system. Hence, there will be no additional requirement of land. Having said that, the Option requires a substantial pumping capacity at a single location. Thereby, modelling of this option was difficult to fit the canals leading to the pumping station within the spatial constraints of the city Master plan. With a single pumping station at Undavalli to dispose entire 18000 cusecs of storm water, there is a requirement of substantial land for the pumping station.

Moreover, the redundancy of pumps not working and the dependency of pumping of large flows at one location is very high and therefore the risk involved in this Option is too high. Therefore, this Option is not considered for the study.

As the average water level in the canals had to drop from the earlier proposed 17m to 14m to accommodate the storm water discharge into the canal by gravity, this option becomes technically challenging. The main issue with this option however is the vulnerability and future

extension capability. No redundancy exists if anything unforeseen happens and future capacity enlargement is not possible due to geometric constraints.

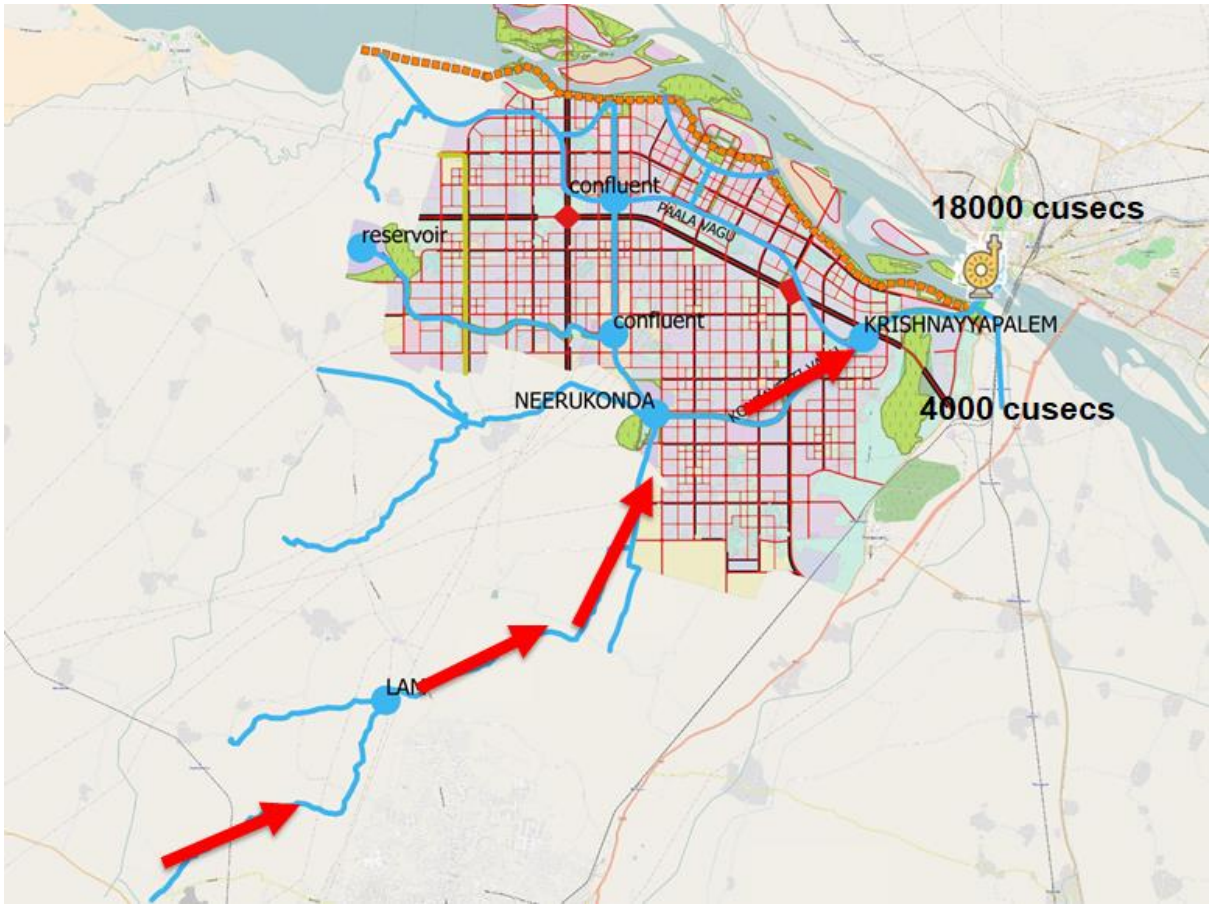


Figure 3-8: Option-3 for Flood Disposal

3.6.2 Comparison of Flood Mitigation Options

The Option 1 has been selected as the preferred option for flood mitigation based on the recommendations of the Technical Expert Committee (TEC) and discussions with stakeholders. The constitution of the TEC & list of key stakeholders consulted enclosed as **Annexure – XVII**. Summary of the comparative analysis of the 3 Options is provided in Table 3-2 and summary of strengths and weaknesses of each option has been presented in the Table 3-3.

Table 3-2: Summary of the Comparative Analysis of the Proposed Flood Management 3 Options.

Sr. No.	Environmental Considerations	Remarks		
		Option 1	**Option 2**	**Option 3**
1.	Land Availability	Land for the proposed width (vary from 120 to 175m) for the canal network and three reservoirs is available with the agency.	Proposed width of the canal under this option is in line with the Option 1. The required land is available for the development of canals and reservoirs is available with the agency. However, the proposed network at the government complex splits the area into two parts for about 8km. and thereby distorting to the Government Core. It also requires at least 3 additional major bridges to integrate the area	Land required for the three reservoirs is available with the agency. However, the proposed width for the canal network varies from 175 to 225 m requiring additional land which is not earmarked in the master plan. Also the land for additional pumping requirements at Undavalli is not available.
		Proposed Reservoirs at Lam (477 acre), Pedaparimi (470 acre), and Vykuntapuram (519 acre) will be located outside the capital city, APCRDA will reserve the land as per the requirement.	Proposed Reservoirs at Lam (477 acre), Pedaparimi (470 acre) will be located outside the capital city, APCRDA will reserve the land as per the requirement.	Proposed Reservoirs at Lam (477 acre), Pedaparimi (470 acre) will be located outside the capital city, APCRDA will reserve the land as per the requirement.
2.	Impact on existing land forms and topography	The option has been derived based on the proposed Land Use of the Capital City, without, altering any landforms and topography.	Same as Option 1. However, to avoid additional infrastructure costs, the proposed canal at the government complex has been converted as an	Expected to change the topography and land form as portion of the canal network would impact the Reduced

Sr. No.	Environmental Considerations	Remarks		
		Option 1	**Option 2**	**Option 3**
			ornamental canal, without altering any landforms and topography	Levels of the infrastructure and thereby increasing earthwork.
3.	Socio-Economic Impact	About 30 families will be displaced.	Physical displacement will be same as Option I	Physical displacement will be substantial than other two options
4.	Impact on Ecology	The study area doesn't have any vulnerable or endangered species. About 500 trees would be affected		Additional canal width would affect another 500 trees than expected under Option 1 and 2
5.	Disposal of excess earth material	About 40 million m^3 earth material would be generated from widening and deepening of the canals, Vagus and reservoirs. Sites for disposal of the excess has been identified within the capital city		This options calls for more excavation of earth and disposal of the same.
6.	Operation & Maintenance	Operation and Management under this option there would be two pumping stations at Vykuntapuram and Undavalli to discharge the excess amount of flood water minimizing the operation costs.	This option requires higher energy consumption than of Option I due to multiple pumping stations.	Under the option-3, the pumping station is proposed only at Undavalli resulting higher operation costs.

Table 3-3: Strengths and Weaknesses of Flood Mitigation Options proposed for Amaravati

Options	Strengths	Weaknesses
Option 1	1. Availability of Land for improvement of PV and KV and city reservoirs 2. Ease of operations and maintenance 3. Possibility for Cost optimization 4. Fits with Amaravati Capital City development phasing plan 5. Low Risk in the event of 1/100 years storm 6. Can be developed in the limited time framework	1. Loss of vegetation due to cutting/rehabilitation of about 500 trees 2. Displacement of 30 families 3. land requirement to construct reservoir at Vykuntapuram and gravity canal
Option 2	1. Availability of Land for improvement of PV and KV and city reservoirs 2. Lesser cost than the other two 3. Moderate Risk in the event of 1/100 year storm	1. Distorting the Core Government Complex 2. Higher infrastructure costs due to the additional number of crossing and bridges to be constructed across the canal 3. Higher operation and maintenance costs 4. Displacement of 30 families. 5. Loss of Vegetation due to cutting/rehabilitation of about 500 trees. 6. Land requirement to construct reservoir at Vykuntapuram and gravity canal.
Option 3	1. No new construction of canal requirement 2. No requirement of Vykuntapuram Reservoir	1. High risk in the event of 1/100 year storm considering pumping station at Undavalli alone 2. High operation and maintenance cost 3. Higher level of displacement of families compared to other two options considering additional requirement of land towards widening of the canals beyond the Master Plan provisions in the city. 4. Loss of vegetation beyond the other two options 5. Change in the landform expected due to further widening of the canals.

Based on the above analysis and limitation on the availability of land it is concluded that option – I is selected for the Amaravati flood mitigation works. Further within Option-1, only Phase-I activities as noted below are being taken up now and part of proposed Bank project. The Phase-I activities on a stand-along basis are designed / envisaged to deliver the flood mitigation outcomes. Phase-II activities would only be taken up as appropriate after some years and outside of this project.

Table 3-4: Works/ components under three different options & Implementation Strategy

S. No	Component	Implementation Strategy		Options		
		*Phase I	#Phase II	Option 1 (Preferred one)	Option 2	Option 3
Canals/Vagus						
1	Widening and deepening of Kondaveeti Vagu (19.85 Km) and Pala Vagu (16.7 Km) – earth works	√		Yes	Yes	Yes
2	Construction of Gravity Canal (8Km) – earth works	√		Yes	No	No
3	Secretariat Canal from Neerukonda to Secretariat			No	Yes	No
4	Feeder Canals from upper catchment to Kondaveeti Vagu and Gravity Canal – earth works		√	Yes	Yes	Yes
5	Lining of the Canals		√	Yes	Yes	Yes
6	Widening and deepening of Kondaveeti Vagu (3.75 Kms)- earth works		√	Yes	Yes	Yes
Reservoirs						
1	Krishnayapalem Reservoir – 0.1 TMC	√		Yes	Yes	Yes
2	Sakhamuru Reservoir – 0.03 TMC	√		Yes	Yes	Yes
3	Neerukonda Reservoir – 0.4 TMC	√		Yes	Yes	Yes
4	Vykuntapuram Reservoir– 0.2 TMC		√	Yes	No	No
5	Pedaparimi Reservoir – 0.3 TMC		√	Yes	Yes	Yes
6	Lam Reservoir– 0.3 TMC		√	Yes	Yes	Yes
7	Construction of weirs and mechanical related works of Sakhamuru, Krishnayapalem and Neerukonda Reservoirs		√	Yes	Yes	Yes

S. No	Component	Implementation Strategy		Options		
		*Phase I	#Phase II	Option 1 (Preferred one)	Option 2	Option 3
Pumping Stations						
1	Pumping station at Undavalli (i) about 5000 cusec is being implemented by WRD, GoAP		5000 Cusec is completed and due for commissioning in next one month[7]			
	(ii) 7350 cusecs to be taken up with additional 5650 cusec in Option-3		√	Yes (7350 Cusec)	Yes (7350 Cusec)	Yes (13000 Cusec)
2	Pumping station at Vykuntapuram		√	Yes (5650 Cusec)	No	No

*Phase I: works are to be implemented with the World Bank funding; #Phase II: works are expected to be implemented with other source of funding

[7] Undavalli Pumping Station with a capacity of 5000 Cusec has been planned before Bank engagement using GoAP funds and the construction has been completed recently and is outside of Bank funding. The flood mitigation EIA, doesn't include this pumping station as the EHS requirements have been implemented considering the State departmental standard operating procedures. There are no residual environmental issues relating to construction of pumping station. The environmental impacts during O&M phase has already been covered in the EIA report.

CHAPTER 4: PROJECT DESCRIPTION

Further to selection of the Option -1, Phase-I (hereafter referred as "the Project") for the flood mitigation works, detail analysis on the project with respective to the proposed works have been presented in this chapter. MA&UD, GoAP, have constituted an expert committee for flood management of Kondaveeti Vagu with vide G.O.Rt.No.22. The Committee having looked into the data generated through model studies and the historical information has suggested that the peak discharges can be estimated approximately 470 cumecs. However, looking at the historical data, where a 70 mm rainfall can occur in one hour with 222 mm in a day, it is suggested that the canals may be designed for a flow of 470 cumecs for the entire catchment region, while provision for pumping facilities can be made for an additional capacity in the range of 100-120 cumecs". The Chief Engineer, Central Designs Organization, Water Resources Department of Government of Andhra Pradesh, also vetted the proposed flood mitigation works and subsequently principal approval has been received from the World Bank. Project components have been depicted at Annexure-I.

4.1 Overview of the Project

The overview of the proposed flood mitigation component is as follows. Based on the hydrological study to establish the flood flow and considering the various options for flood disposal from the proposed capital city and discussions with various stake holders, it has been established that following flood mitigation measures can encounter a 1 in 100-year storm event and avoid flooding of the capital city.

- Widening and deepening of existing Kondaveeti Vagu (for widened and deepened canal cross-sections please refer drawing no.TCE.10244A-CV-3023-SI-30004 to TCE.10244A-CV-3023-SI-30019). Attached as Annexure – III.
- Widening and deepening of existing Pala Vagu (for widened and deepened canal cross-sections please refer drawing no.TCE.10244A-CV-3023-SI-30020 to TCE.10244A-CV-3023-SI-30040). Attached as Annexure – III.
- Construction of the Gravity Canal from Nekkallu to Vykuntapuram (please refer drawing no.TCE.10244A-CV-3023-SI-30041 to TCE.10244A-CV-3023-SI-30055). Attached as Annexure – III.
- Construction of 3 numbers of Reservoirs within the capital city – Neerukonda, Krishnayapalem and Sakhamuru (for Reservoir Details refer drawing no.TCE.10244A-CV-3025-SK-30056 to TCE.10244A-CV-3025-SK-30068). Attached as Annexure – IV.

Table 4-1 below provides typical sectional widths to be undertaken in this option.

Table 4-1: Typical Sectional Widths

Section	Approx. Length (Km)	Bottom Width of Canal (m)	Top Width of Canal (m)	Green Width on each side (m)	Top Width with Green Buffer (m)	Navigable (Yes/No)
Kondaveeti Vagu (19.85 km)						
Krishnayapalem to Neerukonda	7.2	75	115	30	175	Yes

Section	Approx. Length (Km)	Bottom Width of Canal (m)	Top Width of Canal (m)	Green Width on each side (m)	Top Width with Green Buffer (m)	Navigable (Yes/No)
Neerukonda to Sakhamuru	3.6	14	65	20	105	No
Sakhamuru to Anantavaram	9	10/15	30/55	20	105	No
Pala Vagu (16.7 km)						
Krishnayapalem to Secretariat	9.3	25	65	20	105	Yes
Secretariat to Dondapadu	7.4	12	45	30	105	No
Gravity Canal (8 km)						
Vykuntapuram gravity canal	8	40	70	20	110	No
Total Length (Km)	**48.3**					

4.2 Project Components:

The following are the components to be implemented with the World Bank (Phase-I) funding

Components

- Widening and Deepening of Kondaveeti Vagu (From Anathavaram to Krishnayapalem, a length of approx.19.85 Kms)
- Widening and Deepening of Pala Vagu (From Dondapadu to Krishnayapalem a length of approx.16.70 Kms)
- Construction of Gravity Canal (From Nekkallu to Pichikalapalem a length of approx. 7.83 km)
- Construction of Sakhamuru Reservoir (Approx. 0.03 TMC capacity)
- Construction of Krishnayapalem Reservoir (Approx.0.1 TMC Capacity)
- Construction of Neerukonda Reservoir (Approx.0.4 TMC Capacity)

Physical Activities under the proposed components

Canal / Vagu Activities*	Reservoir Activities#
1. Site clearance 2. Excavation 3. Disposal of spoil 4. De-watering	1. Site clearance 2. Excavation works 3. Providing Disposal of excavated soil 4. Levelling of soil 5. Dewatering 6. Providing Earthen Embankment 7. Providing Geo-Textile 8. Providing Gabion wire Mesh 9. Providing Stones 10. Providing Back filling with impervious Soil 11. Providing Back filling with impervious Soil with approved borrow area soil 12. Providing sand cushion layer

*Cross section details of Kondaveeti vagu and Pala vagu canals refer Annexure – III.
Cross sections details of reservoirs refer Annexure – IV and for pumping stations refer Annexure – V.

4.3 Detailed Description of Project (Option 1) for Flood Mitigation

Figure 4-1 presents the way in which the Kondaveeti Vagu catchment model under study is designed to cater to two basic divisions of the entire catchment (421 sq. km) into upper catchment (190 sq. km) and lower catchment (231 sq. km).

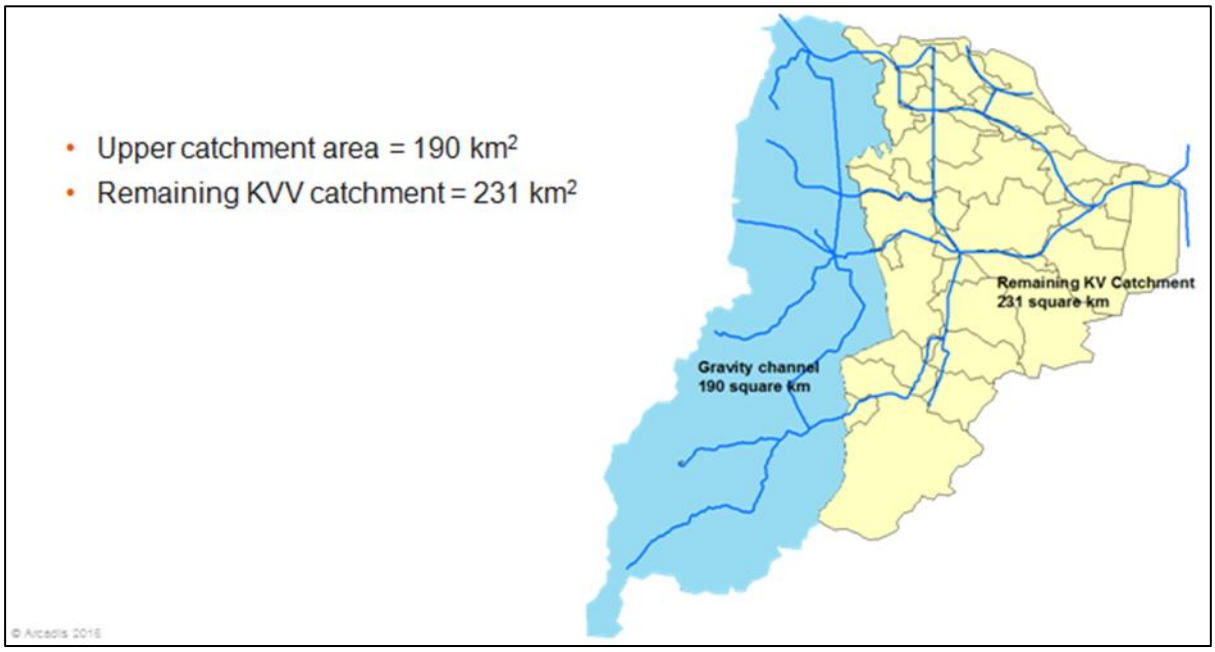


Figure 4-1: Model Design of Kondaveeti Vagu Catchment

The network of canals and location of flood control reservoirs considered in the model are shown in Figure 4-2.

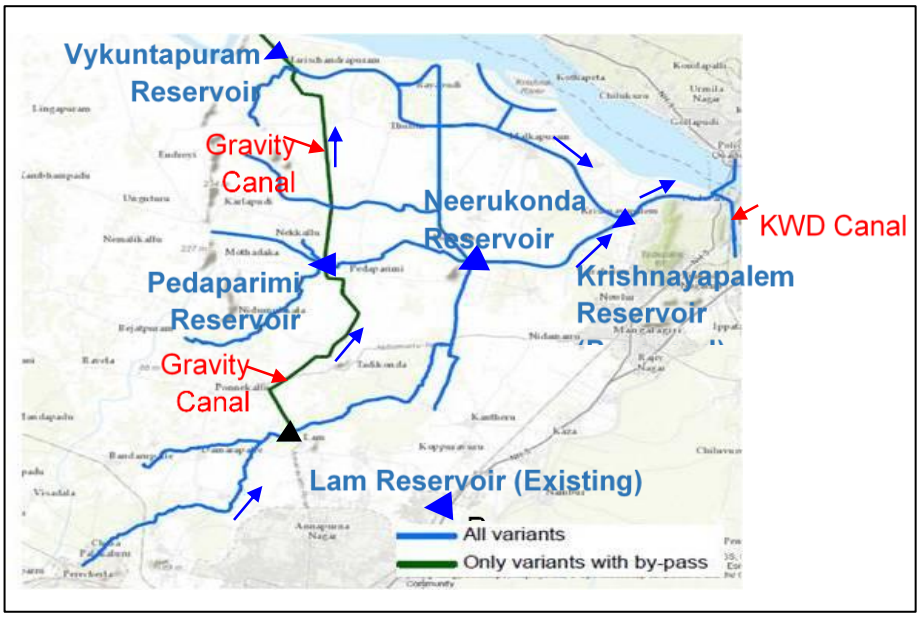


Figure 4-2: Layout of Canals & Flood Detention Reservoirs

4.3.1.1 Detailed Description of Canal Works for Flood Mitigation

The existing canals of Kondaveeti Vagu and Pala Vagu shall be widened and deepened to accommodate the 1 in 100-year return period that has been computed from SOBEK modelling. The flood flow at Undavalli from the catchment area works out to 470 cumecs. The flows that are predicted in various locations along the Kondaveeti Vagu and its in-falling drain are considered for the respective canal stretches. A summary of the design information of canals is indicated in Table 4-2 below.

Table 4-2: Details of Major Canals

Sl. No.	Canal Reach	Design Flow(m^3/s)	Length (km)	Bottom Width(m)	Side Slope	Depth of Flow (m)
1	Kondaveeti Vagu (Ananthavaram to Neerukonda)	60	10.3	14	2.0	4.0
2	Kondaveeti Vagu (Neerukonda to Krishnayapalem)	230	7.2	75	2.0	4.4
3	Pala Vagu (Dondapadu to Secretariat)	40	7.4	12	1.5	3.8
4	Pala Vagu (Secretariat to Krishnayapalem)	250	9.3	25	1.5	5.3
5	Gravity Canal (Nekkallu to Pichikalapalem)	300	8.0	40	1.5	3.8

Considering the type of soil, flow velocities in the canal, aesthetics, maintainability of canals, availability of material, protection against waves and currents due to ship movement, c*anal lining works is proposed to be taken up two years after construction of canals, after assessing the results from the seepage observation wells proposed along the canals.*

Reduced canal sizes conforming to the required flat green area on either side of the canal and to fit into the total width provided for the respective water way as per the Master Plan was adopted for various canals in the capital city.

4.3.1.2 Detailed Description of Reservoir Works for Flood Mitigation

Reservoirs planned in the Kondaveeti Vagu catchment under study are mainly from the point of view of attenuation of a 1 in 100-year storm that is likely to be encountered. The concept of flood management works using these reservoirs is the concept of pre-emptying them before the monsoons. The sizes of these reservoirs are stipulated in the Master Plan Version-IV and the same is used for flood management works purposes. The details of reservoirs are furnished in Table 4-3.

Table 4-3: Details of Reservoirs within KV Catchment

Sl. No.	Reservoir	Storage Capacity (TMC)	Full Reservoir Level (RL in m)	Height of Embankment (in m)	Location	Remarks
1.	Neerukonda	0.4	19.00	2	Lower catchment	Proposed under Phase I
2.	Krishnayapalem	0.1	15.00	1.7	Lower catchment	
3.	Sakhamuru	0.03	17.00	0	Lower catchment	
Total Storage Capacity		**0.53**				

The above Table 4-3 presents details of three numbers of Reservoirs planned from flood management works point of view. These include reservoirs at Neerukonda and Krishnayapalem. Apart from these two there is one smaller reservoir proposed at Sakhamuru which is virtually an ornamental confluence point. As indicated in the table, these reservoirs are small and the total volume of all these reservoirs put together works out to 0.53 TMC. The Full Reservoir Levels of each of these reservoirs is as indicated with the highest being for Neerukonda Reservoir with 19 m and lowest being for Krishnayapalem with 15m.

For design purposes, it is assumed that water level in the reservoirs will be maintained at a lower level than the design FRL to absorb the flood volume. The numerical model shows a significant reduction in peak discharges and water levels in canals if the reservoirs are actively managed. Hence, it is suggested to have a flood warning system in place to ensure proper control of reservoirs during peak flood event.

All three reservoirs are to be constructed within the capital city. The construction of these reservoirs shall be in parallel with the widening and deepening of the interconnecting canal Kondaveeti Vagu. The said works will be taken up in the first phase since the LPS scheme for land acquisition in the capital city is in process and therefore will not be time consuming as compared to the reservoirs outside the capital city. From the point of view of flood management works also the reservoirs inside the capital city area proves crucial for flood attenuation even of normal storm intensities. The details of each of the reservoirs planned inside the capital city is provided in the following paragraphs.

4.3.1.2.1 Neerukonda Reservoir

The details of Neerukonda Reservoir are presented in drawing no.TCE.10244A-CV-3025-SK-30057 and 30058 **(Annexure – IV)**. The total area of this reservoir is around 455 acres. The depth of the reservoir is planned at 8 m. The topography of the area is even without major undulations. The entire reservoir needs to be evolved from excavation alone. Therefore, the embankment portion of the reservoir is the depth to which the necessary freeboard needs to be provided of the order of 2 m.

Neerukonda reservoir has interconnections from the southern side with the Kondaveeti Vagu bringing cargo movement from Undavalli via Krishnayapalem. This reservoir therefore serves as an important boarding point of ship movement and therefore the southern part of the reservoir with two portions, one for the Ship lock aiding the movement of the ship and the other portion facilitating the reservoir outlet.

Reservoir outlet portion consists of overflow section and the other non-overflow section. While the overflow section has an Ogee spillway proposed, the non-overflow section is facilitated by Stop logs and Gates.

From the flood management works point of view, Neerukonda Reservoir has to be pre-emptied before the monsoon rains so that it is effective in flood attenuation. For this purpose, Neerukonda reservoir therefore has to be pre-emptied till its MDDL(Minimum Drawled Drown Level) allowing for its filling. The pumps at Undavalli will be signaled to start once the water level in Neerukonda reservoir reaches its Full Reservoir level (FRL) of RL 19.0m. This is achieved by instrumentation and Control (I&C) system between Undavalli Flood pumping station and Neerukonda reservoir. The details of Neerukonda Reservoir is presented in Table 4-4.

Table 4-4: Details of Neerukonda Reservoir

Sl. No.	Description	Value	
I	**General**		
a)	Location	Amaravati	
b)	Nearest Village	Neerukonda	
c)	Tehsil	Mangalagiri	
d)	District	Guntur	
e)	Purpose	Flood Control, Water Supply & Navigation	
f)	River/Vagu	Kondaveeti Vagu	
g)	Area of Reservoir	440 Acres	
II	**Reservoir**		
a)	Full Reservoir Level	RL 19.00 m	
b)	Reservoir Bed Level	RL 11.00 m	
c)	High Flood Level	RL 19.60 m	
d)	Top Bund Level	RL 21.50 m	
e)	Gross Storage	0.43 TMC (12.2 Mm^3)	
III	**Spillway/Outlet Arrangements**		
a)	Design Discharge	230 m^3/s	
b)	Type of spillway	Gated	Un-gated
c)	Length of overflow	25.4	24.6 m
d)	Sill Level	RL 14.00 m	RL 19.00 m
e)	No. of openings	Four (4)	-
f)	Width of each opening	5.0 m	-
g)	Height of each opening	3.0 m	-
IV	**Scouring Sluices**		
a)	Location	Un-gated spillway (Refer Bid Drawings)	
b)	No. of sluices	2	
c)	Diameter of sluice	0.6 m	
d)	Bottom level of sluice	RL 11.30 m	

4.3.1.2.2 Krishnayapalem Reservoir

This reservoir is basically a confluence point of Kondaveeti Vagu and Pala Vagu. This reservoir basically forms a meeting junction of the two vagus and therefore no control structure for this reservoir is necessary. All the cargo moving from Undavalli to Neerukonda reservoir essentially passes through this reservoir. The Full Reservoir Level is maintained at RL 15.0 m which incidentally is the HFL of the Kondaveeti Vagu. The details of Krishnayapalem Reservoir are

shown in drawing no.TCE.10244A-CV-3025-SK-30063 and 30064**(Annexure – IV)**. Table 4-5 shows the details of this reservoir.

Table 4-5: Details of Krishnayapalem Reservoir

Sl. No.	Description	Value
I	**General**	
a)	Location	Amaravati
b)	Nearest Village	Krishnayapalem
c)	Tehsil	Mangalagiri
d)	District	Guntur
e)	Purpose	Navigation & Recreation
f)	River/Vagu	Kondaveeti Vagu
g)	Area of Reservoir	190 Acres
II	**Reservoir**	
a)	Full Reservoir Level	RL 15.00 m
b)	Reservoir Bed Level	RL 11.00 m
c)	High Flood Level	RL 15.40 m
d)	Top Bund/Bank Level	RL 17.20 m
e)	Gross Storage	0.09MC (2.6 Mm^3)

4.3.1.2.3 Sakhamuru Reservoir

This reservoir is a confluence point of Kondaveeti Vagu and Secretariat canal. This reservoir proposed for ornamental purpose without any control structure. The Full Reservoir Level is maintained at RL 17.0 m. The details of reservoir are shown in drawing no.TCE.10244A-CV-3025-SK-30065 to TCE.10244A-CV-3025-SK-30068**(Enclosed as Annexure – IV**). Table 4-6 shows the details of this reservoir.

Table 4-6: Sakhamuru Reservoir

Sl. No.	Description	Value
I	**General**	
a)	Location	Amaravati
b)	Nearest Village	Sakhamuru
c)	Tehsil	Thullur
d)	District	Guntur
e)	Purpose	Ornamental/Recreation
f)	River/Vagu	Kondaveeti Vagu
g)	Area of Reservoir	50 Acres
II	**Reservoir**	
a)	Full Reservoir Level	RL 17.00 m
b)	Reservoir Bed Level	RL 11.00 m
c)	High Flood Level	RL 17.50 m
d)	Ground Level	RL 21.50 m
e)	Gross Storage	0.03 TMC (0.8 Mm^3)

4.3.1.3 Detailed Description of Flood Pumping Station Works for Flood Mitigation

4.3.1.3.1 Location and Capacity of Pumping Stations

The location and number of flood pumping stations required along with quantum of flood discharge required to be pumped at each of the selected locations has been fixed based on the estimated peak flood discharge and considering the requirement of restricting the maximum

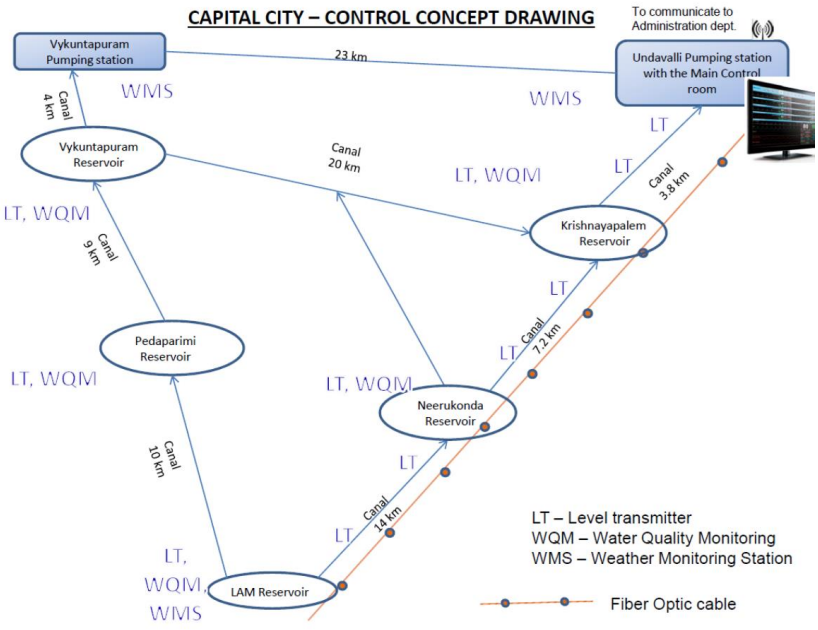
high flood level at Undavalli outlet to RL 15.00 m in order to facilitate gravity drainage of storm water runoff from existing villages.

Accordingly, one flood pumping station has been proposed for the capital city under this project, viz., at Undavalli. Irrigation Department (ID), Government of Andhra Pradesh has recently taken-up the execution of flood pumping station at Undavalli with a capacity of 150 m^3/s, to prevent flooding of the capital city in the immediate future. The pumping station has been located near the existing KWD escape regulator. The contract for construction of Undavalli pumping station has been awarded and the works are ongoing. 17 nos. (15 working + 2 standby) of Vertical Turbine pumps have been considered for the pumping station.

4.3.2 Operation and Monitoring for Flood Mitigation

The flood mitigation measures recommended for the capital city have been designed considering the estimated 100-year peak flood discharge. In order to minimize the overall cost (capital and operation) of flood management works, within the spatial limitations of Master Plan and other technical constraints (as described elsewhere in the report), proper management of entire network of canals, reservoirs and pumping stations has been considered. The capacities of flood pumping stations at Undavalli and Vykuntapuram have been optimized with the assumption that canals and reservoirs will be pre-emptied before the onset of major storm events in order to accommodate the incoming flood volume (i.e., contribution of storage in reservoirs and canals is considered for reduction of flood peaks), thereby reducing the flood discharge that needs pumping.

A 24/7 online based flood and water quality monitoring system has been suggested to be implemented for the entire Kondaveeti Vagu catchment to manage the available infrastructure to prevent flooding of capital city. The monitoring system will involve installation of weather monitoring stations, level transmitters and water quality sensors at major locations along the canals, reservoirs and pump sumps. All the individual systems are interconnected and relayed to the master control room (proposed to be set up at Undavalli Pumping Station) through optical fiber cable network and wireless communication system. Water levels and quality will be measured along the canal, reservoirs and pump sumps, whereas discharge will be measured at reservoirs.



Schematic Drawing of Online based Flood and Water Quality Monitoring System

The flood management works system for the entire capital city will be monitored and operated from master control room at Undavalli. The data collected from other locations will be relayed and displayed at the master control room. Based on the weather forecast/ warnings issued by the local meteorological station (IMD Gannavaram) and data observed within the catchment area

(from Automatic Weather Monitoring Stations/ Automatic Rain Gauge Stations), reservoirs and canals will be pre-emptied by operation of pumps at any of the three or all the pumping stations.

4.3.3 Risks to Flood Mitigation and Required Measures

The details of Flood Risks and Mitigation Measures are presented in Table 4-7.

Table 4-7: Flood Risks and Mitigation Measures

Sl. No.	Cause	Effect	Risk	Suggested Mitigation Measure(s)
1.	Increase in paved area due to development of capital city	Increase in peak flood discharge	Inundation of low lying areas in the eastern boundary of capital city during occurrence of peak flood event	a) Improvement of Kondaveeti Vagu, Pala Vagu and other in-falling drains b) Management of reservoirs c) Construction of flood pumping stations d) Diversion of flows from upper catchment area along the western boundary of capital city
2.	Gravity canal not available	Excess water cannot be diverted	Flooding near Undavalli and along the course of the Pala Vagu and Kondaveeti Vagu between Undavalli and Neerukonda	a) Augmentation of KWD escape regulator to divert flows by gravity.
3.	Reservoir at Neerukonda not constructed or smaller than design assumptions	Peak flow cannot be stored and will cause flooding upstream and or downstream of Neerukonda	Flooding near Undavalli and along the course of the Pala Vagu and Kondaveeti Vagu between Undavalli and Neerukonda.	a) Dimension reservoir (capacity) at correct measures, as given in designs b) Construct additional reservoirs upstream of Neerukonda (may be difficult due to land acquisition issues)
4.	Reservoir at Neerukonda is filled before the peak flow arrives	Peak flow will cause overflow of reservoir	Flooding near Undavalli and along the course of the Pala Vagu and Kondaveeti Vagu between Undavalli and Neerukonda.	a) Empty reservoir before peak event is occurring (pre-emptive) Reservoir management plan should be available b) Flood early warning system based on weather predictions should be available

Sl. No.	Cause	Effect	Risk	Suggested Mitigation Measure(s)
5.	Pump failure (mechanical)	Pump capacity is insufficient to remove excess water	Partial flooding near Undavalli and along the course of the Pala Vagu and Kondaveeti Vagu between Undavalli and Neerukonda. Extent of flooding depends on loss of pumping capacity.	a) Maintenance of pumps according to the standards b) Provision of standby pumps
6.	Pump failure (Electrical failure or power outage)	Pump capacity is unavailable	Flooding near Undavalli and along the course of the Pala Vagu and Kondaveeti Vagu between Undavalli and Neerukonda. See report for expected area to be flooded	a) Install backup power (for example diesel generator) at least for a few pumps. b) Install emergency electrical network or c) Install a dedicated electrical network with direct connection to power plant(s). d) Augmentation of KWD escape regulator to divert flows by gravity

4.4 Inlets and Outlets of Water in Canals

Water is planned to be sourced from River Krishna near the Rayapudi Village. Availability of water in the river at this location is reliable both for short term and long term scenario. Since River Krishna is proposed to be connected to national Waterway-4 (NW-4), availability of water at RL of 17.0m is assured throughout the year. Water will be sourced therefore by gravity through an inlet arrangement. Further, water from here can be conveyed to the waterways in the capital city through a diversion canal from Rayapudi till Pala vagu.

Minimum water depth or level in the canals should be maintained at 3 m for Class I vessels and for commutation and recreation purposes the largest ships need approximately 1.5 m of water depth.

Water from the various waterways (canals) in the capital system needs to be disposed of either to empty them before replenishing or to empty any excess water. The excess water shall be diverted to River Krishna through pumping. Three (3) nos. of 3 m^3/s pumps at Undavalli can be used to remove the water from canals. Further diversion of water by gravity, either to KWD canal or Guntur canal can be made from Prakasam barrage.

The details of inlet & outlet of water in canals and different option study is presented in **Annexure – XXIII**.

CHAPTER 5: BASELINE ENVIRONMENT

5.1 Introduction

A comprehensive understanding of the physical, chemical, and biological environment provides the foundation to a well-executed Environmental Assessment. The detailed baseline characterization is used as input to model possible project impacts, which allows specialists to provide timely input to project designs to reduce potentially adverse environmental impacts. This in turn produces a more socially and environmentally sustainable project and enhances the efficiency of the project permitting process.

The environmental setting of the proposed project is given in Table 5-1.

Table 5-1: Environmental Setting within 10 Km Radius of the Project (Kondaveeti Vagu, Pala Vagu & Pillala Vagu)

S. No	Particulars	Details
1	Latitude and Longitude	North East Coordinate- 16º30'30"N, 80º37' E South West Coordinate-16º29'N, 80º25' E North West Coordinate-16º31'N, 80º22'30" E South East Coordinate-16º24'30"N, 80º34' E
2	Elevation above Mean Sea Level	Varying from 18m to 260m
3	Nearest Highway	NH16 passing within the boundary of the project site
4	Nearest railway station	K C Canal Railway Station near Tadepalli, 1 km , East direction
5	Nearest airstrip	Gannavaram airport 22 km, North East direction
6	Nearest city	Vijayawada, 3 km North East
7	Rivers	Krishna river on the northern fringes of the project site.
8	Hills/ valleys, Monuments	Tadepalli Hills within the project site
9	Archaeologically important places	Undavalli Caves within project site (Undavalli caves at about 0.30 km from the Kondaveeti Vagu)
10	Wildlife Sanctuary	None within the 10km radius
11	Core Biosphere reserve	None within the 10km radius

The baseline environmental studies encompassed the disciplines/ environmental attributes of air, water, noise, soil, land-use, terrestrial and aquatic ecology and socio-economic components.

The baseline data for all the environmental and social parameters is based on the EIA study carried out for the New Capital city in year 2015.

The baseline studies in the project site and study area were conducted for air, noise, water, soil, ecology and social aspects during the summer season. The study shows that Air quality at all the locations (10) is within the NAAQ Standard.

The ground water and surface water results shows that few parameters like Chlorides and Total Dissolved Solids are higher than permissible limits of drinking water quality for both surface and ground water. The Soil quality results show that the soil is suitable for agriculture and construction purposes.

The ecological assessment shows two ecosystems within the project area (aquatic and rocky outcrops) and three major ecosystems in the study area (riverine and riparian ecosystems). There are no rare or endangered species in the project area.

5.2 Meteorology

Micro-meteorology plays a pivotal role in the understanding of the weather phenomena and the climatology which in turn affect the dispersion pattern of the pollutants. Thus the micro-meteorological studies are an integral part of the air pollution studies which not only help in interpretation of the extant baseline conditions within the study area- but also serve as an input to the predictive models for air quality dispersion studies.

5.2.1 Methodology

The methodology adopted for monitoring surface observations was as per the standard norms laid down by Bureau of Indian Standards (BIS), and the India Meteorological Department (IMD). On site monitoring was undertaken for various meteorological variables in order to generate the site-specific data. The data generated- especially the wind pattern has been compared with the secondary data taken from the Wind Rose Atlas for the nearest IMD station Gannavaram for the year 1971-2000.

An automatic weather monitoring station was installed at a height of 10 meters from the ground level at Thullur to monitor parameters of wind speed and wind direction, temperature, & relative humidity. The automatic weather station is shown in Fig-5-1. The data is recorded as the maximum, minimum, instantaneous value, and average value of all the readings collected during the proceeding hour. Monitoring was done as per IS: 8829: Micro-meteorological Techniques in Air Pollution.

The details of parameters monitored, equipment used and the frequency of monitoring are given in **Table 5-2**

Table 5-2: Meteorological Parameters Monitored at Site

S. No.	Parameters	Instruments	Frequency
1.	Wind speed	Counter Cup Anemometer	Hourly/ Continuous
2.	Wind direction	Wind vane	Hourly/ Continuous
3.	Temperature	Thermo sensor	Hourly/ Continuous
4.	Relative humidity	Thermo –hygro sensor	Hourly/ Continuous

Figure 5-1: Automatic weather station installed at Thullur

5.2.2 Findings

The site specific meteorological data including the parameters viz., wind direction, wind speed, relative humidity and ambient temperature were recorded using automatic weather station installed at Thullur and the same are presented in Table 5-3. Automated Weather stations are located at every Mandal of the Andhra Pradesh State. Three such monitoring station falls within the project site and two in the study area. The details of micro-meteorological data from these locations are provided in Table 5-4.

Table 5-3: Site specific meteorological data

Month	Wind speed (m/sec)			Temperature (^{0}C)			Humidity (%)		
	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.
May - June 2015	2.7	0	0.40	46.7	21.8	31.49	100	15	78.2

Table 5-4: Site Specific Met Data from Mandals in Project site during summer 2015

Location	Wind speed (m/sec)			Temperature (^{0}C)			Humidity (%)		
	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.
Thullur	26.2	0	13.1	47.4	16.3	31.8	78.9	5.1	41.9
Tadepalli	11.6	0	5.8	48.2	20.	34.1	83.1	11.3	47.2
Mangalagiri	15.7	0	7.8	48.4	22.2	35.3	80.6	9.87	45.2

5.2.3 Wind pattern for the study period

The wind pattern during the study period is depicted in the form of wind rose in the Figure-5-2. The wind rose depicts that the predominant wind direction is from the South West quadrant followed by the East direction. The wind frequency class distribution reflects that the calms prevailed for 54.57% of the total period during the study and the 0.5m/sec - 2.1 m/sec class prevailed for about 43.8% of the total period.

5.2.4 Temperature

The temperature ranged from a minimum of 21.8 ^{0}C to a maximum of 46.7 ^{0}C while the average was found to be 31.49 ^{0}C.

5.2.5 Relative humidity

The relative humidity ranged from a minimum of 15% to a maximum of 100% while the average was computed to be 78.2%

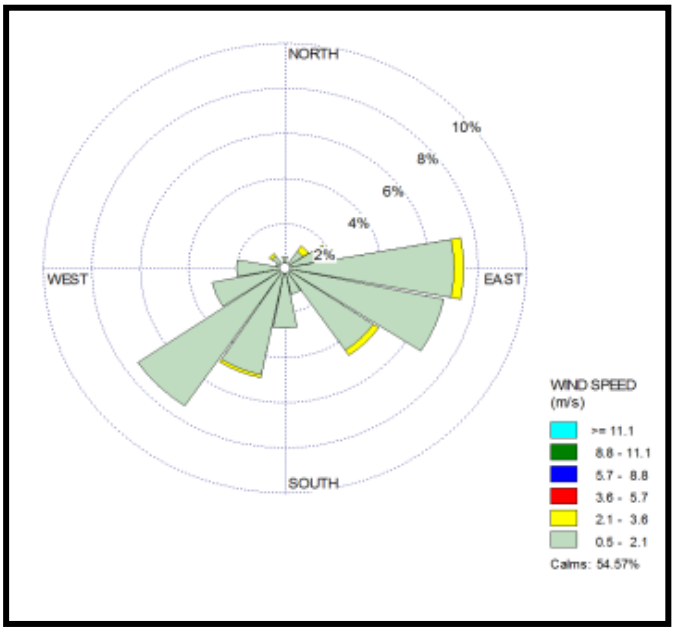


Figure 5-2: Site specific wind rose for the study period (Wind Blowing from)

5.3 Ambient Air Quality

The prime objective of the baseline ambient air monitoring was to evaluate the existing air quality of the area while the secondary objective was to establish the baseline levels of air quality on which the predicted ground level concentrations based on air quality modelling exercise would be superimposed. This would also be useful for assessing the conformity to standards of the ambient air quality during the operation of the proposed project. The ambient air quality was monitored at ten (10) locations in and around the project site.

5.3.1 Methodology

Ambient air quality monitoring has been carried out with a frequency of two days per week at ten (10) locations during the study period. The ambient air quality parameters along with their frequency of sampling are given in Table 5-5.

Table 5-5: Monitored Parameters and Frequency of Sampling

S. No	Parameters	Sampling Frequency
1.	Particulate Matter (PM_{10})	24 hourly sample twice a week for three months
2.	Particulate Matter ($PM._{2.5}$)	24 hourly sample twice a week for three months
3.	Sulphur dioxide (SO_2)	24 hourly samples twice a week for three months
4.	Oxides of Nitrogen (NO_x)	24 hourly samples twice a week for three months

S. No	Parameters	Sampling Frequency
5.	O_3	8 hourly samples twice a week for three months

5.3.2 Sampling and Analytical Techniques

$PM_{2.5}$ and PM_{10} have been estimated by gravimetric method. Modified West and Gaeke method (IS-5182 Part-II, 1969) has been adopted for estimation of SO_2. Jacobs-Hochheiser method (IS-5182 Part-IV, 1975) has been adopted for the estimation of NOx. The techniques used for ambient air quality monitoring and its minimum detectable levels are given in Table 5-6.

Table 5-6: Techniques Used for Ambient Air Quality Monitoring

S. No.	Parameter	Technique	Technical Protocol	Minimum Detectable Limits ($\mu g/m^3$)
1.	PM_{10}	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)	5.0
2.	$PM_{2.5}$	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)	4.0
3.	Sulphur Dioxide	Modified West and Gaeke	IS-5182 (Part-II)	4.0
4.	Nitrogen Oxide	Jacob & Hochheiser	IS-5182 (Part-VI)	4.0
5	CO	Gas Chromatography		
6	O_3	Online Ozone meter		

Source: Bureau of Indian standards

Ambient air quality monitoring analysis report enclosed as **Annexure – VII.**

5.3.3 Findings

- The concentration of $PM_{2.5}$ was found to be between 15 $\mu g/m^3$ (Vykuntapuram) to 47 $\mu g/m^3$. (Mangalagiri).
- The concentration of PM_{10} was between 35 $\mu g/m^3$ (Vykuntapuram) to 53$\mu g/m^3$ (Venkatapalem).
- The SO_2 concentrations were between 10 $\mu g/m^3$ (Abbirajupuram) to 18 $\mu g/m^3$ (Venkatapalem).
- The NO_x concentrations were between 20 $\mu g/m^3$ (Nekkallu) to 29 $\mu g/m^3$ (Sakhamuru).

The concentrations of all the air quality parameters as monitored during the baseline study are within the permissible limits as per the NAAQ Standards as prescribed by MoEF&CC.

5.4 Noise Levels

The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound, which is composed of many frequency components of various loudness distributed over the audible frequency range.

The impact of noise sources on surrounding community depends on:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature.)
- The time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance.
- The location of the noise source, with respect to noise sensitive land use, which determines the loudness and period of exposure.

The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance; depending on loudness of noise levels. The main objective of noise monitoring in the study area is to establish the baseline noise levels and assess the impact of the likely noise expected due to construction and operation of proposed project.

5.4.1 Methodology

Noise survey has been conducted in the study area covering two zones viz., Residential, and commercial. The noise monitoring has been undertaken for 24 hrs at each location.

5.4.2 Findings

The ambient noise levels measured and analysed for equivalent noise levels viz. L_{eq} (24hrly), $L_{day,}$ and $L_{night\ at}$ all the noise monitoring locations for the study period are presented in Table 5-7.

Table 5-7: Leq (day) and Leq (night) at Noise Monitoring Locations

S. No	Station	Leq day dB(A)	Leq night dB(A)	WB-EHS Guidelines Leq day dB(A)	WB-EHS Guidelines Leq night dB(A)
1	Thullur	55.3	39.4	55	45
2	Mandadam	48.6	42.5	55	45
3	Ainavolu	53.6	39.6	55	45
4	Kuragallu	56.7	38.3	55	45
5	Nekkallu	53.9	40.0	55	45
6	Sakhamuru	58.7	54.6	55	45
7	Abbirajupalem	53.2	38.6	55	45
8	Vykuntapuram	46.8	41.0	55	45
9	Venkatapalem	62.3	41.8	55	45
10	Mangalgiri	70.8	63.7	55	45

5.4.2.1 Residential Zone

The Leq day for the residential zone was observed to be in the range of 46.8 dB (A) (Vykuntapuram) to 62.3 dB (A) (Venkatapalem).

The Leq night for the residential zone was observed to be in the range of 38.3 dB (A) (Kuragallu) to 54.6 dB (A) (Sakhamuru).

The ambient noise levels in the villages are under the influence of local agriculture and the Leq values are within permissible limits in almost all the villages.

5.4.2.2 Commercial Zone

The Leq day for the commercial zone at Mangalagiri was found to be 70.8 dB (A) while the Leq for the night was found to be 63.7 dB (A) and were found to exceed the CPCB limits for the commercial zone –both for the day time and the night time.

5.5 Water Quality

Water quality is a term used to express the suitability of water to sustain various uses or processes. Any particular use will have certain requirements for the physical, chemical or

biological characteristics of water; for example limits on the concentrations of toxic substances for drinking water use, or restrictions on temperature and pH ranges for water supporting invertebrate communities. Consequently, water quality can be defined by a range of variables which limit water use. Although many uses have some common requirements for certain variables, each use will have its own demands and influences on water quality.

Quantity and quality demands of different users will not always be compatible, and the activities of one user may restrict the activities of another, either by demanding water of a quality outside the range required by the other user or by lowering quality during use of the water. Efforts to improve or maintain a certain water quality often compromise between the quality and quantity demands of different users. There is increasing recognition that natural ecosystems have a legitimate place in the consideration of options for water quality management. This is both for their intrinsic value and because they are sensitive indicators of changes or deterioration in overall water quality, providing a useful addition to physical, chemical and other information.

The composition of surface and underground waters is dependent on natural factors (geological, topographical, meteorological, hydrological and biological) in the drainage basin and varies with seasonal differences in runoff volumes, weather conditions and water levels.

Human intervention also has significant effects on water quality. Some of these effects are the result of hydrological changes, such as the building of dams and diversion of flow. More obvious are the polluting activities, such as the discharge of domestic, industrial, urban and other wastewaters into the watercourse (whether intentional or accidental) and the spreading of chemicals on agricultural land in the drainage basin.

5.5.1 Methodology

Keeping the aforesaid in view the water quality (ground and surface) was studied with special reference to the parameters mentioned in the IS 10500. A total of 12 locations were selected to study the water quality out of which the number of surface water locations were five (5) and the ground water sampling locations were seven (7) within the project boundary.

The purpose of this study is to:

- Assess the water quality characteristics for critical parameters;
- Evaluate the impacts on agricultural productivity, habitat conditions, recreational resources and aesthetics in the vicinity; and
- Predict the likely impacts of water quality due to the project and related activities.

Fifteen surface water and twenty ground water samples were collected as grab samples and analysed for various parameters. The analysed results were compared with the standards for drinking water as per IS 10500.

Surface and ground water sample analysis report enclosed as **Annexure – VIII.**

5.5.2 Findings

5.5.2.1 Finding on Ground water samples

- The maximum value of chlorides (580 mg/lit) at Anantavaram was found to exceed the acceptable limit as per IS 10500 for drinking water (250 mg/lit) considerably.
- The maximum value of TDS (2692 mg/lit) at Anantavaram was found to exceed the acceptable limit for the same as per IS 10500 for drinking water (500 mg/lit). The TDS value exceeds the permissible limits at many locations in the study area.
- The maximum value of sulfates (258 mg/lit) at Ananthavaram was found to exceed the acceptable limit for the same as per IS 10500 for drinking water (200 mg/lit).

5.5.2.2 Finding on Surface Water Samples

- The value of TDS is very high at Thullur (1464 mg/lit) and Lake near Mandadam (3031 mg/lit), TDS was found to exceed the acceptable limit for the same as per IS 10500 for drinking water (500 mg/lit) at many locations within the study area.
- The maximum value of chlorides (578 mg/lit) at Lake near Mandadam was found at to exceed the acceptable limit for the same as per IS 10500 for drinking water (250 mg/lit), the values of Chlorides are within permissible limits in all other locations.
- The maximum value of Sulfates (296 mg/lit) was found to exceed the acceptable limit for the same as per IS 10500 for drinking water (200 mg/lit) at only one location in a lake near Mandadam.
- The higher values of the parameters which exceed the desirable limits as per IS10500 may be potentially attributed to the agricultural activity and localized anthropogenic activities.
- The maximum value of nitrates (86 mg/lit) was found to exceed the acceptable limit for the same as per IS 10500 for drinking water (45 mg/lit) at only one location in a lake near Mandadam.

5.6 Hydrogeology

Central Ground Water Board Report presents the study area predominantly covered under Alluvium formation. The thickness of alluvium varies from a few meters to over 100m. The deltaic alluvium found in palaeo/ buried channels upto 30m depth with thick graveliferous sand. Ground water is being developed in the flood plain areas along river course mostly through filter-points and shallow tube wells with yields ranging from 3 to over 15 lps as observed around Rayapudi and Borupalem areas of Amaravati and Thullur mandals. The depth to water level in the alluvium ranges from ground level to 5-12m bgl with poor to moderate discharges. In deltaic alluvium ground water is brackish in nature.

The details of hydro-geomorphological unit (HGM Unit) in the project area are given as Table 5-8.

Table 5-8: Hydro-Geomorphological Units in the project area

S. No	HGM UNIT	Area in Sq. Km
1	Canal	0.10
2	Channel Bar (CB)	9.09
3	Denudation Hill (DH)	0.78
4	Flood Plain Deep (FDP) 20-30m	28.76
5	Inselberg (I)	0.45
6	Pediment (PD)	3.17
7	Pediment (PD) 1-4m	1.44
8	Pediplain Moderately Weathered(PPM,11-18m)	1.04
9	Pediplain Shallow Weathered(PPS,6-9m)	141.40
10	River	25.23
11	Structural Hill (SH)	3.44
12	Tank	2.13

As observed from the hydrogeological map, the project is covered predominantly under Shallow weathered Pediplain.

5.7 Soil Characteristics

Table 5-9: Soil classification

S.No	Soil Tests	Classification	
1	pH	<4.50 extremely acidic	6.50-7.30 neutral
		4.50-5.00 very strongly acidic	7.30-7.80 slightly alkaline
		5.00-5.50 strongly acidic	7.60-8.50 moderately alkaline
		5.50-6.00 moderately acidic	8.50-9.00 strongly alkaline
		6.00-6.50 slightly acidic	9.00 very strongly alkaline
2	Electrical Conductivity (mmhos/ cm)	upto 1.00 average	
		1.01-2.00 harmful to germination	
		2.01-3.00 harmful to crops sensitive to salts	
3	Organic Carbon	upto 0.2 : very less	0.61-0.8 : on an average sufficient
		0.21-0.4 : less	0.81-1.0 : Sufficient
		0.41-0.5 : medium	>1.0 : more than sufficient
4	Nitrogen (kg/ha)	upto 50 very less	151-300 better
		51-100 less	above 300 sufficient
		101-150 good	
5	Phosphorus (kg/ha)	upto 15 very less	51-65 on an average sufficient
		16-30 less	65-80 sufficient
		31-50 medium	above 80 more than sufficient
6	Potash (kg/ha)	0 – 120 very less	241-300 average
		120-180 less	301-360 better
		181-240 medium	above 360 more than sufficient

5.7.1 Results and discussion

The soil samples were analysed for all the important parameters like pH, electrical conductance, calcium, magnesium, nitrogen, phosphorus, potassium, etc. The NPK represents the nutrients available in the soil, which directly indicates the soil fertility. The range of variation of different parameters found in the study area is explained briefly below. Soil Quality analysis report enclosed as **Annexure – IX.**

5.7.2 pH

The pH values in the study area are varying from 5.4 (Abbirajupalem) to 8.2 (Ainavolu) showing strongly acidic to moderately alkaline nature during entire study period when compared to the soil classification Table 5-9 above.

5.7.3 Electrical Conductivity

The electrical conductivity (20%) in the soil samples was in the range of 205 (Nekkallu) to 1009 µmhos/cm (Lingayapalem). Hence in study area- the available soil is of good quality.

5.7.4 Nitrogen, Phosphorous and Potassium

The nitrogen content in the soil samples analysed was in the range of 60 kg/ha (Nekkallu) to 204 kg/ha. (Abbarajapalem & Sakhamuru).The nitrogen content varies from "less" to "better" as per soil classification table above.

The phosphorous presence in the samples analysed was found in the range of 34 kg/ha (Ananthavaram) to 158 kg/ha (Abbirajupalem). The phosphorus content varies from "medium" to "more than sufficient" as per the soil classification table above.

The total potassium is varying between 49 kg/ha (Ananthavaram) – 256 kg/ha (Lingayapalem). The total potassium varied from "very less" to "average" as per the soil classification table above.

5.8 Traffic Situation

The traffic survey was conducted on four roads for ascertaining the vehicle count on the as per the Table 5-10 below

Table 5-10: Details of traffic survey

S. No	Road	Dates of vehicle count	Category of vehicles counted
1.	Amaravati to Thullur Road	1.6.15 to 2.6.15 6.6.15 to 7.6.15 8.6.15 to 9.6.15 13.6.15 to 14.6.15	2 wheeler 3 wheeler LMV (4 wheeler) Heavy Motor Vehicles
2.	Thullur to Tadikonda Road	1.6.15 to 2.6.15 6.6.15 to 7.6.15 8.6.15 to 9.6.15 13.6.15 to 14.6.15	
3.	Pedaparimi to Mangalgiri Road	1.6.15 to 2.6.15 6.6.15 to 7.6.15 8.6.15 to 9.6.15 13.6.15 to 14.6.15	
4.	Thullur to Undavalli Road	1.6.15 to 2.6.15 6.6.15 to 7.6.15 8.6.15 to 9.6.15 13.6.15 to 14.6.15	

The worst case scenario of traffic i.e., maximum traffic in terms of no. of total vehicles on each road is discussed below and the findings are presented in Table 5-11.

Table 5-11: Worst case traffic scenarios on each road

S. No	Road	Date	2wheeler Total No of vehicles (% of total)	3Wheeler Total No of vehicles (% of total)	LMV(4wheeler) Total No of vehicles (% of total)	HMV Total No of vehicles (% of total)
1	Amaravati to Thullur Road	06.06.2015 to 07.06.2015	4010 (66%)	316 (6%)	927 (15%)	816 (13%)
2	Thullur to Tadikonda Road	01.06.2015 to 02.06.2015	7846 (66%)	1035 (9%)	1674 (14%)	1357 (11%)
3	Pedaparimi to Mangalgiri Road	01.06.2015 to 02.06.2015	4357 (65%)	557 (8%)	1035 (15%)	796 (12%)
4	Thullur to Undavalli Road	06.06.2015 to 07.06.2015	5505 (64%)	795 (9%)	1448 (2%)	826 (10%)

Amaravati to Thullur Road: The highest no. of total vehicles on this road was found to be from 6.6.2015 to 7.6.2015. The trend reflected that the highest no. of vehicles by category were 2 wheelers (66%) followed by Light Motor vehicles (15%), Heavy motor vehicles (13%) and lastly 3 wheelers (6%) in descending order.

Thullur to Tadikonda Road: The highest no. of total vehicles on this road was found to be from 1.6.2015 to 2.6.2015. The trend reflected that the highest no. of vehicles by category were 2 wheelers (66%) followed by Light Motor vehicles (14%), heavy motor vehicles (11%) and lastly 3 wheelers (9%) in descending order.

Pedaparimi to Mangalgiri Road: The highest no. of total vehicles on this road was found to be from 1.6.2015 to 2.6.2015. The trend reflected that the highest no. of vehicles by category were 2 wheelers (65%) followed by Light Motor vehicles (15%), heavy motor vehicles (12%) and lastly 3 wheelers (8%) in descending order.

Thullur to Undavalli Road: The highest no. of total vehicles on this road was found to be from 6.6.2015 to 7.6.2015. The trend reflected that the highest no. of vehicles by category were 2 wheelers (64%) followed by Heavy Motor vehicles (10%), 3 wheeler (9%) and lastly light motor vehicles (2%) in descending order.

5.9 Ecology and Biodiversity

5.9.1 Terrestrial ecology

5.9.1.1 Methodology

- Secondary data collection from previous reports
- Requisite data collection from the local Forest Dept. office
- Detailed, quantitative pre-monsoon biodiversity survey for plants, four vertebrates (mammals, avifauna, reptiles, amphibians), and insects using quadrate and transect-based analysis

- Data interpretation and analysis to yield phyto-sociology indices (IVI) and diversity indices including Simpson's and Shannon Wiener's, apart from density and abundance values using standard formulae
- Photo presentation of flora and fauna of the entire study area
- List of flora and fauna species with IUCN category and schedule as per The Wildlife Protection Act, I972

Chiefly, 25 villages are covered under 3 mandals – Thullur, Mangalagiri and Tadepalli. 15 Transects were laid across the project site and 10km beyond the boundaries, extending to Kondapalli reserve forest in the north, Tadikonda and Peddakonda in the south, Chevapandu in the west and Peddavadiapuddi in the east. Of these, 4 transects were laid inside Kondapalli (Table 5-12). In addition, short line transects were laid along the main longer transects and mammals, avifauna, herpeto-fauna and insects sighted were enlisted along with the number of individuals sighted.

Table 5-12: List of Transects

Transect No	Direction	Length in km	Chief villages/ hamlets
1	East-west, parallel to Krishna River	20 km	Venkatapalem is about 500m away
2	East-west, parallel to Transect 1 road	17 km	Krishnayapalem, Mandadam, Velagapudi, Rayapudi, Abbarajupalem, Borupalem
3	North-south	3 km	Undavalli, Penumaka
4	North-south	21 km	Mangalagiri
5	North-south mostly, east-west in the end	11 km	Peddavadiapuddi
6	East-west	20 km	Mangalagiri, Nowluru (rural), Kuragullu, Neerukonda, Nekkallu, Chevapadu
7	North-south	11 km	Borapalem, Dondapadu, Ananathvaram, Nekkallu
8	East-west, then a V-shaped transect to Pedda Konda hills	17 km	Tadikonda
9a, b, c, d & e	Kondapalli RF	1.5-2 km	Inside Kondapalli
10	North-south	11.5 km	Venkatapalem to Ainavolu to Sakhamuru to Neerukonda
11	North-south	5 km	Rayapudi to Thullur to Mandalam Office to Sakhamuru

5.9.1.2 Findings

Considering that most of the study area was under agriculture, a list of crops and horticultural plants was prepared with observation and augmented with the interview of local farmers (Table 5-13).

Table 5-13: Lists of Agricultural Crops and Plantations

S. No.	Common Name	Scientific Name	Remarks
1	Banana	*Musa* sp.	Transect 1 (at Venkatapalem) Transect 3 (at Undavalli)
2	Gherkins	Cucumis anguria	Transect 1 (at Venkatapalem)
3	Rice	Oryza sativa	Transect 3 (at Penumaka)
4	Maize	Zea mays	Transect 2 (at Krishnayyapalem, Velagapudi) Transect 3 (at Penumaka) Transect 6 (at Chevapadu) Transect 7 (at Dondapadu, Borupalem)
5	Sugarcane	Saccharum sp.	Transect 3 (at Velagapudi, Undavalli, Penumaka)
6	Drumsticks	Moringa oleifera	Transect 3 (at Undavalli, Penumaka)
7	Cotton	Gossypium sp.	Transect 6 (at Chevapadu) Transect 7 (at Borupalem) Transect 10 (at Ainavolu, Velagapudi)
8	Citrus	--	Transect 7 (at Borupalem)

Forest

A forest ecosystem is typically associated with land masses covered in trees and those trees are often classified by foresters into forest cover types. Significance: A forest ecosystem & its community are directly related to species diversity. This system supports interacting units including trees, soil, insects, animals, and man.

Ecological Role: In addition to assisting in climate control, forests have other ecological benefits. They prevent erosion by reducing the rainfall's force on the soil's surface and by absorbing water and not allowing it to directly run off and remove topsoil. Forests also act as water filters, collecting and storing water and recharging underground aquifers. Forests also increase the atmosphere's humidity by transpiration, which affects temperature and rainfall. However, there is forest cover in the project area.

Rocky outcrop

Outcrops along steep ravines & in monumental rocky landscapes forces openings in forest canopies revealing the foundations of terrains contributes Rocky outcrop ecosystem. Significance: Rocky outcrop ecosystem provide niche habitat to unique and unusual species. The structure & biological composition of Rocks provide important shade & shelter, roosting, feeding, & nursery areas for birds & other species.

Within the study area, rocky outcrops were observed at Undavalli (where the Undavalli caves are present) and Tadepalli, Neerukonda, and Ananthvaram. Beyond its boundary, rocky outcrops were located at Pedukonda and Tadikonda in the south, at Chevapadu in the west and at Mangalagiri in the east.

The list of trees (Floral species) found in the study area is given in Table 5-14.

Table 5-14: Floral list in Study area

Sr. No.	Tree/ Plant Species	Frequency	Number
1.	Azardhrichta indica	135	590
2.	Acacia Nilotica	144	749
3.	Delonix regia	53	148

Sr. No.	Tree/ Plant Species	Frequency	Number
4.	Ficus benhgalensis	15	42
5.	Thespesia populnea	18	39
6.	Ficus religiosa	20	39
7.	Tamarindus indica	6	25
8.	Mangifera indica	15	44
9.	Albizia saman	36	81
10.	Borassus flabellifer	29	59
11.	Ancardium occidentale	8	14
12.	Ficus hispida	6	14
13.	Syzygium cumini	5	15
14.	Leucaena leucocephala	13	27
15.	Grewia asiatica	32	88
16.	Dalbergia sissoo	19	34
17.	Albizia lebbeck	8	18
18.	Tectona grandis	3	8
19.	Saraca asoca	12	26
20.	Gliricidia sepium	2	77
21.	Eucalyptus	10	25
22.	Maerua apetala	4	6
23.	Cordia dichotoma	1	1
24.	Ixora pavetta	1	2
25.	Psidium guajava	1	3
26.	Annona Squamosa	1	2
27.	Ficus arnottiana	1	3
28.	Pongamia Pinnata	1	2
29.	Trema orientalis	5	15
30.	Phoenix syvestris	2	4
31.	Peltophorum pterocarpum	7	12
32.	Cassia fistula	13	29
33.	Lannea coromandalica	1	2
34.	Wrightia tomentosa	32	55

5.9.2 Tree Survey along the Proposed Canals

Tree survey is carried out for all the proposed canals of it's both banks for the purpose of relocating and cutting. The summary of the affected trees along different canals are given in Table 5-15.

Table 5-15: Summary of the Affected Trees

Sr. No.	Canal	No. of Trees		Affected Trees	
		Right Bank	Left Bank	To be cut	To be re-located
1.	Kondaveeti Vagu	255	234	296	85
2.	Pala Vagu	117	152	127	21
Total		**372**	**386**	**423**	**106**

The list of species for each canal with details like its DBH, health, length and location etc. are given at **Annexure XXIV.**

5.9.3 Aquatic Ecology

5.9.3.1 Methodology

- Collection of 5 sediment samples for analysis of micro and macro benthos – analysis to include characterization, identification, and calculation of univariate diversity indices (Shannon Wiener's, Pielou's Evenness and Margalef's measure of richness)
- Collection of 5 water samples for analysis of phytoplankton and zooplankton
- Identification of the fisheries based on the secondary data from the local fisheries office/ department.
- Delineation of impacts due to the project on the terrestrial ecology and the mitigation measures proposed thereof

5.9.3.2 Findings

An interview of fishermen yielded data of the fish catches obtained from Krishna River (**Table 5-16**). In **Table 5-17**, benthic organisms sampled from 5 locations of River Krishna have been enlisted. Phyto and zooplankton have been enlisted in **Table 5-18 and 5-19**, respectively.

Table 5-16: List of Fish from River Krishna (as per a survey of local fishermen)

S. No.	Common Name	Scientific Name	IUCN Status
1.	Giant snake-head Fish	Channa micropeltes	Least Concern
2.	Panchax	Aplocheilus panchax	Least Concern
3.	Rohu	Labeo rohita	Least Concern
4.	Giant River Prawn	Macrobrachium rosenbergii	Least Concern
5.	Tilapia	--	Least Concern
6.	Guppy	Poecilia reticulata	Least Concern
7.	Barb	Barbus sp.	Least Concern

Table 5-17: Benthos from River Krishna

Name	Bhavani Island	Prakasam Barrage	Tadepalli	Varath Bridge	Guntupalli	%
Gastropods	50	175	--	125	--	11.29
Peleypods	100	175	--	25	--	9.68
Brachyuran	25	--	--	--	--	0.81
Ostracods	125	--	--	--	--	4.03
Polychaetes	25	--	--	--	--	1.61
Oligochaetes	600	325	--	--	100	13.87
Chironomus larvae	300	100	25	--	--B	13.71

N.B. All figures are actual numbers/kg sediment sample

Table 5-18: Phytoplankton's from River Krishna

Name	Bhavani Island	Prakasam Barrage	Tadepalli	Varath Bridge	Guntupalli
Navicula	78	30	-	2	6
Suriella	36	50	14	-	4
Tabellaria	6	-	-	-	-
Cyclotella	14	22	-	26	5
Sygnema	6	2	-	-	-
Scenedesmus	24	-	2	150	2

Name	Bhavani Island	Prakasam Barrage	Tadepalli	Varath Bridge	Guntupalli
Ulothrix	8	2	-	-	6
Coelastrum	4	-	-	-	-
Netrium	12	-	-	-	-
Closterium	4	-	-	-	4
Cymbella	2	-	-	-	4
Synedra	4	-	-	-	-
Oscillatoria	14	24	12	50	-
Asterionella	4	-	-	-	-
Rivularia	4	-	2	2	-
Diatoms	8	22	-	-	-
Ankistrodesmus	-	4	-	-	-
Nitella	-	4	-	-	-
Amphora	-	26	4	-	-
Hydrilla	-	10	-	-	-
Volvox	-	4	2	6	4
Spirogyra	-	14	-	-	-
Fradillaria	-	1	2	-	-
Closterium	-	4	-	-	-
Microspora	-	1	-	-	-
Pediastrum	-	-	-	30	2

High numbers of *Scendesmus* sp. at Varathi Bridge indicate algal bloom and eutrophication at that location.

Table 5-19: Zooplanktons from River Krishna

Name	Bhavani Island	Prakasam Barrage	Tadepalli	Varath Bridge	Guntupalli
Insect larvae	11	-	2	7	8
Decapod larvae	1	-		-	2
Nauplius	13	-	6	3	6
Cyclopoid	5	-	2	7	1
Diatoms	-	2	-	13	1
Chironomus larvae	6	21	-	21	-
Streptocephalus	-	-	-	1	-
Chillodenella	-	-	-	2	-
Daphnia	11	1	1	1	-
Tadpole	-	-	-	11	-
Heterodera	1	1	1	-	-
Brachionus sps	15	4	1	-	-
Amphipods	-	1	-	-	-
Decapod oona	-	1	-	-	-
Lucifers	-	-	-	-	-
Metepus	7	1	-	-	-
Cocconeis	-	2	-	3	-
Fish larvae	4	4	-	-	-
Sida	-	1	-	-	-
Mysids	3	-	-	-	-

Long term impact of aquatic ecology should be monitored in up-stream and downstream for Kondaveeti Vagu, Pala Vagu and Krishna River. The aquatic life may get impacted not only due to new Capital city, but also due to several other projects planned on Krishna River. A comprehensive study is recommended for this aspect.

The Krishna river Bio-resources study is referred for the analysis of findings for flora and fauna for the river[8].

5.10 Other Fauna Species

The following list of aquatic birds has been compiled based on primary sightings.

Table 5-20: Aquatic Birds

Sr.No	Common Name	Scientific Name
1	Common moorhen	*Gallinula chloropus*
2	White-breasted waterhen	*Amaurornis phoenicurus*
3	Common coot	*Fulica atra*
4	Pond heron	*Ardeola grayii*
5	Purple heron	*Ardea purpurea*
6	Cattle egret	*Bubulcus ibis*
7	Great egret	*Ardea alba*
8	Little cormorant	*Microcarbo niger*
9	Asian Open bill	*Anastomus oscitans*
10	Common kingfisher	*Alcedo atthis*
11	Pied kingfisher	*Ceryle rudis*
12	Bronze-winged jacana	*Metopidius indicus*
13	Pheasant-tailed jacana	*Hydrophasianus chirurgus*
14	Spot-billed duck	*Anas poecilorhyncha*
15	Little grebe	*Tachybaptus ruficollis*

During the primary survey no aquatic mammals and amphibians were sighted. Hence, secondary data was collated from approved field guides. Range of the amphibians as shown by Daniel J.C. (2002) was used to compile the following list.

Table 5-21: Amphibians

Sr.No	Common Name	Scientific Name
1.	Common Indian Toad	*Bufo melanostictus*
2.	Common tree Frog	*Polypedates maculatus*
3.	Skittering Frog	*Euphlyctis cyanophlyctis*
4.	Indian Bull frog	*Hoplobatrachus tigerinus*

Reference: Daniel, J.C. (2002). The Book of Indian Reptiles and Amphibians: Oxford

In addition, domesticated animals have been observed in the project area. Details of the same has been presented hereunder

S.No	Animal	Approximate Number
1.	Buffalo	1,00,000
2.	Pig	50,000
3.	Cow	200
4.	Sheep	5,000
5.	Goat	1,500

**After interaction with locals and with authorities from Vijayawada Veterinary College*

[8] http://faunaofindia.nic.in/PDFVolumes/occpapers/160/index.pdf

5.11 Physical and Cultural Resource

5.11.1 Undavalli Caves

The famous Undavalli caves an archeologically important site falls within the project boundary. The proponent will follow respective regulation in this regard.

Table 5-22: Sensitive cultural/ religious property within 10km radius of the Kondaveeti vagu canal

S. No	Name of the sensitive cultural/ religious property	Distance between sensitive cultural/ religious property of Kondaveeti Vagu (Km)
1	Undavalli Caves	0.30
2	Durga Devi Temple	5.4
3	Mangalagiri Panakala Swamy Temple	8.4

The Undavalli Caves – also referred to as the Rock Cut Cave Temple at Undavalli – is a protected monument so identified by the Archaeological Survey of India, Government of India. It is a four storied rock-cut temple about 29 meters long and 16 meters wide dating back to the 6th – 7th century AD.

The capital region master plan has integrated this monument in overall plan for the capital region development. This monument will be conserved in its original entity. All the activities under Flood mitigation project would be carried out beyond the 300m radii of this important monument.

5.11.2 Ancient Monuments and Archaeological Sites and Remains Rules 1959

Enclosed as Annexure – XIII.

5.12 Land use/ Land cover (LU/LC)

The term 'land use' used in this section includes land use and land cover together. The land use study was undertaken by utilising three principal resources: namely:

- Survey of India (SOI) Topo-sheets no. E44-U6, U7, U10 and U11 of 1:50,000 scale;
- Digital Globe's WorldView-2 Satellite Image (WorldView-2) in Geo-coded False Color Composite (FCC) and
- Ground truth validation for the FCC imageries.
- During DPR stage Land Use (LU) pattern of 2013-14 has been considered as provided by Amaravati Development Corporation (ADC). The LU is given at Annexure II.

5.13 Socio-Economic Environment

Socio-Economic study of the area is a part of Environmental impact assessment study for the proposed new city project area. Socio-Economics, a component of environment includes description of demography, available basic amenities like housing, health care services, transportation, education and cultural activities. Information on the above mentioned parameters has been collected to define the socio-economic profile of the study area

5.13.1 Methodology

The socio-economic baseline profile of the study area is a representation of the primary survey done in the sample villages in and around the proposed project area. Data from secondary sources like the Primary Census Abstract and Village Directory of 2011, District statistical abstract, has also been utilized to profile the socio-economic condition of the community.

Study consisted of data collation on the baseline social and economic indices of the study area. Relevant data were presented under various subheadings, including: social environment (socio-cultural/ Demography, education and literacy) economic survey includes the (worker details, employment/ unemployment, etc.)

5.13.2 Findings

5.13.2.1 Demography

As per the 2011 census the total population of the project area is 97906. Out of the total population of the project area male's population is 48677 and female population is 49229. The proportion of SC/ST population is 29.67% & 4.36%. Demographic details are presented in the Table 5-23 below

Total population of the study area is 262816. Out of the total population the male population is 131383, and female population is 131433 with the sex ratio of the 1000 is higher than the state level which is 940 females per 1000 male. It is indicates that the male and female population ratio is equal in the study area .the proportion of the SC and ST population is 29% and 3%.

Table 5-23: Demographic details of the project area and study area

Sl No	Demographic features	Project area	Study area (10kms)
1	Number of Houses	27271	72123
2	Total Population	97906	262816
3	Total Male population	48677	131383
4	Total Female population	49229	131433
5	Sex ratio (Per 1000 Male)	1011	1000
6	Total Population (0-6yrs)	9786	25879
7	Male population (0-6yrs)	4975	13121
8	Female population (0-6yrs)	4811	12758
9	Sex ratio (Per 1000 Male) (0-6yrs)	967	972.3344
10	SC population	29051(29.67%)	77780(29.59%)
11	ST Population	4275(4.36%)	9187((**3.49%)**

Source: Census C.D. 2011 of Andhra Pradesh

5.13.2.2 Literacy

As per the table the literacy rate for the project area is 62% which is lower than the state literacy level which is 67%. However, there is a significant gap between male (33%) and female (28%) literacy rate. In the study area male literacy rate is 33% and female literacy rate is 27%. The details of the literacy rate given in the Table 5-24 below

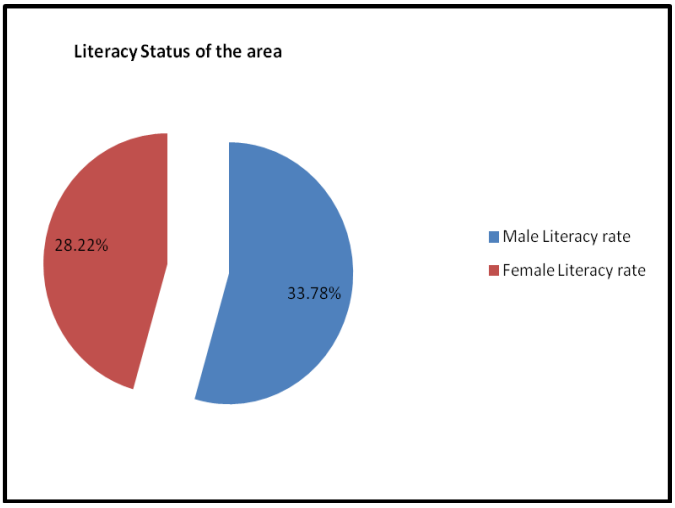


Figure 5-3: Literacy status of the area

Table 5-24: Literacy details of the area given in the below table

S. No	Literacy Level	Project Area	Study Area
1	Total No. of Literates	60706	159399
2	No. of Male Literates	33075	87550
3	No. of Female Literates	27631	71849
4	Total Literacy Rate	62%	60.65%
5	Male Literacy Rate (%)	33.78%	33.31%
6	Female Literacy Rate (%)	28.22%	27.33%

Source: Census C.D. 2011 of Andhra Pradesh

5.13.2.3 Economic Activity

The major economic source of the area is agriculture and allied activities, and the major crops grown are paddy, cotton, chilly, corn, maize, vegetables, etc.

5.13.2.4 Work participation

Work participation in the project area is only 50.47%. From that main workers are 46.45%, from the main workers cultivators are (5.96%) & other allied activity workers are 12.86% and rest is marginal workers which are 4.01%, the non-worker population covered the major portion of the population which is 49.52%.

In the study area total main worker population is 45%, from that cultivators are 7%, main allied activity workers are 26%, and household and OT workers are 0.63% & 11%, the marginal population of the area is 5% and the major portion covers the non-worker population which is 49%.the details of the work participation given in the Figure 5- 4 and Table – 5-25.

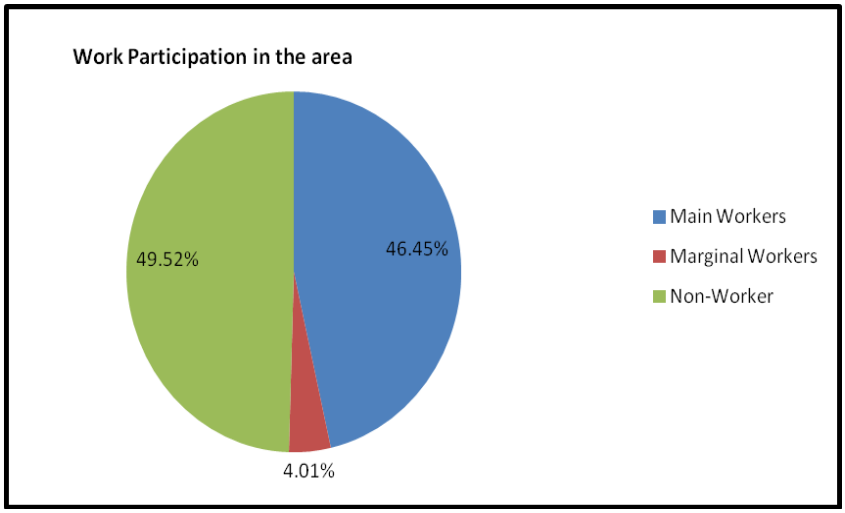


Figure 5-4: Work Participation in the Study Area

Table 5-25: Work participation in the study area

S. No	Work Participation	Project Area	Study Area
1	Total Worker	49145 (50.47%)	133864(50.93%)
2	Main Worker	45483 (46.45%)	120262(45.75%)
3	Cultivators	5840 (5.96%)	18776(7.14%)
4	Main AL	26276 (26.83%)	70585(26.85%)
5	HH Industry	772 (0.78%)	1665(0.63%)
6	OT Workers	12595 (12.86%)	29236(11.12%)
7	Marginal Workers	3932 (4.01%)	13602(5.17%)
8	Non Workers	48491 (49.52%)	128952(49.06%)
9	Male Non Worker	18785 (19.18%)	51514(19.60%)
10	Female Non Worker	29706 (30.34%)	77438(29.46%)

Source: Census C.D. 2011 of Andhra Pradesh

Observations based on primary survey
Following are the observations based on the primary survey

5.13.2.5 Infrastructure & Facilities

The availability of community facility as education, health, potable water, electricity, and transport facilities are important indicators of the wellbeing and Quality of Life (QoL) of villagers. Based on the socio-economic survey Infrastructural facilities exist in the area are as follows:

5.13.2.6 Community Concern & Expectation

A definitive way to measure the quality of life in this region is to ascertain the presence, accessibility and utility of the social and physical infrastructure in the study area, Lack of access can emerge either due to the absence of social and/or physical infrastructure.

Electricity
As per the survey information 90 % the sample villages having the power supply facility. The average hours of electricity available in the villages has increased during last two years

Drinking water
Availability and access to safe drinking water has been the most crucial factor involving serious health concerns in the area. All the sample villages have drinking water facility in the form of ponds, because the ground water is salty in most of the villages in the study area

Sanitation facility
The sanitation status of the sample villages shows that almost all the households had no access to sanitary latrine or constructed toilets in their houses, so people faced the sanitation problem in the area

Education
The survey of sample villages reveals that there are less number of exclusive schools in the area. However all villages have at least one primary school within each village of the study area, but higher education facility is not available in most of the villages, Most of the schools are found to be approachable through kaccha roads and within the 2-5kms away from their village.

Health Facilities
Government facilities are the only available sources for cheap curative care in the area. The surveys of the sample villages reveal that these villages didn't have access to the primary health centres (PHCs) and the majority of the PHCs were available at a distance of more than 5 kms. Overall, it is reflected that access to health facilities is not easy in most of the Villages.

Other facilities
The facilities in the sample villages as reported during survey, is seen to be rather weak. The nearest bus stop is available within an average distance of 2-5 kilometres. However most of the roads in the area are only kaccha roads.

All the people in the study area are aware of the project activity and they have mostly positive opinion towards the project activity. The general social profile in the study area is as follows:

Table 5-26: Socio-economic Survey Findings

Sr. No.	Social Attributes	Details
1.	Language:	The main language spoken in the area is Telugu.
Social Infrastructure facilities		
2.	Availability of Water:	Majority of the villages face the problem of the drinking water as the ground water is salty, and people depend on pond water for drinking purpose which is very unhygienic and causes various health problems. Few people use mineral water for drinking purpose procured from outside, which is expensive.
3.	Medical Facility:	Availability of medical facility in the area is poor, and the facilities are available at 4-5 Kms away from the villages.
4.	Education facility	Education facility is available only up to primary school level in most villages.
5.	Road facility	Approach roads to the villages are unpaved (kuccha) road. The transportation facility is poor. Minimum bus facility is available and the major mode of transportation is private auto- rickshaws and private motor vehicles.
6.	Electricity facility	Electricity is available and is on a satisfactory level and there is no problem of power outage in the area.
Objectives and Expectations		
7.	The opinions & the expectations of the people from the upcoming project activity are listed below	
8.	Land acquisition	Some villagers lost their land in the project. The compensation has been delivered to the people at the rate of new capital city policy and mostly people are satisfied with the compensation. However, some people in the area are not

Sr. No.	Social Attributes	Details
		satisfied with the compensation process and they claim that they were content with their agricultural activity.
9.	People awareness	People are aware regarding proposed project but they are not informed regarding the type of project activities. It was expressed during public consultations that project authority should create awareness regarding type of project activities.
10.	Needs and expectations	Villagers expressed their needs towards employment & expected employment & health facility from the upcoming project activity
11.	Positive opinion towards project	Majority of the people opined positively regarding the proposed project and satisfied with the compensation and land pooling process.
12.	Employment opportunity	There is large scale unemployment reported during the survey period and the proposed project will provide ample opportunities to the unemployed population.
13.	Demand for the employment	People have lost their land and don`t have employment, so they are expecting employment on priority basis.
14.	Expectations for the opportunities of the self-employment	Project effected villagers are expecting that authority should provide self-employment opportunities, so that villagers can use their compensation for self-employment purpose.
15.	Expectations for the infrastructure development	People of the project area are expecting development in infrastructure like roads, water, medical, drainage and transportation facility by the authority.
16.	Expectations regarding development	Villagers expect the project would bring development in their villages and would open up opportunity of employment and other business avenues.
17.	Mixed reactions towards project	Villagers in the project area have expressed mixed opinions regarding the pace and extent of the proposed development - the village sites (Gramakantham) development in particular.

CHAPTER 6: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 Introduction

Impact can be defined as "any alteration of environmental conditions or creation of a new set of environmental conditions, adverse or beneficial, caused or induced by the action or set of actions under consideration".

This chapter describes various social and environmental impacts identified and assessed with respect to the Flood Mitigation works during construction and operation phases.

These impacts have been ascertained as part of the overall sub-project level designs with a view to minimize impacts through design interventions as much as possible. The residual impacts which could not be addressed as part of the design exercise have been clearly identified upfront such that necessary mitigation/management measures could be designed as part of the sub – project design documents (DPRs). The process of identification of impacts and integration of design measures have been iterative through relevant stakeholder consultations. The proposed flood mitigation works would lead to several positive impacts including overall aesthetic improvement of the city, significant employment generation, protection from potential floods, future opportunity for inland waterways and thereby contributing to reduction in road traffic, future tourism opportunities and associated economic opportunities.

The expected environmental impacts of concern due to flood mitigation measures could be mainly classified under two categories:

1) Impacts associated with Construction activities
   (a) Earthwork in excavation for deepening and widening of existing streams up to uniform bed level of +11m level and the proposed gravity canal;
   (b) Excavation and gabion lining for the proposed reservoirs
   (c) Construction facilities includes construction of camp sites, labour camps, and equipment
2) Commissioning
3) Operation and maintenance
   (a) Water intake in to the canals to maintain minimum water level of +14m
   (b) Maintaining of canals and reservoirs profile and operation of pumping stations

The impact analysis considering the above is presented in the following sections
Environmental Impacts - Construction activities.

6.1.1 Impacts due Earthwork and Embankments

1. *Spoil Disposal*: The construction of flood management works could lead to significant impacts relating to management earthwork involved in widening and deepening of existing canals, construction of gravity canals, and construction of flood retention reservoirs. The total quantity of earthwork (excavation) involved in all these works is 41,427,813 Cu.m. (About 41.5 Mil.Cu.m.). Out of this quantity, 444,800 Cu.m. is needed for earthwork in filling at reservoirs, and about 475,000 top soil need to be protected. Given this, about 38.20 Mil.Cu.m. need to be disposed. If necessary arrangements are not made, this could lead to serious impacts. In order to ensure safe disposal of spoil, ADC has identified areas within the city, which need to be filled up to achieve the ground level as per the Amaravati City Master Plan. These five sites would accommodate the 38.2 Mil.Cu.m spoil generated through excavation. Bore log data and soil quality details in the project area are placed at Annexure X, which, also provides a detailed location map showing the sites to be levelled, capacity of each site to

accommodate the spoil, and connectivity to sites. The map also depicts the nearby settlements, and water bodies which have been considered for assessing the impacts of spoil disposal. The associated impacts of spoil disposal, though temporary in nature but requiring specific mitigation measures include the following:

(a) *Potential air and noise quality impacts* due to fugitive dust emissions at settlements/villages which are within 500 meters radius from the disposal sites including: (i) Nidamarru; (ii) Sakhamuru; (iii) Rayapudi; and (iv) Lingayapalem. In addition, there could be marginal air quality impacts on other villages adjacent to the access roads. Specific environmental management measures would be required to address impacts on these villages.

(b) *Sludge on Natural Stream Bed:* The flows in the streams are intermittent and most part of the year remain dry in the current conditions. The irrigation authorities as part of the routine maintenance works, prior to monsoon, desilt the stream bed which is conventionally utilized by the farmers in the nearby fields. The sludge/silt mostly comprise of alluvial deposits during flash floods occurring during monsoon. However, in order to ascertain any requirement of treatment prior to spoil disposal, necessary measures such as sediment quality testing has been provisioned in the EMP.

(c) *Traffic Impacts*: Carting of excavated material will lead to significant increase in traffic on the access roads to the disposal sites for a temporary period of about 9 to 12 months. The relevant access roads include: E3, E8, E10, E14, N4, N9, N14, and N16. These roads have already been constructed as part of capital city's trunk infrastructure development as arterial and sub-arterial roads. No other village roads need to be used as all the disposal sites are next the above referred trunk roads. However, the settlements immediately next to the above referred roads would be subjected to potential road safety risks and fugitive dust and noise pollution. These impacts need to be addressed with relevant environmental management measures. The villages/settlements along these roads include: (i) Uddandarayapalem; (ii) Venkatapalem; (iii) Mandadam; (iv) Malkapuram; and (v) Velagapudi

(d) *Erosion of disposal sites*: This impact is not expected as the spoil is planned to be used for the filling the sites identified for levelling, which, will be utilized for different land uses as per the master plan. There are no ecologically or socially sensitive areas identified at/around these sites. Please refer Annexure –X for the location of the disposal sites.

(e) *Top Soil*: earthwork excavations would generate about 475,000 Cu.m. of top soil from all the sites. In order to prevent the loss of top soil, the design considerations have already factored to use this quantity within the 30m green buffer on either sides of the canal.

2. *Stone Aggregate for Reservoir Lining:* The reservoir embankment uses about 444,800 Cu.m. Soil for raising about 2m from ground level. In addition, about 114,260 Cu.m. of stone will be used for gabion lining. The potential quarries sites (refer Annexure – XI) approved by Mines and Geology Department, GoAP include Ananthavaram, Endroy, Lemalla and Karlapudi. Development of the quarry sites may lead to environment impacts. Given this, it is important to stipulate relevant construction contract provisions to ensure that the contractor prepares quarry management and rehabilitation plans.
3. *Dewatering*: In addition to the above impacts, earthwork excavation along the canal would require dewatering as some parts of the canal would encounter low ground water table. This aspect was analyzed in detail and it's observed that the ground water table is below 6 to 7 meters. However, the dewatering requirement cannot be ruled out as some of the sections encounter areas of shallow water table. To avoid construction related inconveniences, the design provisions have factored to start construction from upper reaches and the dewatering is proposed to be discharged

downstream. The water quality discharged would be of high turbidity in nature which could lead to pollution at the ultimate end of discharges in to Krishna River. This impact need to be addressed with relevant management measures.

4. *Drainage Pattern*: would not be affected with the proposed interventions as the discharges from different sub-streams and area flows will still drain in to the proposed canals. The enhanced capacity of the canals will further improve the overall drainage pattern for flood evacuation from the area. However, there is a possibility of blocking the natural drains with construction debris (especially during construction period) and thereby affecting local level drainage pattern. In order to prevent such events, it is necessary to enforce effective measures during construction phase as part of contractor's responsibility.
5. *Loss of Vegetation*: Out of the total canal length of 48 km., about 28 km. is in the barren area. Rest of the canal length has about 758 trees on either side. Out of these, about 529 will be affected and an estimated 106 trees can be transplanted in the green buffer zone. While Annex XXIV and XXV presents detailed vegetation survey, the summary of inventory is presented below. This impact has been addressed as part of designing the overall green corridor with 30m buffer on either side of the canal. The green buffer would provide about 45,000 trees all along the canal (The green buffer zone marked along the canals is placed at Annexure XIV). This measure also ensure that the compliance with compensatory plantation under WALTA Act.

Sr. No.	Canal	No. of Trees		Affected Trees	
		Right Bank	Left Bank	To be cut	To be re-located
1.	Kondaveeti Vagu	255	234	296	85
2.	Pala Vagu	117	152	127	21

6.1.2 Impacts due to Construction Facilities

The construction facilities and the activities could lead to range of impacts which could be significant although these impacts are temporary in nature. The key expected impacts include:

1. *Labor Influx*: The proposed construction activities at Amaravati is likely to lead to considerable influx of workers to the project site as the local labor is mostly related to agriculture workers with limited or no skill for construction works. While this could lead to some demand triggering local skill base development in the long term, there could be short term adverse social impacts on the local communities. Also, the labor influx could cause serious impacts relating to public health, socio-economic changes, competing demand for community resources, etc. These impacts need to be addressed with a comprehensive environmental management plans which necessarily includes (but not limited to): (a) management labor camps with all basic amenities and facilities including drinking water, sanitation, and clean living space; (b) camp site discipline including with specific protocols defined to ensure minimal impact on local communities; and (c) strict compliance with local laws and regulations.
2. *Occupational Health and Safety*: The construction activities could lead to occupational health and safety issues if necessary care is not taken to integrate the safety management systems in to the work protocols. These include: (a) provision of personal protective equipment; (b) site safety measures; (c) equipment safety measures; and (d) medical aid in case of emergency situations. These aspects need to be enforced through comprehensive environmental management plans
3. *Construction Related Pollution*: The construction phase would lead to significant air, noise and water pollution if necessary precautionary measures are not taken up. During construction phase, the major sources of air and noise pollution will be from heavy construction operations. The construction phase impacts will be associated with land

clearing, ground excavation, cut and fill operations (earth moving) and construction works and the major concern will be particulate matter (PM10 and PM2.5) and the noise pollution near the settlements and sensitive receptors like hospitals, schools, and religious places. The villages along the canal will be most impacted. These villages include: (a) Krishnayapalem; (b) Mandadam; (c) Malkapuram; (d) Velagapudi; (e) Sakhamuru; and (f) Neerukonda. The impacts on this villages need to be addressed with specific environmental management measures which will contain the construction related pollution and night time disturbances.

4. *Wastes*: The construction activities will include storage, handling and disposal of petroleum based products such as lubricants, hydraulic fluids, or fuels. Storage/usage and/or disposal could not only cause impacts but also lead to hazards/risks of potential leakage and contamination. Similarly, there would be several other waste which may not be hazardous but could lead to in-sanitary or disorderly conditions in and around construction sites. These include: solid and liquid wastes generated from construction camps, construction waste which is not systematically disposed causing cess pools and associated disease burden, etc.

6.1.3 Social Impacts

The total land requirement for flood mitigation works for a length of about 48.4 Kms and reservoirs (as per the Blue Network DPR) is 1998.86 acres comprising (LPS – 1131.30 acres; 75.46 acres under LA, 781.72 (5.3 acres of land is occupied by encroachers) under Government lands) and 10.38 acres under R1 Zone in Village Habitation). A total of 1913.02 acres of lands are already available with CRDA through LPS corresponding to 1754 landowners who gave lands under LPS and as lands covered in existing blue network (streams), 75.46 acres of land to be acquired under LARR, 10.38 acres within village habitation (R1 zone) to be acquired under Negotiated Settlement policy. LARR Act and Negotiated Settlement Policy are expected to impact [137] families. Among these, 27 families will be physically displaced. The land requirement details for the project, impacts present status of land assembly are detailed in RAP for flood mitigation works. The consultations relating to social impacts is presented in Chapter 7 of this report

6.1.4 Impact on Cultural and Heritage Sites

Three common property resources including, one temple in Mandadam, one burial ground in Sakhamuru and one burial ground in Mandadam will be affected. The specific details in this regard are detailed out in RAP for flood mitigation works. In addition, Undavalli Cave Temple, which is listed as a 'protected monument' by the Archeological Survey of India, is located near the project area. Nearest edge of the monument is at a distance of 300 meters from the existing canal. An existing road separates the monument and the canal. This being a sensitive location, necessary precautions need to be taken during construction phase to minimize the impacts, if any. Also provisions for managing chance finds need to be integrated as part of the EMP measures. Ancient monuments and archeological sites and remains rules 1959 is placed at **Annexure – XIII**.

6.2 Environmental Impacts – Construction Phase

The proposed commissioning of Canals and Reservoirs is not expected to lead to any major impacts as these structures are not expected to hold significant volume of water above ground level. For example, the reservoirs will be less than 2m above the ground level with one third of this height will be free board. The rest of the 7m water column is below the ground level. Similarly, the canals will not have any embankment. While the risk of inundation due to breach of pondage is minimal, there could be impacts related to seepage leading to waterlogging in low lying areas. Such an impact could lead to secondary impacts on environment and health. These expected impacts have been minimized through design interventions which include: (a) lining of reservoirs with 1m impervious soil layer; (b) gradual filling of canals over a period of two years, covering

two year monsoons; (c) continuous seepage studies along the canal network to monitor seepage related issues during initial two years to ascertain the lining requirements at different sections of the canals. The environmental management plan covers the necessary management measures in this regard.

6.3 Environmental Impacts – Operation and Maintenance

6.3.1 Impacts due to Canal Network Operation

1. *Canal Water Level*: As mentioned in the above section, the canal water level will filled gradually to attain water column of about 3 meters (+11 to +14m). the canal water level could lead to the following impacts:
   a) Water Intake from Krishna River: will be to the tune of 0.35TMC (The proposed gravity inlet arrangement for drawing water from River Krishna to the Pala vagu canal is placed at Annexure VI; inlet and outlet details are placed at Annexure XXIII. The O&M aspects related to the project is placed at Annexure XXII). The impact of this quantity on downstream users. The Prakasam barrage at Vijayawada has a minimum quantity of 3TMC considering lean period flows. Given this, the water intake in to the canals is marginal quantity. Also, the water intake in to the canals will be released in to downstream irrigation purposes on bi-weekly basis. Thus, the flood mitigation canals will be only pass through arrangement with one time filing requirement. Such an arrangement will also ensure minimizing eutrophication conditions and eliminate the need for weed control measures.
   b) Increase in Ground Water Table: With the canals having natural (i.e., uncemented/ non-concretized) beds and banks, and having increased perennial water level due to widening and deepening, could result in natural groundwater recharge which intron could lead to secondary impacts. As referred above, it is proposed to observe the impact of canals on ground water and the subsidence of soil or water logging, if any for 2 years. After 2 year, the canals would be lined as per the requirement depending on the impacts on surface water bodies and ground water table.
2. *Canal maintenance* on regular basis could lead minor civil works and associated construction facilities. The maintenance works could lead to debris and marginal impacts. These impacts need to be managed with relevant environmental management measures.

6.3.2 Impacts due to Associated Facilities

1. *Green buffer along the canals:* The green buffer, if not managed as per the design standards, could lead to canal side degradation including encroachments, disposal of municipal waste, construction debris, etc. In order to avoid such impacts, the EMP lays basic minimum standards to be maintained along the canal network
2. *Discharge of untreated effluents*, silt & debris, and solid waste through natural storm water drains could occur. In such an event the aesthetics and the physical environment could be seriously affected. These impacts could be effectively managed since Amaravati City has an elaborate waste management strategies integrated in to city development plans. However, specific environmental management measures need to be followed to avoid such a scenario.
3. *Safety*: given open canal configuration, there is potential risk of safety. This aspect has been addressed as part of the design measures by providing access control and safety railing at all the settlement locations.

CHAPTER 7: PUBLIC CONSULTATION

7.1 Introduction:

Flood mitigation is identified[9] as one of the key proposals in the Amaravati Capital city master plan preparation process during 2015-16. Several consultations were held with stakeholders including public, land owners, village elders and land less laborers as part of the master plan consultation process during the preparation of draft master plan as well as the final master plan[10]. While consultations for implementation of flood mitigation works are documented in this chapter, a brief account of earlier consultations held for obtaining environmental clearance for the master plan is presented below. The public consultation attendees list is placed at Annexure XX.

7.2 Summary of consultations as part of capital city environmental clearance

The consultations were carried out by team of Social and Environmental experts in the month of June 2015. This consultation was based on the selected diverse groups of villagers within the Amravati Capital city. The summary of the stakeholder Consultation expectations are given in the following section.

7.2.1 Approach and Methodology

Approach and methodology mainly consists of quantitative and qualitative tools and techniques. The available secondary literature and project related documents were reviewed and consultations were held with the project officials to identify the project area. Preliminary field visits were conducted. Socio-economic survey was carried out using pre-tested structured questionnaire[11]. Group Discussion at village level was also conducted.

The work plan includes the following tasks and activities

- The information relating to social parameters such as Demographic details, basic amenities, health status etc. were collected through secondary and primary sources during the study period
- All this information was used for identifying, predicting and evaluating the likely impacts of the proposed project activity. Precautionary measures were suggested for avoiding adverse socio-economic impacts.

7.3 Summary of Stakeholder Consultation Process:

The details of the stakeholder consultations have been presented in detail as part of the report[12]. The consultation was conducted along with other functional area experts of the EIA study. The consultation process goes further to include the villagers other than the affected ones to understand their expectations, apprehensions about the project. The consultation also focused to include the women and the youngsters in villages particularly keeping in view the proposed new city development.

[9] Chapter 6.1.5, Concept Master Plan, July 2015
[10] Concept Master Plan published in July 2015; draft master plan published on December 2015 and the final master plan was notified on February 23, 2016. Documents consisting of comments and suggestions are available with APCRDA.
[11] Questionnaire format, filled in questionnaire and full details are available with APCRDA.
[12] Amaravati EIA report, available at crda.ap.gov.in, environment

Venue: Multiple villages (list in files), 2nd and 3rd week of June 2015
Participant: TCE: Mrs. Mamta Bavaskar (Social Expert), Dr. Jyoti Prabha (EIA Expert) & Mr. Babu Kiran **Sivala (Environment Expert)**
Stakeholders: Stakeholders identified in the project include:

- CRDA Representative
- Local Community
- Panchayats members
- Local villagers
- Landowners
- Landless
- Women
- Labors
- Key decision makers in the village, informal representatives

7.3.1 Socio - Economic Survey, findings:

All the people in the study area are aware of the project activity and they have mostly positive opinion towards the project activity. The general social profile in the study area is as follows:

- The main language spoken in the area is Telugu.
- Majority of the villages face the problem of the drinking water as the ground water is salty, and people depend on pond water for drinking purpose which is very unhygienic and causes various health problems. Few people use mineral water for drinking purpose procured from outside, which is expensive.
- Availability of medical facility in the area is poor, and the facilities are available at 4-5 kms away from the villages.
- Education facility is available only up to primary school level in most villages.
- Approach roads to the villages are unpaved (kaccha) road. The transportation facility is poor. Minimum bus facility is available and the major mode of transportation is private auto- rickshaws and private motor vehicles.
- Electricity is available and is on a satisfactory level and there is no problem of power outage in the area.


Survey in the Kuragallu village


Survey in the Thullur Village

Discussion with the Female members in the village Nowluruu

Group discussion in the Bethapudi Village

Figure 7-1: Photographs of Social Survey (for EIA in 2015)

7.3.2 Awareness & Expectations:

The opinions & the expectations of the people from the Amaravati Capital City Development activity are listed below

- Some villagers lost their land in the project. The compensation has been delivered to the people at the rate of new capital city policy and mostly people are satisfied with the compensation.
- People are aware regarding proposed project but they are not informed regarding the type of project activities. It was expressed during public consultations that project authority should create awareness regarding type of project activities.
- Villagers expressed their needs towards employment & expected employment & health facility from the upcoming project activity
- Majority of the people opined positively regarding the proposed project and satisfied with the compensation and land pooling process.
- There is large scale unemployment reported during the survey period and the proposed project will provide ample opportunities to the unemployed population.
- People have lost their land and don`t have employment, so they are expecting employment on priority basis.
- Project effected villagers are expecting that authority should provide self-employment opportunities, so that villagers can use their compensation for self-employment purpose.
- People of the project area are expecting development in infrastructure like roads, water, medical, drainage and transportation facility by the authority.
- Villagers expect the project would bring development in their villages and would open up opportunity of employment and other business avenues.

7.3.3 Present status on opinions and expectations:

- The compensation in the form of annuity as per the scheme is being disbursed regularly. The 4th year annuity disbursed as well.
- Several awareness sessions conducted during 2015-2018 to appraise the people about master plan, infrastructure master plan, subprojects, infrastructure development works in returnable layouts, livelihood and employment opportunities13. In addition, the competent authority offices (CA offices) are provided with Project Information Centres to disseminate information about projects, progress and benefits. The CRDA online website provides latest updates through dashboard. Mana Amaravati App, downloaded by over 30000 users is also widely used to get updates, information about

[13] Public Consultations in detail are available in ESMF.

projects and progress of works and disbursement of benefits. The online as well as offline platforms are widely used by the people for accessing details of training programmes, skill upgradation works as well as livelihood opportunities. CRDA, through various campaigns is identifying most needy people that require additional support for providing targeted interventions.14 Separate studies are commissioned by Bank in respect of LPS and livelihoods and the outcomes are discussed in detail in the Resettlement Action Plan.

7.4 Stakeholder Consultation during EIA for the Flood Mitigation Works in 2017

Stakeholder consultation was carried out by the team of Social and Environmental experts in the month of July 2017. The details of the stakeholder consultation process and outcomes are given in the following sections.

Approach and Methodology

a) The lists of PAPs(Project Affected Persons) (losing land and/ or structures) were collected from the CRDA records. The survey was carried out among these PAPs. Many of these PAPs have opted for LPS (Land Pooling Scheme).
b) Prior appointment is taken and arranged through authorities such as CRDA , ADC, revenue dept. etc. to conduct surveys in the affected villages,
c) Information was gathered through Competent Authorities about PAPs,
d) Villages were surveyed by the team on scheduled date, and
e) Revisited the villages in case of respondents not present during first time.

The Competent Authorities (Officials from CRDA, ADC and Revenue Dept.) assigned their teams who are well versed with the landowners as well as geography to assist the survey. The survey was carried out among those losing land under LA&RR Act or through negotiated settlement (physical displacements). Some of the landowners did not participate in the LA & RR due to title issues of their land and therefore, they were not able to participate in LPS. [15]

7.4.1 Survey Findings

The proposed Flood Mitigation works involve 8.21 acres of private land in village areas and will displace 27 families in different locations along the alignment in 3 villages i.e., Mandadam, Rayapudi and Velagapudi. The total population to be displaced is 66 people based on enumeration of the affected families. The impacts to houses as well as buildings and any units is considered as full and whole unit to be acquired. Partial acquisition of units is avoided. All impacted households within village boundaries will be entitled for compensation to land and structures and resettlement assistance as per negotiated settlement policy[16]. The village-wise physical displacement is 24 families in Mandadam, 2 families in Rayapudi and 1 family in Velagapudi. The following are the key findings from the survey among the displaced families:

- About 26 of the PAP households are Female Headed Households
- About 21% of the PAPs are illiterates
- Most of the PAP household heads are farmers (34%) and 25% are working as Agricultural laborers. This corroborates with the fact that these are agrarian communities, dependent on agriculture.
- About 96% of the PAPs have own houses and among them 20% have pucca Houses.
- 100% of the PAP households have latrines.

[14] Ref RAP for flood mitigation works
[15] CRDA conducted special drives to sort out disputes. Some landowners are seeking legal recourse on their internal family disputes on title. In some cases, while the disputes are yet to be settled, landowners approached CRDA to offer lands under LPS with a condition that the benefit sharing and compensation will be as per outcome of legal outcome on title.
[16] Ref RPF and RAP for flood mitigation works.

- The average household income of the PAPs stands at Rs. 4,340/- per month.

7.4.2 Focus Group Discussions

Out of the 20 affected villages[17], 20 Focus Group Discussions were conducted in 14 villages at different locations. Around 165 people consisting of PAFs and landless pensioners, women's groups, SC / ST community, structure affected PDFs, PDFs affected on government lands, etc. The attendance sheets and the detailed pictures of these FGDs are available in the project files for reference. The summary of these FGDs is given below

- Many of the PAFs indicated that they are aware of the project and the impacts. However, they requested for additional inputs on entitlements. They requested that this information be given through community meetings, print and electronic media and other communication materials like pamphlets, FAQ booklets, etc. They would like this to be in easily understandable terms with examples.
- The PAFs want information on the implementation schedule with details such as a) when the acquisition will be done, b) when would they be notified to vacate their residences, c) how much time will be given for vacating the houses, d) when will be rehabilitation plots allotted to them, e) whether they would be relocated as a community as they are now, f) how much time will be given for building houses at the resettlement locations, g) can they take the salvageable material from the demolished residences, etc.
- Annuity is not being paid to the occupants who are on Govt. lands. It is requested to provide annuity to them on par with other assigned LPS land owners. They also knowingly or unknowingly depending upon Government lands for the past three generations and getting their livelihood.
- The eligibility or ineligibility of occupants needs clarity to know how they are given residential returnable plots 250 Sq. yds. per Acre. Majority of the occupants demand to provide at least 500 Sq. Yds. as their family size is increased.
- Minimum of INR 30,000/- not applied to one individual as he has his government land about 0.60 acres at four different places.[18]
- Providing infrastructural facility to all LPS returnable plots to be planned as soon as possible.
- Loss of Agricultural activity is a problem for the farmers.
- Seasonal employment to be provided to local labor or vehicles.
- NTR Sujala Sravanthi scheme is excellent in supplying drinking water to Sakhamuru village.
- Water for daily use is not available. Hence there will be much water trouble for daily use during ensuing summer and it is requested to plan for alternative source of water either from the pipe line arranged at **VIT** or from **SRM** or from Sakhamuru park where water pipes arranged.
- Returnable plots registration is somewhat slow.
- Flood water from Vykuntapuram must be diverted into the Krishna River.
- Vagu digging soil must be used for filling the low-lying areas where plots are in existing village nearer to Vagu.
- One individual who has gone to Singapore told that there is no private land which all the land resources are in the government control and also all individuals work hard and give more importance to cleanliness.
- It is informed that Lands under PWD control are not yet transferred to and all those types of land must come to CRDA custody and then all the land owners of Borupalem who surrendered their land under LPS will go to Registration.

[17] Total 20 revenue villages affected by the flood mitigation works but impacts are only in 15 villages.
[18] Base annuity of 30,000 is paid to landowner, even if the combined land extent is less than one acre.

- Jareebu lands are now treated as non-Jareebu which is a major problem related to 14 acres of Lemon Gardens.[19]
- Infrastructure as promised to be provided at the LPS layouts at the earliest.
- It is enquired about the Buffer Zone under flood mitigation Measures (where residential construction cannot take place) which is meant for the purpose of greenery and for strengthening of Bunds of the proposed channels.
- Revetment of Channels is necessary as it is the loose black soil which may be eroded during floods.
- In survey no.577 an extent of 0.51 acres which was surrendered to CRDA under LPS. Annuity of INR 15000/ for one year was paid and it was delayed the next two annuities.
- People demanded to solve the Gramakantham issue as soon as possible.[20]
- The Land owners of Jasmine gardens demands for higher compensation.
- 10 cents exemption is a demand from the people of Kuragallu.
- Poles for the plots to be placed to identify where one's own plot is. There are no poles to some plots.

Table 7-1: Common Property Resources affected

No	Village	Type of Impacts	Acres	Action plan
1	Mandadam	Temple	0.19	Consultations are initiated with the community
2		Burial Ground	0.73	As the remaining site is adequate, additional site is not proposed - accepted by the Community[21]
3.	Sakhamuru	Burial Ground	0.26	

Out of the 20 affected villages[22], 20 Focus Group Discussions were conducted in 14 villages at different locations. Displacements limited as the impacts are outside habitation area. The details of displacement are furnished in RAP for Flood Management Works. No adverse social impacts are identified as the works are meant to free the capital city from possible inundation and there are no physical displacement and resettlement requirements in these 6 villages. The habitations will benefit from these works as loss to livelihoods and assets are mitigated.

Around 165 people consisting of PAFs and landless pensioners, women's groups, SC / ST community, structure affected PDFs, PDFs affected on government lands, etc. The attendance sheets and the detailed pictures of these FGDs are available in the project files for reference. A detailed description of the key issues raised and how those issues are addressed is presented below.

Table 7-2: Details of focus group discussions

No	Key issues raised	How those addressed
Mandadam: 25-07-2017: FGD with marginal farmers, landless pensioners and PDFs due to structure loss - 15 attended		
1	Entitlements to the LA and LPS	The entitlements under LA, LPS and Negotiated Settlement Policy have been explained in detail.
Ainavolu: 25-07-2017: FGD with women pensioners and marginal farmers - 23 including 7 women		

[19] Classification as per expert team and process as per Got order, applicable to entire capital city.
[20] This issue is in 3 villages for 108 landowners only. CRDA is discussing with landowners to resolve.
[21] Ref RAP for flood mitigation works
[22] Total 20 revenue villages affected by the flood mitigation works but impacts are only in 15 villages.

No	Key issues raised	How those addressed
2	Requested for extending Health cards coverage and acceptability in more number of hospitals for all kinds of ailments.	Government of Andhra Pradesh as part of the NTR Vaidya Seva issues Health cards to only BPL families / holders of white ration cards. In Amaravati, the Health cards are issued to all the residents of Capital City as on 8-12-2014. These health cards enable treatments to 1044 ailments at designated hospitals across Andhra Pradesh.
Pichikalapalem: 25-07-2017 : FGD with Marginal Farmers, pensioners and occupants in Government lands - 35 including 9 women		
3	Loans for small business, fees reimbursement	The policy is being prepared for issue of loans to initiate entrepreneurial activities.
Krishnayapalem: 19-03-2018 : FGD with occupants in Government lands: 8 participants including 1 woman		
4	• Annuity is not being paid to the occupants who are on Govt. lands. It is requested to provide annuity to them on par with other assigned LPS land owners. They also knowingly or unknowingly depending upon Government lands for the past three generations and getting their livelihood. • Pension amount of INR 2500 is also not given to some of the occupants who are not now living in that village. • 10% increase of Pension amount is required. • The eligibility or ineligibility of occupants needs clarity to know how they are given residential returnable plots 250 Sq. yds. per Acre. Majority of the occupants demand to provide at least 500 Sq. Yds. as their family size is increased. • Minimum of INR 30,000/- not applied to one individual as he has his government land about 0.60 acres at four different places.	▪ The compensation to occupants of Government lands was covered under G.O.Ms.No.153 dated 19-04-2017 and the compensation is being paid accordingly. ▪ With reference to payment of pensions to non-residents it is clarified that all the persons who are in Household survey will be provided with pensions as per their eligibility. If those eligible are missed out, they can apply to receive the pension amount. It is clarified that about 200 new pensions are sanctioned in the preceding weeks. ▪ Indexation of pension amount is considered. ▪ The allotment of residential plots to occupants is as per the guidelines under land pooling scheme. Specific grievances, if any, may be applied to concerned CA for examination. ▪ It is clarified that an individual can receive annuity equivalent to 1 acre even if he / she possesses combined extent of less than 1 acre. The request is not admissible as per the policy.
Nowluruu-2 (Yerrabalem): 19-03-2018 : FGD with LPS Landowners: 6 participants		

No	Key issues raised	How those addressed
5	• Drainage in existing village will be a problem for them. Before, this capital city project, there are vagus and Donkas through which the sewage water flows. But now all the vagu, vanka and Donkas were taken away by CRDA and developing them as returnable plots. Now they may face drainage problem. • An individual who is Dumb and local eligible person is not getting pension from CRDA or handicap pension under Social security scheme. • Providing infrastructural facility to all LPS returnable plots to be planned as soon as possible. • Loss of Agricultural activity is a problem for the farmers.	▪ The flood mitigation plan including storm water discharge is explained. The plan will ensure that there are no issues arising out of discharge of storm water. ▪ Indexation of pension amount is considered. ▪ With reference to development of Infrastructure, it is clarified that all steps are being taken in a phased manner to develop the infrastructure as per master plan.
Sakhamuru : 20-03-2018 : FGD with LPS landowners: 4 participants		
6	• Boundary stones at some returnable plots to be fixed. • Health Cards issue brought to the notice of the Commissioner. The Commissioner assured that there will be some particular individual on this job of health cards, and his Phone number will be written on the walls of every CRDA office to facilitate the Health card holders to contact the person at need times. • Seasonal employment to be provided to local labor or vehicles. • NTR sujala sravanthi scheme is excellent in supplying drinking water to Sakhamuru village. • Water for daily use is not available. Hence there will be much water trouble for daily use during ensuing summer and it is requested to plan for alternative	▪ Boundary stones as per standards are fixed for all the returnable plots with GPS coordinates. Any specific issue will be addressed by the CA. ▪ Project information center is designated to provide additional support regarding health cards. A qualified medical doctor is placed as coordinator to facilitate health card and treatment related issues for Amaravati health card holders. A sticker containing essential information will be affixed to each health cardholder's residence and communication material is handed over regarding treated ailments and designated hospitals. A common toll free number 104 will attend to resolving any queries ▪ Steps are being taken to position a person to look after health cards issues and specific instructions have been issued to all contractors by the ADC to engage local people in construction work.

No	Key issues raised	How those addressed
	source of water either from the pipe line arranged at VIT or from SRM or from Sakhamuru park where water pipes arranged.	▪ Suitable steps will be taken to redress water problems.
Velagapudi : 20-03-2018; FGD with LPS landowners: 9 participants		
7	• Discrimination in LPS package for the same individual for an extent of 0.19 acres of Jareebu it is INR 30,000 offered but for other parcel of land with the same extent of 0.19 under assignment is offered only INR 10,000. But the individual expects that a minimum of INR 30.000 for the assigned land also. • Returnable Plots registration is pending as their plots are located on the land of a person who is willing to give land to CRDA either under LPS or under LA or NSP. Requested to take steps for reallocation of plots. • Panchayat Secretary told that if Vagu is properly levelled to ensure free flow of rain water into Krishna River, it a good solution for inundation problems and requested to take steps accordingly as all land now is under the control of CRDA.	▪ It is clarified that compensation is being paid as per the approved guidelines and there is no discrimination in payment of annuity to any person. Specific cases may be brought to the notice of the concerned CA for redressal. Steps are being taken to relocate the plots in the undisputed area. Flood Mitigation Works will be done as per the drawings approved to avoid inundation.
Abbarajupalem: 21-03-2018: FGD with LPS landowners: 3 participants		
8	• Returnable plots for LPS land owners allotted on the land not surrendered by the private individual. And also there are only two boundary poles for the commercial plots which require planning for erection of another two poles. • It is complained that the authorities have denied payment of annuity to them treating their lands as non Jareebu now, though they were classified as Jareebu lands in the past and paid annuity accordingly for three years. It is	▪ Utmost care has been taken to allot plots in lands under possession of APCRDA. Specific grievances as to plot allotment may be brought to the notice of the concerned CA for redressal. ▪ A technical committee constituted by the District Administration has reviewed all cases regarding land classification and annuity is paid based on the decision of the Committee.

No	Key issues raised	How those addressed
	further complained that notices were issued to 11 land owners and the individuals went to the court also. But two individual have not yet received either notice or annuity but orally informed. Thus the farmers are not willing to get their lands registered.	
Borupalem: 21-03-2018 : FGD with LPS landowners: 11 participants		
9	• Returnable plots registration is somewhat slow. • Flood water from Vykuntapuram must be diverted into the Krishna River. • Vagu digging soil must be used for filling the low-lying areas where plots are in existing village nearer to Vagu. • One individual who has gone to Singapore told that there is no private land which all the land resources are in the government control and also all individuals work hard and give more importance to cleanliness. • It is informed that Lands under PWD control are not yet transferred to and all those types of land must come to CRDA custody and then all the land owners of Borupalem who surrendered their land under LPS will go to Registration. • Jareebu lands are now treated as non-Jareebu which is a major problem related to 14 acres of Lemon Gardens. • Infrastructure as promised to be provided at the LPS layouts at the earliest.	▪ New registration offices are set up in centralized places to ensure speedy registration of plots. It is informed that about 10000 registrations are already complete. Channelization of flood water will be attended as per the approved drawings to ensure safety of property and lives. Consultations are in its way for the transfer of PWD lands to APCRDA.
Venkatapalem: 21-03-2018 : FGD with LPS landowners and Marginal farmers: 15 participants		
10	• It is opined that it will take 20 years or so for getting the area developed as promised. So all the	▪ The matter of extending annuity to LPS landowners beyond 10 years, Kalyana Lakshmi, Medical facilities

No	Key issues raised	How those addressed
	LPS land owners request for enhancement of annuity period from 10 years to 15 years annuity. • **1325** health cards were issued at Venkatapalem village and all of them shall be provided with medical aid without any ceiling and without any charges for Medical tests. • Kalyana Lakshmi scheme shall be extended to poor people in upper castes also. • LA farmers land under valued as INR 22 lakh. But the land owners request to fix the value basing on the market value at INR 4 crore per acre. • Health card Desk is to be situated at Thullur.	are noted and passed on to appropriate authorities.
Kuragallu: 22-03-2018 : FGD with LPS landowners: 18 participants		
11	• It is enquired about the Buffer Zone under flood mitigation Measures (where no residential construction cannot take place) which is meant for the purpose of greenery and for strengthening of Bunds of the proposed channels. • Revetment of Channels is necessary as it is the loose black soil which may be eroded during floods. • In survey no.577 an extent of 0.51 acres which was surrendered to CRDA under LPS. Annuity of INR 15000/ for one year was paid and it was delayed the next two annuities. • People demanded to solve the Gramakantham burning issue as soon as possible.	▪ Buffer zone as provided under Flood Mitigation Works and as per the drawings will be adopted. Similarly revetment of channels will be taken up as per drawings and designs. ▪ The issue relating to Gramakantham's is considerably resolved already. ▪ The payment of annuity is being made to all the eligible LPS landowners. The third year annuity has already been released. Compensation to LPS farmers including jasmine gardens is being paid as per the provisions of LPS Rules. Specific demarcation of plots is being carried out by putting boundary stones.

No	Key issues raised	How those addressed
	• The Land owners of Jasmine gardens demands for higher compensation. • 10 cents exemption is a demand from the people of Kuragallu. • Poles for the plots to be placed to identify where one's own plot is. There are no poles to some plots.	
Ananthavaram & Nekkallu: 22-03-2018 : FGD with LPS landowners: 8 participants		
12	• There is some delay in payment of annuity • Gramakantham issue • Partial loan waiver.	▪ With regard to the partial loan waiver, the beneficiary is advised to submit representation for taking suitable steps.
Penumaka : 25-04-2018 FGD with LPS landowners: 4 participants including 1 woman		
13	• Allotment of returnable plots not yet done. The farmers requested to give the returnable plots as soon as possible. • Health cards were issued to everyone but in some hospitals these were not accepted, saying that, that particular hospital/disease is not listed on the health card. • The farmers who attended to the FGD felt happy for the rise in Land prices due to capital announcement / formation only. • People request capital gain tax exemption until the allotted plot(s) is sold. • Peg-marking is not yet done.	▪ The request for extending unlimited medical facilities, capital gains tax is passed on to appropriate authorities.

7.4.3 Consultation on draft EMP for Flood Mitigation Works

Stakeholder consultation was carried out by the team of Social and Environmental experts in the month of January 2018. This consultation was held with villagers residing along the alignment proposed for flood mitigation works within the Amravati Capital City. The summary of the stakeholder consultation expectations is given in the following section. Details of Public Consultations given in Table 7-3.

The public consultation was carried out in the four villages of the study area: Mandadam, Thullur, Neerukonda and Krishnayapalem.

The consultation team and discussion topics are given below:

Discussion Topics: Draft Resettlement Action Plan for Flood Management works and Draft Environmental Assessment and Environmental Management Plan for flood management works.

Organization/ Representaiton	Participants
Public Representatives	Local villagers
	Landowners
	Landless
	Women
	Labors
	Key decision makers in the village, informal representatives
Vasavya Mahila Mandali (Bank appointed NGO)	Dr. B Keerthi
	Mr. Ramanujaiah
	Mr. Dhanunjay Rao
	Mr. Sivayya
CRDA	Mr. Sastry
	Ms. Gayathri
	Mr. Bhavani Prasad
	Mr. Rambabu and others
ADCL	Mr. Ganesh Babu
	Mr. Venkata Ramana
	Mr. Ashraf
Blue Consultant	Mr. Babu Kiran Sivala
	Mrs. Mamta Bavaskar

7.4.4 The objectives of the public consultations are as follows:

- To identify issues that need to be resolved to minimize environmental impacts.
- To identify risks both anticipated and unanticipated to the project as a consequences of the construction activities
- To engage people in a regular and open dialogue to reduce conflicts and create a mutually beneficial environment for the people.

7.4.4.1 Mandadam village public consultation:

First public meeting was conducted at Mandadam village. During this meeting people were appraised about details of the project by means of hard copies of drawings and were informed that the World Bank financing is proposed for the development of the flood mitigation project.

One of the affected persons in the village informed that he was losing 0.08% of houses sites in Velagapudi, he asked same size at rehabilitation and resettlement colony. The same was discussed with the officers who is present for the public consultation meeting.

Some of the people raised their concerns at Mandadam on following the NGT judgment in implementation of proposed flood mitigation project related to Kondaveeti vagu. People expressed concern and asked if the NGT judgment was being implemented.

One of the affected persons in the Velagapudi Village was losing 0.06% of house and he asked same size of site at R& R colony. The same was discussed with CRDA officials.

Applications from farmers and residents of the villages were collected and submitted to CRDA.

7.4.4.2 Thullur village public consultation:

Second public meeting was conducted at Thullur village. During this meeting people were appraised about details of the project by means of hard copies of drawings and were informed that the World Bank financing is proposed for the development of the flood mitigation project.

At the time of the consultations clarifications were provided by CRDA Director, Strategy. The participants were given an overview of the proposed flood mitigation works. The participants expressed concern about expected flooding during the rainy season and enquired as to when the works would be completed.

7.4.4.3 Neerukonda village public consultation:

Third public meeting was conducted at Neerukonda village. During this meeting people were appraised about details of the project by means of hard copies of drawings and were informed that the World Bank financing is proposed for the development of the flood mitigation project. As at the Mandadam consultation, at Neerukonda as well, the participants expressed concern about implementation of the NGT issue At Neerukonda written petitions were given by attendees, and signed acknowledgement was provided by APCRDA.

7.4.4.4 Krishnayapalem village public consultation:

Fourth public meeting was conducted at Krishnayapalem village. During this meeting people were appraised about details of the project by means of hard copies of drawings and were informed that World Bank financing is proposed for the flood mitigation project.

Farmers raised concern about disaster preparedness in case of simultaneous flood to Krishna River and Kondaveeti Vagu. They also expressed concern that Neerukonda to Krishnayapalem is flood prone area that require additional protection measures.

7.4.5 Overall suggestions by the people in the public consultations meetings

- Minutes book to be maintained for all consultations by CRDA / government and take signatures from participants.
- One of the farmers from Thullur consultation suggested that people gave the lands in LPS for building capital city and taking the Annuity from CRDA from past three years, so as these lands belong to government, no need to consult for anything.
- Farmers raised concern of adequacy of disaster preparedness in case flood occurs in both Krishna river and Kondaveeti Vagu at the same time.They also expressed concerns that Neerukonda to Krishnayapalem is a flood prone area that requires additional protection.

Table 7-3: Details of Public Consultations

Sr. No.	Name of the village	Date /time	Participants	Major issues discussed	Clarification by the authority
1.	Mandadam	6th Jan 2018 (11.30 AM to 2.15 PM)	• More than 215 participants • Landowners from Undavalli & Penumaka • PAPs • Landless poor people	• Participants objected that CRDA gave two messages about the meetings; it caused ambiguity to attend the meetings.	APCRDA received requests from the public to conduct meetings in their villages also. Accordingly, two more meetings were announced in Thullur and Krishnayapalem, which are convenient for flood PAFs to participate. It is appraised to all that the participants are welcome in any / all of the meetings.
				• Participants said that CRDA taking signatures from the attendees and not mention any minutes on the paper, so they objected, mainly they suspected that the attendance sheet is used as confirmation paper of the meeting.	APCRDA clarified that the participants are required to record their participation as it is an important evidence of their participation, which will be kept in project files throughout the project period. It is further clarified that minutes will be included in the revised version of RAP and uploaded onto website of APCRDA for access by the public.
				• Farmers objected that CRDA did not follow the NGT guidelines, as per NGT flood ways are not to disturb existing ones, but in some areas Rayapudi, Lingayapalem it was filled.	The works undertaken by APCRDA are in accordance with the NGT directions. If any deviations observed due to miss-communication will be quickly addressed appropriately.
				• The public also expressed that the compensation being paid	No pending issues related to project footprint. Statements raised on adhoc

Sr. No.	Name of the village	Date /time	Participants	Major issues discussed	Clarification by the authority
				is not too genuine and also there are a few title related issues.	basis are forwarded to concerned authorities for initiating necessary action.
				• Farmers expressed whether reservoir's bunds are prepared pucca	It is clarified that the bunds will be made to withstand overflows, breaches, etc., and will be as per the relevant engineering / construction codes prescribed by IS. Also the designs are vetted by professional agencies and technical committees.
				• People expressed the concern that pensions are paid to landless is insufficient looking at the rising prices.	It is clarified in RPF and also in RAP that pension is an allowance and is not a replacement of livelihood income. Pension paid to landless is equivalent to the annuity of the landowner with an acre or less of land.
				• They also mentioned that they are not finding any work as all the agricultural activities are stopped in the capital city region	The skill development and livelihood development initiatives for promoting alternate livelihoods are explained. It is further clarified that targeted skill development programs will be conducted as desired by them.
				• People expressed concern about the flooding problem in the rainy season & Public enquired about the immediate mitigation measures:	The inundation mitigation measures through the project are explained in detail. The reservoirs, canals and the pumping systems are designed to fully mitigate 1 in 100 year flows. On an immediate basis, the existing channels

Sr. No.	Name of the village	Date /time	Participants	Major issues discussed	Clarification by the authority
					are being cleaned and pumping systems at Undavalli are being completed.
				• The public expressed that the earth material would be generated from widening and deepening of the canals: Mitigation measures has to be taken up and included in the EMP.	The EMP has already put in place mitigation measures regarding dug earth.
				• People expressed that as per the NGT guidelines, the flood banks should not be touched to take up the Flood Mitigation Works.	The proposed works will be as per the directions of Hon'ble NGT.
				• They expressed that the proposed alignment is not feasible	Alignments are finalized only after conducting required studies and after approval of the Competent Authorities.
				• People expressed that they faced the drinking water problem from the last 5 decades.	The Capital City Infrastructure Master Plan has addressed the water supply scheme for the entire capital city.
2.	Thullur	6th Jan 2018 (3.00 PM to 4.00 PM)	• Total 17 participants • 2 women • Landless poor & landowners and	• The public expressed their doubts about the alignment and the water storage capacity of the proposed reservoirs and the area / extent covered by these reservoirs. They also	It is clarified that the alignments are finalized after conducting required gravitational studies and with the approval of the Competent Authorities. Similarly, new reservoirs are proposed with a storage capacity of 0.4 TMC at Neerukonda, 0.1 TMC at Krishnayapalem

Sr. No.	Name of the village	Date /time	Participants	Major issues discussed	Clarification by the authority
				expressed that it becomes difficult for them to attend the frequent meetings, surveys, FGDs, etc. in view of their current work and requested not to create any disturbance unless the meeting / issue is really urgent.	and 0.03 TMC at Sakhamuru. The public are informed that unless and until there is a great need, meetings and surveys will not be scheduled as suggested.
3.	Neerukonda	6th Jan 2018 (5.00 PM to 6.45 PM)	• Total 120 participants • 28 women • No one signed the attendance sheet. • landowners of Undavalli & Penumaka • Landless labors	• The public expressed that they are not ready to give their lands. They also expressed that they are against the capital city construction and development. • Vagu lands are not to be used for Flood Mitigation Works. • They enquired whether ASCCDP is a registered body and ADC has a right to develop infrastructure facilities. • Some of the public expressed title related issues and gramakantha issues. • They said that the development works are not being done as per the applicable Acts and policies	It is clarified that required technical studies have been carried out as required to finalize the designs and drawings and there is no necessity for any apprehension as to the storage capacity of the reservoirs. Further, it is clarified that ASCCDP is a project designed by APCRDA which is constituted under the Act and the ADC is the executing agency of the works. Other issues as raised by the public as to Gramakantham, development works, etc., have been explained in a transparent manner. With regard to construction of Amaravati at alternative location is a policy matter to be decided by the Government.

Sr. No.	Name of the village	Date /time	Participants	Major issues discussed	Clarification by the authority
				• They mentioned that the records in government are misleading and hence requested for reinitiating the study about the lands, agriculture, Jareebu-dry classification, type of land use, etc. and then prepare the RAP for payment of compensation.	
				• The public opposed the storage capacity and extent of reservoir coverage in Neerukonda saying that the base estimates are incorrect.	
				• They expressed that the capital city should be built in an alternative location instead of Amravati.	
4.	**Krishnayapalem**	6th Jan 2018 (7.00 PM to 7.35 PM)	• Total – 25 • Women: 6	• The public expressed / enquired about the green belt development along the vagus (canals) and reservoirs: included in the EMP	The public are clarified that sufficient green belt development is being taken up along the Vagus (canals) and reservoirs as per the assurance given to NGT by APCRDA.
				Suggestions from the local people in the area • The public here expressed that the sub-project is a good	

Sr. No.	Name of the village	Date /time	Participants	Major issues discussed	Clarification by the authority
				initiative from the government side to preserve water and as a precautionary measure to avoid flooding in the capital city. • The public also mentioned that the R&R colonies are to be provided to PDFs with all the facilities on par with the LPS layouts. • They also expressed that the Karakatta Bridge has to be strengthened. Additional protection measures and safety measures to avoid disaster has to be taken up and included in the EMP.	

Krishnayapalam

Mandadam

Figure 7-2: Photo presentation for Public Consultations

CHAPTER 8: ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

Based on the assessment of potential negative impacts referred to as in Chapter 6 above, this chapter will present Environmental Management Plan (EMP) for the works of the amended and supplemented items for the sustainable development project of Flood Mitigation Works. Environmental Management Plan (EMP): An EMP is an instrument that details (a) the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental impacts or to reduce them to acceptable levels; and (b) the actions needed to implement these measures. EMPs are therefore important tools for ensuring that the management actions arising from Environmental Impact Assessment (EIA) processes are clearly defined and implemented through all phases of the project life cycle. This plan also helps an organization map its progress toward achieving continual improvements.

Objective of This EMP:

- To prepare a document which sets forth all the measures identified by the client
- To prevent, minimize, mitigate and compensate for the potential negative impacts derived from the flood mitigation works, as well as to strengthen the positive impacts.
- To define the parameters and variables to be used to assess the environmental quality in the influence area of the Project.
- To establish the mechanisms so that pertinent authorities can follow up on the Project environmental variables and implement the necessary controls.
- To design the mechanisms for accident prevention and response, and for contingencies which may arise during the execution and operation of the project

Design measures and Proposed EMP Content

The detailed designs for the proposed flood mitigation works has several built in measures to minimize environmental impacts. Summary of these include:

- Advanced Flood Early Warning System (FEWS) and city level disaster management plan (Please refer **Annexure XXI**)
- Multiple pumping options which not only minimizes flood risk but also optimizes pumping requirements as well as earthwork for establishing canal network
- Water circulation mechanism within the canal network which not only protects the downstream irrigation users but also minimizes chances of eutrophication and public health impacts thereby
- The overall city level grievance redressal mechanism involving citizens to minimise the impacts

In addition to the above, the EMP provided in the following sections cover:

- Environmental management for the Project's construction phase, as well as for the Project's operations phase.
- Guidance for the development of more detailed EMPs and relevant sub plans prepared by the Proponent (or its agent or contracted entity) prior to commencement of the Project's construction and operations phases.

The various EMP measures during pre-construction and infrastructure development phase are listed in Table 8-1 to 8 -3. EC conditions and compliance along with NGT conditions and compliance are placed to be followed while implementing and the same is placed at **Annexure XVIII** and **Annexure XIX.**

Table 8-1: Environmental Management Plan for Flood mitigation works – Kondaveetivagu, Palavagu & Gravity canal - Pre – construction Stage

Sr. No.	Project related Issues	Mitigation Measures to be taken	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
I.	Pre-Construction Stage			
i	Assure compliance with relevant construction field legislation	All clearances required from other departments and Environmental aspects shall be ensured and made available before start of work. Acquire construction permit, Provide Water management guidelines if subprojects are executed near surface watercourses. Kindly refer the table no: 2 -1.	Contractor	ADC
ii	Utility Relocation	As it is green field site, no such major utilities shall be envisaged. Since the proposed Canals / Vagus and Reservoirs are mainly surrounded by agricultural land, there are no utilities except overhead electric line and poles. • Identify the common utilities that would be affected such as: telephone cables, electric cables, electric poles, water pipelines etc. • Affected utilities shall be relocated with prior approval of the concerned agencies before construction starts. • Alternate temporary arrangement for crossing over shall be provided.	Planning - ADC Execution - Contractor	ADC
Iii	Tree Cutting	Trees will generally not be removed unless they are a safety hazard. Removal of trees shall be done only after the permissions / approvals are obtained. Disposal of cut trees is to be done immediately to ensure that the traffic movement is not disrupted. Proposed canal alignment mainly passes through agriculture field. • Permission for tree cutting as per WALTA, 2002 needs to be taken.	Contractor	ADC
iv.	Supply of Material	Procurement of construction material only from permitted sites and licensed/ authorized quarries.	Contractor	ADC

Sr. No.	Project related Issues	Mitigation Measures to be taken	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
v.	Water	The Contractor will be responsible for arranging adequate supply of water for the entire construction period. The contractor shall consult the local people before finalizing the locations. The contractor will preferentially source all water requirements from surface water bodies. The contractor will be allowed to pump only from the surface water bodies. Boring of any tube wells will be prohibited. The contractor will minimize wastage of water during construction.	Contractor	ADC
vi	Appointment of Environment & Safety Officer	The Contractor would prepare OHS plan and other required plans as per the WBs guidelines. The contractor will appoint qualified and experienced Environment & Safety Officer (ESO), who will dedicatedly work and ensure implementation of EMP including Occupational health and safety issues at the camp, construction work sites.	Contractor	ADC
vii	Other Construction Vehicles, Equipment and Machinery	• All vehicles, equipment and machinery to be procured for construction/ protection work will conform to the relevant Bureau of Indian Standard (BIS) norms/ CPCB standards. The discharge standards promulgated under the Environment Protection Act, 1986 and Motor Vehicles Act, 1988 will be strictly adhered to. • Soundproof DG set as per regulations will be used at the project site. • The contractor will maintain records of Pollution Under Control (PUC) certificates for all vehicles used during the contract period, which will be produced to Project Implementation Unit for verification whenever required.	Contractor	ADC
viii	Labour Requirement	The contractor preferably will use unskilled/ semiskilled labour from local area to give the maximum benefit to the local community. Planning of	Contractor	ADC

Sr. No.	Project related Issues	Mitigation Measures to be taken	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		labour camps, needs to be done to ensure adequate water supply, sanitation and drainage etc., in conformity with the Indian Labour Laws. Contractor will develop labour management plan along with campsite management plan		
ix	Design consideration for Flood control	There are many design considerations to be taken for the project such as: - Design of storm water drains considering the peak run-off and discharge capacity of drains. - Erosion control - Dyke and embankment to be designed as per Seismic activity of the area - Ground seepage and control - Using natural slope to the extent possible - Minimal intervention to the natural contour - Management of catchment area with plantation etc.	Design stage consultant	ADC

Table 8-2: Environmental Management Plan for Flood mitigation works - Construction Stage[23] and Operation Stage

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
Construction Stage					
LAND					
Soil Erosion	Main reason for soil erosion could be due to excavation (~41.5 Mil.Cu.m). Contractor should plan the activities so that proper erosion control measures would be adopted. Following preventive measures to be taken such as • Excavation and backfilling to be avoided in the monsoons and shall be planned for dry season. • Vegetation growth along the banks to be maintained to the possible extent for soil stability and revegetation of disturbed areas and traps. • Proper drainage to be maintained for soil stability • Embankment slopes to be constructed within the right-of-way. Bio-turfing of embankments should be made enhance the slope stabilization. • Embankments and other areas of unsupported fill will not be constructed with steeper side slopes, or to greater widths than those shown in the design drawings.	Upon completion of construction activities at these sites. During construction	**Contractor**	**PMC & PIU**	Standard engineering practices and Contract Documents
Quarrying and Material Sources	The reservoir embankment would require 0.111 M. Cu.m of stone will be used lining of the reservoirs.	Beginning with & throughout construction	**Contractor**	**PMC & PIU**	The Environment

[23] The construction activities include site clearance, excavation, disposal of spoil, de-watering, construction of reservoir embankments and lining of reservoirs
[24] Some of the mitigation measures are preventive in nature while some others include additional measures in terms of environmental conservation and involve physical and construction work
[25] Timeframe refers to the duration or instant of time when the mitigation measures will be taken.

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• Quarry material shall be sourced from approved and licensed aggregate and sand quarries identified by the Government. • For operating new quarries, the Contractor shall obtain materials from quarries only after consent of concerned authorities and only after development of a comprehensive quarry' redevelopment plan. • Adequate safety precautions shall be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material shall be covered to prevent spillage. Operations to be undertaken by the Contractor as per the direction and satisfaction of the PIU. • The contractor shall prepare query rehabilitation and management plan (environmental management plan) acceptable to ADC and the Bank.				(Protection) Act, 1986 The Air (Prevention and Control of Pollution) Act 1981 Contract Document
Loss of top soil	• Earthwork excavations would generate about 0.475 M. Cu.m of top sol from all the sites which would be stored in a stockpile and shall be covered. • Stockpiles to be designed in such a way that slope do not exceed 1:2 (vertical to horizontal). • Top soil will be safeguard from erosion and will be reused at the 30 meter buffer on either sides of the canal.	During Construction	**Contractor**	**PMC & PIU**	Contract Document
Contamination of Soil	Oil & fuel spills from construction equipment and improper management of construction site could result contamination of soil. The contract should	During Construction	**Contractor**	**PMC & PIU**	The Environment

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	strictly enforce the Guidelines of "Hazardous waste (management and handling) rules, 1989. • Plant to be setup 500m away from surface water body. • Oil interceptor will be installed at construction site. • Septic tank will be constructed for safe disposal of waste.				(Protection) Act, 1986 Contract Document
Generation of debris	• Any debris accumulated in the canals/vagus or generated due to construction activities should be stored at a designated place by the authority which need to be sufficiently away from waterbodies and habitats. • The generated debris shall be re-used efficiently if found suitable for using mainly as fill materials and stone pitching work without limiting to the project activities.	During Construction	**Contractor**	**PMC & PIU**	The Municipal Solid Wastes (Management and Handling) Rules, 2016 C&D Waste Rules 2016
Erosion of Disposal sites	Five disposal sites within the city has been identified considering the topographic profile and landfilling requirements. The impact is not expected as the disposal sites will be utilized for different land uses as per the master plan. However, the contractor has to spread the soil entire designated site to the possible extent to avoid any associated risks involved in disposal.	During Construction	**Contractor**	**PMC & PIU**	Contract Document
AIR					
Dust Generation	Vehicles are expected to pass through the major roads which are adjacent to the settlements namely (i) Uddandarayapalem; (ii) Venkatapalem; (iii) Mandadam; (iv) Malkapuram and (v) Velagapudi. Dust generation is expected from the excavation	Beginning with & throughout construction	**Contractor**	**PMC & PIU**	The Environment (Protection) Act, 1986

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	and disposal activities. Following preventive measures are suggested • Excavation activities at nearby settlements to be undertaken by sprinkling of the water. • Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. • Water shall be applied to at least 80 percent of all inactive disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust or three-sided enclosure shall be installed with walls with no more than 50 percent porosity that extends, at a minimum, to the top of the pile. • Clearing and grubbing to be done, just before the start of next activity on that site. In case of time gap, water should be sprinkled regularly till the start of next activity. • Unloading and disposal of spoil to be preferably undertaken in the night times. • Embankment slopes to be covered immediately after completion. • The contractor to develop and submit a dust control plan, an Air Quality Management Plan and Emissions Monitoring/Testing Plan.				The Air (Prevention and Control of Pollution) Act 1981 Contract Document
Emissions	• The contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Regular pollution check for construction vehicles shall be made. • DG set to be provided with vertical opening chimney of adequate height as per CPCB guidelines.	During Construction	**Contractor**	**PMC & PIU**	The Environment (Protection) Act, 1986 The Air (Prevention and

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• LPG shall be used as fuel for cooking of food at construction labour camp instead of fuel wood. The unloading of all materials at construction sites will be limited to day time only to avoid accidents.				Control of Pollution) Act 1981 Contract Document
Equipment	Proposed activities require following equipment Excavation Equipment 1. Shovel of 0.85 Cum – 120/day 2. Tipper of 5 Cum – 850/Day Embankment Lining of Reservoirs 1. Angle Dozer of 90 H.P Capacity – 5/Day 2. Electrical Pump of 5 H.P – 6 3. Water tanker of 8000 liters – 6 4. Vibratory roller of 8 ton capacity - 6 The contractor will procure the construction plant and machinery, which will conform to the pollution control norms specified by the MoEF&CC/ CPCB/ APPCB. The contractor will ensure that all vehicles, equipment and machinery used for construction works are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of CPCB and/Motor Vehicles Rules.	During Construction	**Contractor**	**PMC & PIU**	Contract Document
WATER					
Dewatering	Dewatering requirement may arise due to shallow water table at certain part of the canal sections to be excavated. Following preventive measures are to be undertaken to avoid any constructed related inconveniences	Throughout the Construction	**Contractor**	**PMC & PIU**	The Environment (Protection) Act, 1986. The Water (Prevention and

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• Construction should start from upper reaches and the dewatering is proposed to be discharged downstream • To reduce the turbidity baffles would be provided before the discharge into the downstream • Maintenance of the baffles would be undertaken periodically by the contractor				Control of Pollution) Act 1974 Contract Document
Contamination of Surface and Ground Water	• To prevent surface and ground water contamination by oil/ grease, leak proof containers will be used for storage and transportation. An oil trap should be provided to prevent contamination from accidental spillage of oil. • All the debris resulting from construction activities shall be removed from the site on regular basis to prevent their runoff. Storage area shall be kept away from the water bodies to prevent any wash away into water bodies and ground water infiltration rates. • Adequate sanitation and waste management facility to be provided in construction camp as per Appendix 1.3 of EIA report and it is to be ensured that no liquid or solid waste get disposed into river during the construction period. • Labour camps are to be located away from water bodies • Construction labours should be restricted from polluting the source or misusing the source.	During construction	**Contractor**	**PMC & PIU**	The Environment (Protection) Act, 1986. The Water (Prevention and Control of Pollution) Act 1974 Contract Document

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• With the envisaged canal lining after 2 years and reservoir lining in this project activity, there could be increase in the ground water level which may result secondary impacts on the structures. Necessary studies need to be conducted to understand the high ground water level by proponent.				
Alteration of Drainage	• Construction materials containing fine particles will be stored in an enclosure such that sediment-laden water does not drain into nearby watercourses. All discharge standards promulgated under Environmental Protection Act, 1986, will be adhered to. • All liquid wastes generated from the site shall be disposed of as acceptable to the Engineer. • Excavated soil shall be used/ transported at the earliest for filling low lying areas at the site for raising of level as planned. • Moreover, the washed soil to also be arrested by creating garland drains, leading to settling pond/s to allow its settling and avoid its mixing with surface water and result in their silting. Washing of trucks should only take place in paved or lined areas with appropriate wastewater collection measures. • Provision of a temporary or alternative pathway for storm-water drainage, avoiding the elimination or the temporary closure of the natural run-off pathways.	Whenever encountered during construction	**Contractor**	**PMC & PIU**	The Environment (Protection) Act, 1986. The Water (Prevention and Control of Pollution) Act 1974 Contract Document

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• The drainage system shall be cleaned from time to time, so it is always able to carry the volume of storm water for which it was designed.				
Sludge/silt	Currently the sludge/silt cleared by the irrigation authorities are used by the farmers in the adjoining fields. However, any deposits of sludge/silt observed while the proposed works following precautions to be undertaken • Slude/Silt to be tested before the disposal at the approved sites in accordance with the provisions. • Sludge/silt disposal has to be undertaken only on receipt of approval on the test report and quantity from the ADC. • Silt fencing will be provided around stockpiles at the construction sites close to water bodies. The fencing needs to be provided prior to commencement of earthworks and continue till the stabilization of the embankment slopes.	Throughout the Construction	**Contractor**	**PMC & PIU**	The Environment (Protection) Act, 1986. The Water (Prevention and Control of Pollution) Act 1974 Contract Document(BoQ)
Water requirement for project	• During construction only permitted quantity (permission taken) from approved sources should be used in construction activity. • Contractor to ensure optimum use of water; discourage labour from wastage of water. • Prior written permission from authorities for use of water for construction activity should be submitted to PIU. • It is prohibited to use of ground water for any purposes. Boring of any tube wells will be prohibited.	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
NOISE					
Noise from vehicles, plants and equipment	• Construction operations should be undertaken primarily to day time, i.e. 6:00 am-10:00 pm only to minimize noise impacts. • The excavators should be equipped with the noise reduction/ masking equipment to reduce the noise generation inside and outside water. Noise from equipment can be reduced at source by isolation of exhaust system, by keeping engine room doors shut and by shielding. • Equipment's to be used for construction work shall be hand held tools with restricted use of pneumatic tools. • The equipment's used in construction shall strictly conform to the MoEF&CC/ CPCB noise standards and shall have latest noise suppression mountings. • All vehicles and equipment's used in construction will be fitted with exhaust silencers. • Only acoustic enclosures fitted DG sets will be allowed at the construction site and plant/ campsite.	Throughout the Construction	**Contractor**	**PMC & PIU**	Noise Pollution (Regulation and Control) Rules, 2000
FLORA AND FAUNA					
Loss of trees and Plantation works	Clearing and uprooting should be avoided beyond that which is directly required for construction activities. Buffer of minimum 30 meters to be developed either side of the canal and 50 meters around the	After completion of construction activities	**Contractor**	**PMC & PIU**	Forest (Conservation) Act, 1980, amended 1988 Andhra

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	waterbodies. Plantation as proposed below to be implemented on completion works[26]. 1. Pala vagu - Canal front (Approx. length of 16.7 Kms) – 118.6 Acre 2. Vykuntapuram Gravity Canal Front (Approx. length of 8kms with 23m wide section) – 39.5 Acre 3. Krishna Riverfront Development (25 km with 100m wide stretch greening) – 618 Acre 4. North bank canal front redevelopment – 60kms 5. Tree plantation shall be carried out as per the CPCB norms and Tree Authority directives following AP WALT ACT.				Pradesh Water, Land and Tree Act, 2002 Contract Document
Fauna	• Construction workers must protect natural resources • Hunting will be strictly prohibited	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document
SOCIO-ECONOMIC ENVIRONMENT					
Accidents	The Contractor will provide, erect and maintain barricades, including signs marking flats, lights and flagmen as required by the PMC along the project works.	After Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document
Resettlement Action of People	Near 27 families are being affected due to the project. Affected people will be compensated as per the entitled framework detailed in RAP.	During Construction	**Contractor**	**PMC & PIU**	Contract Document and RAP

[26] Iindicative and subjected change as per the final green master plan

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
Public Health and Safety	• No blasting activities near the existing settlements (especially near Neerukonda and Krishnayapalem) • Debris, so generated will be disposed to the satisfaction of Engineer. • Monitoring of air, water, noise and land during construction and operation phase.	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document
Labor Camps	• Contractors should recruit the local people as laborers at least for unskilled and semi-skilled jobs. • Hygiene and basic facilities should be ensured at labor camp to prevent the spread of disease. • Labor Camp should be equipped with adequate number of Indian style of toilets with running water facility and connected to septic tanks; • No Asbestos Containing Materials should be used for construction. Construction material should preferably be certified green materials. • Provision must be made for Washing Areas. Soak pits & other measures to prevent stagnation of water must be made. • Adequate space, ventilation and privacy is mandatory. • Adequate waste management measures to be implemented • Cooking fuel must be LPG(fuelwood, kerosene or any such substance shouldn't be used) • Contractors should follow the guidelines for siting and layout of construction as per the Annexure – XII, Annexure XIIa and XIIb of EIA Report	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• Campsite discipline including with specific protocols defined to ensure minimal impact on local communities. • Contractor should prepare Labor Management Plan and Camp site Management Plan. • Contractor should display the minimum wage and raise awareness on the labor rights.				
Operation Health and Safety	The Contractor would prepare OHS plan and other required plans as per the WBs guidelines. • All the laborers to be engaged for construction works shall be screened for health and adequately treated before issue of work permits. Periodic health check-up of construction workers. Provision of infrastructure and amenities for migrant labor in construction camp to avoid dependence on limited local resources. • Prevention of larval and adult propagation through sanitary improvements and elimination of breeding habitats close to human settlements in the close vicinity of construction site. • Implementation of a vector control program. • Avoiding collection of stagnant water. • Educating project personnel and area residents on risks, prevention, and available treatment for vector-borne diseases. • Promoting use of repellents, clothing, netting, and other barriers to prevent insect bites. • The contractor will appoint qualified and experienced Environment & Safety Officer (ESO), who will dedicatedly work and ensure implementation of EMP including Occupational	Throughout the Construction	**Contractor**	**PMC & PIU**	Relevant provisions of the Building and other construction workers (regulation of employment and conditions of services) Act 1996 are adhered to. Environmental, Health, and Safety (EHS) Guidelines-Water and Sanitation (2007) prepared by World Bank Group.

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	health and safety issues at the camp, construction work sites • The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the country' labor regulations and International Labor Organization (ILO) Convention No-62 as far as those are applicable to this contract				
Traffic Management	Carting of excavated material would require 845 vehicles per day. This would to increase in traffic on the access roads in the city including E3, E8, E10, E14, N4, N9, N14 and N16. The village settlements along these roads viz. (i) Uddandarayapalem; (ii) Venkatapalem; (iii) Mandadam; (iv) Malkapuram and (v) Velagapudi are expected to have problems due to envisaged additional traffic. In this regard, following preventive measures are suggested • Before start of the construction, proper traffic management plan will be prepared and submitted to ADC for approval. Secure assistance from local police for traffic control during the construction. • Necessary signage and barricading will be provided for safety of road users. • Contractor will ensure that no construction materials and debris are lying on the road. It will be collected and disposed of properly. • Wherever possible, rerouting of construction traffic to wider, less-restrictive road shall be preferred.	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• The contractor shall provide training to the drivers regarding the traffic rules and management provisions. Training records shall be maintained by the contractor. • On possibility, the movement of heavy vehicles to be restricted to the night times • Unnecessary parking and sound pollution to be strictly avoided especially when vehicles are passing through the settlements and sensitive receptor such as schools, hospital and cultural centers.				
RISK AND SAFETY					
Risk and Safety from Construction activities	• Adequate precautions will be taken to prevent danger from electrical equipment. • No material or any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights will be provided to protect the public.	Throughout the Construction	**Contractor**	**PMC & PIU**	EHS Guidelines of WB
Risk caused by Force' Majure	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work. Contractor has to prepare a response plan before start of construction works.	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document
Safety measures during construction	The Contractor will make sure that during the construction work all The Contractor shall provide and ensure enforcement with zero tolerance on the following: • Protective footwear to be given to all workers.	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	• Ear plugs to workers exposed to high noise levels. • Helmets to all workers, supervising staff and inspecting official entering construction site, plant area, quarry and engaged in loading /unloading operations • Protective goggles and clothing to workers engaged in stone breaking activities. • Contractors has to ensure workers safety during construction activities as per the Annexure XXIX of EIA Report • Environmental and safety cell of the company shall also actively involved in imparting training and raising environmental awareness level of the construction staff.				
Hygiene	• At every workplace, good and sufficient water supply shall be maintained to avoid waterborne / water-related / water-based diseases to ensure the health and hygiene of workers. • Adequate drainage, mobile toilets shall be provided at workplace. • Preventive Medical care shall be provided to workers. • An action plan shall be prepared and implemented	Throughout the Construction	**Contractor**	**PMC & PIU**	Contract Document
HERITAGE AND CULTURE					
Heritage	• The Undavalli caves is at a distance of 300 meters from the existing canal which would not	During Construction	**Contractor**	**PMC & PIU**	Contract Document Ancient Monuments and

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	fall on either protected area[27] or regulated area[28] as per the Handbook of Conservation of Heritage Buildings published by CPWD. • However, specific measures to mitigate construction stage impacts include a. exclusion of any construction facilities (such as disposal sites, DG sets, batching plant, labor camps, etc.) within 1km radius; b. high level screen to prevent any air pollution from construction site and provision of water sprinkling; and c. exclusion of blasting activities within 1km radius				Archaeological Sites and Remains Rules 1959 Handbook of Conservation of Heritage Buildings published by CPWD.
Cultural Sites	Three common property resources including, one temple in Mandadam, one burial ground in Sakhamuru and one burial ground in Mandadam will be affected. The specific details are detailed out in RAP for flood mitigation works.	During Construction	**Contractor**	**PMC &PIU**	Contract Document & RAP
CONTRACTORS OBLIGATION					
Clean-up Operations, Restoration and Rehabilitation	• The contractor will prepare site restoration and demobilization plan, which will be approved by the Environmental Expert of Project Implementation Unit. The clean-up and restoration operation are to be implemented by the contractor prior to demobilization. The Contractor will clear all temporary structures;	On Completion	**Contractor**	**PMC & PIU**	Contract Document

[27] "Prohibited Area" means area of the protected monuments declared as of national importance and extending to a distance of 100 meters in all direction.

[26] "Regulated Area" means area in respect of every ancient monuments and archaeological sites and remains declared as of national importance and extending to a distance of 200 meters in all direction.

Environmental Impact & Aspect	Mitigation Measures[24]	Time frame[25]	Implementation	Monitoring and Supervision	Reference
	dispose all garbage, night soils and POL (Petroleum, Oil and Lubricants) wastes in environmental sound manner. • All disposal pits or trenches will be filled in and effectively sealed off. • All construction zones including camp, and any other area used/affected due to the project operations will be left clean and tidy at the contractor's expense to the entire satisfaction to the Environmental Expert of ADC				

Table 8-3: Environmental Management Plan for Flood mitigation works - Operation and Management Stage

Environmental Impact & Aspect	Mitigation Measures[29]	Time frame[30]	Implementation	Monitoring and Supervision	Reference
Drawl of Water from Krishna River	Water intake from Krishna river to the tune of 0.35 TMC out of the available 3 TMC (lean period) would be required to maintain minimum water levels on bi-weekly basis.	During Operation stage	ADC	ADC	EMP
Green buffer	The proposed green buffer either side of the canal and around the reservoirs, if not, managed as per the standards could lead to degradation including encroachments, disposal of wastes, construction debris etc. In order to avoid such impacts following measures to be adopted	During Operation stage	ADC	ADC	Forest (Conservation) Act, 1980, amended 1988 Andhra Pradesh Water, Land and Tree Act, 2002 Contract Document EMP
Maintenance of Canals	• The drainage system, canal will be periodically cleared so as to ensure water flow. The outlet structure should be inspected for evidence of clogging or outflow release velocities that are greater than design flow. • At least twice during the rainy season, accumulated trash and debris should be removed	During Operation stage	ADC	ADC	EMP

[29] Some of the mitigation measures are preventive in nature while some others include additional measures in terms of environmental conservation and involve physical and construction work

[30] Timeframe refers to the duration or instant of time when the mitigation measures will be taken.

Environmental Impact & Aspect	Mitigation Measures[29]	Time frame[30]	Implementation	Monitoring and Supervision	Reference
	from the side slopes, embankment, and spillway. All pond outlet devices should be protected from clogging. Sediment should be removed from the main ponds as necessary and at least once every two years. • Maintain oxygen levels for aquatic life and avoid generation of odors by following approved clearing mechanism.				
Maintenance of Reservoirs	• De-silting shall be carried out periodically. The outlet structure should be inspected for evidence of clogging or outflow release velocities that are greater than design flow. • At least twice during the rainy season, accumulated trash and debris should be removed. Sediment should be removed from the main ponds as necessary and at least once every two years. • Maintain oxygen levels for aquatic life and avoid generation of odors by following approved clearing mechanism	During Operation stage	ADC	ADC	EMP
Pollution Monitoring	The Project Implementation Unit will monitor the Ambient Air Quality, Water Quality, Soil Quality and Noise by engaging NABL approved Lab.	During Operation stage	ADC	ADC/APCRDA	EMP
Disposal of Waste and untreated effluents	In absence of strict mechanism towards maintenance of storm water, sewage and solid waste, the canals are prone for disposal of waste and untreated effluents. Proper disposal of waste oil, measures to control of oil spillage and etc., would be necessary during	During Operation stage	ADC/APCRDA	ADC/APCRDA	EMP

Environmental Impact & Aspect	Mitigation Measures[29]	Time frame[30]	Implementation	Monitoring and Supervision	Reference
	operation of the equipment involved in the flood mitigation works. In order to avoid any such implications the proponent has been implementing state of the art infrastructure in the capital city with operation and maintenance as part of the contractor of that facilities.				
Safety	Considering the open canal configuration, there is potential risk of safety. Following measures are proposed to avoid any such safety breach - 2.5 m long permanent type-IV barricade with 2.15 m high from road level conforming to IRC-SP 55-2014 including provision of LED strip lighting to MS barricades as safety measuring during night hours Workers safety measures such as use of PPE(Personal Protection Equipment) is necessary in case of operations involving in machinery.	During Operation stage	ADC	ADC/APCRDA	EMP

8.2 Organizational Framework

The proposed project will be implemented by ADC through its Project Implementation Unit (PIU). The PIU comprises of officers from Engineering Division, Procurement Division, Finance Division, Administrative Division, Social and Environmental Division of ADCL. The proposed Project Implementation Unit of ADCL is placed at Annexure XXVII of this report. In addition, Environmental management cell of APCRDA consisting Director (Environment), Director (Strategy), Chief Engineer, Superintendent Engineer, and Environment Engineer would be on board throughout implementation and monitoring of the project.

8.2.1 Implementation of EMP

The implementation and monitoring of EMP would be through Environmental Management Cell under the Project Implementation Unit of ADCL. The roles and responsibilities of the officers are hereunder

Officer	Responsibility
Project Director (PIU)	• Overview of the project implementation • Ensure timely budget for the EMP. • Coordination with different state level committee, to obtain regulatory clearances. • Participate in state level meetings • Monthly review of the progress.
Deputy Project Director (PIU)	• Overall responsible for EMP implementation • Reporting to various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation • Coordination with PIU Staff (EMC). • Responsible for obtaining regulatory Clearances • Review of the progress made by contractors • Ensure that BOQ items mentioned in EMP are executed as per Contract provisions.
Environmental Officer (PIU)	• Assisting Project Director in overall implementation of EMP • Review of periodic reports on EMP implementation and advising Project Director in taking corrective measure. • Conducting periodic field inspection of EMP implementation • Assisting Project Director to reporting various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation • Preparing environmental training program and conducting the same for field officers and engineers of contractor.
Social Officer(PIU)	• Assisting Project Director in overall implementation of EMP/RAP • Review of periodic reports on EMP/RAP implementation and advising Project Director in taking corrective measure. • Conducting periodic field inspection of EMP/RAP implementation • Assisting Project Director to reporting various stakeholders (World Bank, Regulatory bodies) on status of RAP implementation in coordination with APCRDA • Preparing training program and conducting the same for field officers and engineers of contractor.
Engineer (PMC/Authority Engineer)	• Act as an "Engineer" for supervising EMP implementation • Responsible for maintaining quality of EMP envisioned in detail Project Report

Officer	Responsibility
	• Maintaining progress reports on EMP implementation • Periodic reporting to PIU-ADC about the status of EMP implementation • Work in close coordination with Executive Engineer (package unit) and contractor.
Executive Engineer (PIU)	• Conducting need-based site inspection and preparing compliance reports and forwarding the same to the Environmental Management Cell (EMC) • Programming necessary training program on environmental issues.
Deputy Executive Engineer (PIU)	• Working as site-representative of Executive Engineer • Conducting regular site inspection to all onsite and offsite works • Maintaining records of all necessary statutory compliance, to be obtained from contractor. • Maintaining records of EMP implementation including photographic records • Attending environmental and social training programs • Preparing periodic reports on EMP implementation and forwarding to EE
Manager - Environmental and Social Development	• As detailed below

For ensuring that EMP is implemented as per provision in the document, Contractor shall nominate a qualified and experienced as Manager - Environmental and Social development from the commencement to completion of the project.

The responsibilities of Manager - Environmental and Social development of Contractor will include but not limited to the following:

- Directly reporting to the Project Manager of the Contractor;
- Discussing various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions;
- Prepare Contractor's Checklist, traffic management plan and safety plan as part of their Work Program;
- Ensure Contractor's compliance with the ESMF stipulations, code of conduct and conditions of statutory bodies;
- Assisting the project manager to ensure social and environmentally sound and safe construction practices;
- Conducting periodic environmental and safety training of engineers, supervisors and workers along with sensitization on social issues that may be arising during the construction stage of the project;
- Preparing a registers for material sources, labor, pollution monitoring results (if required by APPCB), public complaint/grievance redressal and as may be directed by the Engineer;

- Assisting the ADC on various environmental/social monitoring and control activities including pollution monitoring;
- Preparing and submitting monthly/bi-monthly reports or as specified in the contract documents to ADC on status of implementation safeguard measures.
- Will be responsible for getting and maintaining the approvals or clearance for various departments and Environmental officer.
- Will be responsible for all environmental and social safeguards of the project

8.3 Awareness and Training

ADC would take actions to augment the capacity of project management unit (PMU). A capacity building and training programme would be prepared which includes training of staff of Environmental and Social cell of PMU, contractor's staff (labours & engineers), PMC staff on environmental management, regulatory compliance and safety aspects. Training and human resource development is an important link to achieve sustainable operation of the facility and environmental management. For successful functioning of the project, relevant EMP should be communicated to the following groups of people: Proponent will set up an Environmental Monitoring Cell (EMC) to review the effectiveness of environment management system during construction and operational phase. EMC will work out a schedule for monitoring and will meet regularly to review the effectiveness of the EMP implementation. The data collected on various EMP measures would be reviewed by EMC and if needed corrective action will be formulated for implementation. Environmental training programs are presented in Table below

Table 8-4: Environmental Protection Training Table

S. No.	Training Program	Objective and Outline of Content	Participant profile	No of participants	Responsibility for Organizing	Frequency
1	Site Induction training	Site inductions for Collection, transport ,treatment and disposal of solid & hazardous waste	Staff and Contractors	25	Contractor	Once every six months to provide training, every time a new workers or new contractor should also provide training for admission
2	Environmental Awareness	Site environmental controls and an outline of the potential consequences of not meeting the environmental responsibilities	Staff and Contractors	20	Contractor	
3	DMP & Emergency Incidents	Understanding the requirements of Disaster Management Plan for emergency incidents	Staff and Contractors	20	Contractor	
4	Waste Minimization & Energy Conservation	Techniques for waste minimization,	Staff and Contractors	10	Contractor	

S. No.	Training Program	Objective and Outline of Content	Participant profile	No of participants	Responsibility for Organizing	Frequency
		water & energy conservation				
5	Environmental Health and Safety	Applicable environmental, health and safety regulations and compliance requirements for the same	Staff and Contractors	20	Contractor	
6	Social Issues	Gender issues, Non-discrimination, public consultation, labor influx	Staff and Contractor	20	Contractor/ADC	Once in Every Three Months

8.3.1 Workforce of Contractors

Through Training and Awareness robust measures shall be put in place to address the risk of gender-based violence. This can include:

(i) training and awareness raising among the workforce

(ii) informing workers about national laws that make sexual harassment and gender-based violence a punishable offence;

(iii) introducing a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance; and

(iv) Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence. Workforce of contractors training program is presented in Table below.

Table 8-5: Workforce of contractors training

Training Program	Objective and Outline of Content	Participant profile	No of participants	Responsibility for Organizing	Frequency
Labor safety & Environment Sanitation	Leaning on Labor safety and environmental sanitation	Contractor's workers and technical staff	All workers and staff on site	Contractor	Once every six months to provide training, every time a new workers or new contractor should also provide training for admission

8.4 Monitoring and Reporting procedures

The project's monitoring program included surface and groundwater quality impacts,

disturbance to important ecological habitats including riverside ecosystems, unscheduled environmental compliance inspections during construction, final inspection upon completion to ensure site condition is satisfactory, and assessment of sites prior to and after construction to ensure no loss of natural values.

Stipulated Air Quality Standards	
Total Particulates within 30 m of construction zone	- < 500 mcg/cum
PM_{10} (24 hrs. avg) in ambient air	- < 100 mcg/cum
$PM_{2.5}$ (24 hrs. avg) in ambient air	– < 60 mcg/cum
Noise Level Standards	
Work zone (8hrs. avg)	- < 85 dB(A)
Day time (Residential area)	- < 55 dB(A)
Night time (Residential area)	- < 45 dB(A)
Effluent Discharge Standards	
TSS	- < 100 mg/l
BOD_3 (27^0C)	- < 30 mg/l
TKN	- < 100 mg/l
Oil & grease	- < 10 mg/l

8.4.1 Reporting Requirements

Record keeping and reporting of performance is an important management tool for ensuring sustainable operation of the proposed development. Records should be maintained for regulatory, monitoring and operational issues.

Contractor would be required to submit monthly and six monthly reports containing the status of environment, health & safety at site to PMC (Project management consultant) & PIU (Project Implementation Unit) of ADC. PMC will be responsible for construction supervision and ensuring effective implementation of EMP by the contractor. PMC should report to PMU monthly about the performance and effectiveness of the EMP implemented by contractor on site and coordinate with field units and PMU for necessary corrective actions as may be required.

Environmental Monitoring Indicators and Reporting System for the proposed development are summarized in Table 8-6 and 8-7.

Metrics for regular reporting for Contractors:

a. environmental incidents, including contamination, pollution or damage to ground or water supplies;

b. health and safety incidents, accidents, injuries and all fatalities that require treatment;

c. Incidents requiring immediate notification: The Contractor shall provide immediate notification to the Site Engineer of incidents in the following categories. Full details of

such incidents shall be provided to the Engineer within the timeframe agreed with the Engineer.

- Confirmed or likely violation of any law or international agreement;
- Any fatality or serious (lost time) injury;
- Significant adverse effects or damage to private property (e.g. vehicle accident, damage from fly rock, working beyond the boundary)
- Major pollution of drinking water aquifer or damage; or
- Any allegation of sexual harassment or sexual misbehavior, child abuse, defilement, or other
- Violations involving children.

d. interactions with regulators: agency, dates, subjects, outcomes

e. status of all permits and agreements:

   i. work permits: number required, number received, actions taken for those not received;

   ii. status of permits and consents: list areas/facilities with permits required (quarries, asphalt & batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to site engineer (or equivalent), status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);

f. health and safety supervision:

   i. safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;

   ii. number of workers, work hours, metric of PPE use (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);

g. worker accommodations:

   i. number of migrant labor housed in accommodations, number of locals;

   ii. date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;

   iii. actions taken to recommend/require improved conditions, or to improve conditions.

h. HIV/AIDS: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);

i. gender (for migrant labor and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);

j. training:

i. number of new workers, number receiving induction training, dates of induction training;

ii. number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;

iii. number and dates of HIV/AIDS sensitization and/or training, no. workers receiving training (in the reporting period and in the past); same questions for gender sensitization, flag person training.

iv. number and date of GBV /SEA sensitization and/or training, number of workers receiving training on code of conduct (in the reporting period and in the past), etc.

i. environmental and social supervision: days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, days worked (hours community center open), number of people met, highlights of activities (issues raised), etc, highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management;

k. Grievances: list new grievances (e.g. allegations of GBV / SEA) received in the reporting period and unresolved past grievances by date received, complainant, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up(Cross-reference other sections as needed):

i. Worker grievances;

ii. Community grievances

l. Traffic and vehicles/equipment:

i. traffic accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;

ii. accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;

iii. overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).

m. Environmental mitigations and issues (what has been done):

i. dust: number of working bowsers, number of waterings/day, number of complaints, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/spoil lorries with covers, actions taken for uncovered vehicles;

ii. erosion control: controls implemented by location, status of water crossings, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;

iii. quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;

iv. blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);

v. spill cleanups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination;

vi. waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;

vii. details of tree plantings and other mitigations required undertaken in the reporting period;

viii. details of water and swamp protection mitigations required undertaken in the reporting period

n. compliance:

i. compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

ii. compliance status of Contractors EMP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance

iii. compliance status of GBV/SEA prevention and response action plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance

iv. compliance status of Health and Safety Management Plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance

v. compliance with Air, Water, Noise and Soil quality/sediment standards as stipulated by CPCB based on Environmental Quality Monitoring protocols(Table 8-5 & Table 8-6)

vi. other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

Metrics for regular reporting for PMC:

a. environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies;

b. health and safety incidents, accidents, injuries and all fatalities that require treatment;

c. Incidents requiring immediate notification: The Contractor shall provide immediate notification to the Site Engineer of incidents in the following categories. Full details of such incidents shall be provided to the Engineer within the timeframe agreed with the Engineer.

- Confirmed or likely violation of any law or international agreement;
- Any fatality or serious (lost time) injury;
- Significant adverse effects or damage to private property (e.g. vehicle accident, damage from fly rock, working beyond the boundary)
- Major pollution of drinking water aquifer or damage; or

- Any allegation of sexual harassment or sexual misbehavior, child abuse, defilement, or other
- Violations involving children.

d. interactions with regulators: agency, dates, subjects, outcomes

e. status of all permits and agreements:

vii. work permits: number required, number received, actions taken for those not received;

viii. status of permits and consents: list areas/facilities with permits required (quarries, asphalt & batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to site engineer (or equivalent), status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);

f. health and safety supervision:

i. safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;

ii. number of workers, work hours, metric of PPE use (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);

g. worker accommodations:

i. number of migrant labor housed in accommodations, number of locals;

ii. date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;

iii. actions taken to recommend/require improved conditions, or to improve conditions.

h. HIV/AIDS: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);

i. gender (for migrant labor and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);

j. training:

i. number of new workers, number receiving induction training, dates of induction training;

ii. number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;

iii. number and dates of HIV/AIDS sensitization and/or training, no. workers receiving training (in the reporting period and in the past); same questions for gender sensitization, flag person training.

iv. number and date of GBV /SEA sensitization and/or training, number of workers receiving training on code of conduct (in the reporting period and in the past), etc.

v. environmental and social supervision: days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, days worked (hours community center open), number of people met, highlights of activities (issues raised), etc, highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management;

k. Grievances: list new grievances (e.g. allegations of GBV / SEA) received in the reporting period and unresolved past grievances by date received, complainant, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up(Cross-reference other sections as needed):

   i. Worker grievances;

   ii. Community grievances

l. Traffic and vehicles/equipment:

   i. traffic accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;

   ii. accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;

   iii. overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).

m. Environmental mitigations and issues (what has been done):

   i. dust: number of working bowsers, number of waterings/day, number of complaints, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/spoil lorries with covers, actions taken for uncovered vehicles;

   ii. erosion control: controls implemented by location, status of water crossings, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;

   iii. quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;

   iv. blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);

   v. spill cleanups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination;

   vi. waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;

   vii. details of tree plantings and other mitigations required undertaken in the reporting period;

   viii. details of water and swamp protection mitigations required undertaken in the reporting period

n. compliance:

   i. compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

   ii. compliance status of Contractors EMP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance

   iii. compliance status of GBV/SEA prevention and response action plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance

   iv. compliance status of Health and Safety Management Plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance

   v. compliance with Air, Water, Noise and Soil quality/sediment standards as stipulated by CPCB based on Environmental Quality Monitoring protocols(Table 8-5 & Table 8-6)

   vi. other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

Table 8-6: Environmental Monitoring Indicators & Reporting Frequency

Sr. No.	Indicator	Details	Frequency	Responsibility
1.	Regularity Permissions	Ensure necessary regulatory permissions	Before commencement of work	Engineer
2.	Insurance of workers	Ensure insurance of workers	Monthly	Contractor
3.	Gender Issues	Monitoring and documentation of deployment of women	Monthly	Contractor
4.	Grievances	Monitoring of grievances or complaints received during construction work	Weekly	PIU
5.	Air Quality	24 hourly Ambient Air Quality monitoring for $PM_{2.5}$, PM_{10}, SO_2 and NO_2 and CO	Once in each quarter (per year)	Contractor by engaging NABL accredited Environmental Lab
6.	Noise Levels	Noise levels(dB) for Day and Night	Once in each quarter (per year)	Contractor by engaging NABL accredited Environmental Lab
8.	Sediment Quality	Testing of dredged sediment for presence of heavy metals, toxins and other contaminants	Once prior to excavation	Contractor by engaging NABL accredited Environmental Lab
7.	Wastes and Debris	Monitoring of collection and disposal of debris at pre-identified site from construction sites	Daily	Contractor
8.	Traffic Safety	Monitoring traffic safety at worksites	Daily	Contractor
9.	Cleaning and Restoration	Camp and construction sites	On completion of work	Environment & Safety Officer of the Contractor

Table 8-7: Reporting System

Sr. No.	Item	Stage	Contractor	PMC/PIU
			Implementation& Reporting to PMC/PIU	Supervise/Field Compliance Monitoring
1.	Identification of disposal locations for debris	Construction	One Time	One Time
2.	Monthly EMP Implementation Report	Construction	Monthly	Monthly
3.	Environmental Quality Monitoring	Construction	Quarter	Quarter
4.	Cleaning and Restoration	After Completion of Construction	One Time	One Time
5.	Accident reporting	Construction	Monthly	Monthly

APCRDA/ADCL would report to the World Bank as per the project and World Bank reporting requirements

The contractor will take all reasonable steps to protect the environment on and off the construction site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his operation.

8.5 Contract Clauses

- The Contractor shall be responsible for implementation of environmental provisions outlined in the EMP, in addition to adhering to all environmental provisions in the applicable specifications for the works as part of good engineering practice.
- All works undertaken towards protection of environmental resources as part of the EMP and as part of good engineering practices while adhering to relevant specifications shall be deemed to be incidental to works being carried out and no separate payment will be made unless otherwise specified explicitly. The costs towards environmental management as per EMP unless otherwise provided as a separate head, will be deemed to be part of the BOQ of the project. The scope of works of the Contractor towards the Implementation of the environmental provisions shall be as follows;
- Abide by all existing environmental regulations and requirements of the GoI/GoAP, during implementation.
- Compliance with all mitigation measures and monitoring requirements set out in the EMP
- Schedule of a method statement detailing how the subproject EMP will be complied with. This shall include methods and schedule of monitoring.
- Monitoring of project environmental performance and periodic submission of monitoring reports shall be done as per the EMP provisions.

- Compliance of all safety rules at work and provision of adequate health and safety measures such as water, food, sanitation, personal protective equipment, workers' insurance and medical facilities.

Code of Conduct of the Contractor

The Contractor will develop a Code of Conduct that will apply to Contractor's Personnel to ensure compliance with its Environmental, Social, Health and Safety (ESHS) obligations. The code of Conduct shall include the risks to be addressed by the Code in accordance with EMP including risks associated with: labor influx, spread of communicable diseases, sexual harassment, gender based violence, sexual exploitation and abuse, illicit behaviour and crime, and maintaining a safe environment etc.

In addition, the Contractor shall detail how this Code of Conduct will be implemented. This will include: how it will be introduced into conditions of employment/engagement, what training will be provided, how it will be monitored and how the Contractor proposes to deal with any breaches.

The Contractor shall be required to implement the agreed Code of Conduct

The Code of conduct will include the following

- *Environmental Management Plan*
- *consent/permit conditions* (Consent for establishment, consent for operation, explosive licence, Licence for quarrying, disposal of spoil or any other material and etc. as applicable)
- *required standards including World Bank Group EHS Guidelines*
- *relevant international conventions, standards or treaties, etc., national, legal and/or regulatory requirements and standards (where these represent higher standards than the WBG EHS Guidelines)*
- *relevant standards e.g. Workers' Accommodation: Process and Standards (IFC and EBRD)*
- *relevant sector standards e.g. workers' accommodation*
- *grievance redress mechanisms.*

A satisfactory code of conduct shall contain obligations on all Contractor's Personnel (including sub-contractors and day workers) that are suitable to address the following issues, as a minimum. Additional obligations may be added to respond to particular concerns of the region, the location and the project sector or to specific project requirements.

The Code of Conduct shall ensure

1. Compliance with applicable laws, rules, and regulations
2. Compliance with applicable health and safety requirements to protect the local community (including vulnerable and disadvantaged groups), the ADC's Personnel, and the Contractor's Personnel (including wearing prescribed personal protective equipment, preventing avoidable accidents and a duty to report conditions or practices that pose a safety hazard or threaten the environment)
3. No use of illegal substances

4. Non-Discrimination in dealing with the local community (including vulnerable and disadvantaged groups), the ADC's Personnel, and the Contractor's Personnel (for example on the basis of family status, ethnicity, race, gender, religion, language, marital status, age, disability (physical and mental), sexual orientation, gender identity, political conviction or social, civic, or health status)
5. Interactions with the local community(ies), members of the local community (ies), and any affected person(s) shall convey an attitude of respect, including to their culture and traditions
6. Prevention of Sexual harassment (for example to prohibit use of language or behavior, in particular towards women and/or children, that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate)
7. Prevention of Violence, including sexual and/or gender based violence (for example acts that inflict physical, mental or sexual harm or suffering, threats of such acts, coercion, and deprivation of liberty
8. Prevention of Exploitation including sexual exploitation and abuse (for example the prohibition of the exchange of money, employment, goods, or services for sex, including sexual favors or other forms of humiliating, degrading behavior, exploitative behavior or abuse of power)
9. Protection of children(persons less than 18 years of age) (including prohibitions against sexual activity or abuse, or otherwise unacceptable behavior towards children, limiting interactions with children, and ensuring their safety in project areas)
10. Sanitation requirements (for example, to ensure workers use specified sanitary facilities provided by their employer and not open areas)
11. Avoidance of conflicts of interest (such that benefits, contracts, or employment, or any sort of preferential treatment or favors, are not provided to any person with whom there is a financial, family, or personal connection)
12. Respecting reasonable work instructions (including regarding environmental and social norms)
13. Protection and proper use of property (for example, to prohibit theft, carelessness or waste)
14. Duty to report violations of this Code
15. Non retaliation against workers who report violations of the Code, if that report is made in good faith.

The Code of Conduct should be written in plain language and signed by each worker to indicate that they have:

- received a copy of the code;
- had the code explained to them;
- acknowledged that adherence to this Code of Conduct is a condition of employment; and
- understood that violations of the Code can result in serious consequences, up to and including dismissal, or referral to legal authorities.

A copy of the code will be displayed in a location easily accessible to the community and project affected people. It shall be provided in languages comprehensible to the local community, Contractor's Personnel, ADC's Personnel, and affected persons.

Movement/ Circulation Plan during Construction

For all construction activities, the Contractor shall prior to initiation of construction activities, prepare and get approved by the Engineer, a construction plan including the staging, sequencing of construction activities, circulation plans to ensure smooth movement of public, including provision of alternative routes, etc.

Debris Disposal

The contractor will prior to start of construction and dismantling operations identify potential sites for disposal of hazardous construction debris, sites for general construction wastes and domestic wastes from construction camps. The contractor will obtain approval on identified sites from the Local Authority and disposal will be only after consent letter from the ADC.

Precautions for Protection of Environmental Resources

- The Contractor shall ensure that construction activities do not result in any contamination of land or water by polluting substances.
- Unless otherwise provided in the specifications, the Contractor shall ensure that no trees or shrubs or waterside vegetation are felled or harmed except those required to be cleared for execution of the works. The Contractor shall protect trees and vegetation from damage to the satisfaction of the Engineer.
- The Contractor shall consult with local residents and local government before locating project offices, sheds, and construction plant.
- The Contractor will maintain ecological balance by preventing felling of trees, water pollution and defacing of natural landscape. In respect of ecological balance, the Contractor will observe the following instructions.
- In the conduct of cleaning activities and operation of equipment, the Contractor will utilize such practicable methods and devices as are reasonably available to control, prevent and otherwise minimize air/noise pollution.
- The Contractor shall monitor the environmental parameters periodically as specified in the monitoring plan and report to the Engineer.

Occupational Health and Safety during Construction

The Contractor shall prepare Occupational Health and Safety Plan and other as per the World Bank regulations.

The Contractor shall, in accordance with the safety and health provisions specified in the EMP, provide workers with a safe and healthy working environment, in the work areas, through application of preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. The borrower/ client will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by

- Providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances;
- Providing appropriate equipment to minimize risks and requiring and enforcing its use;
- Training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment;
- Documenting and reporting occupational accidents, diseases, and incidents; and
- Having emergency prevention, preparedness, and response arrangements in place.

8.6 Flood Mitigation Plan

Large number of urban locations are located on hazard prone land areas and a big majority of people are affected because of flooding. Irrespective of whether urban floods are part of larger riverine floods or result from inadequate drainage capacities, the damage potential of floods in cities is extraordinarily high. The main impacts of flooding on the population include, material damage and loss of life; the interruption of economic activity in the flooded areas; infection by water-borne diseases; and water pollution when toxic-waste dumps are flooded.

Given the high spatial concentration of people and values in cities, even small-scale floods may lead to considerable damage. In extreme cases urban floods can result in disasters that set back urban development by years or even decades. Recent statistics clearly indicate that economic damages caused by urban floods are rising.

In the context of Disaster Management (DM), awareness generation should have two objectives. First, it will prepare communities to deal with disasters in a manner that people's lives and properties are protected, and to ultimately become resilient.

Public awareness generation will serve to empower people with knowledge about the role and responsibilities of the state, leading to crystallisation of political and administrative will. This will manifest itself in better and timely strategies for disaster risk reduction.

As discussed in National Guidelines on Management of Floods, the most basic thing is that the community is to be aware of vulnerability which can vary from low to very high, but keeping the mobility of the people in the urban areas. They have to sensitise in all situations. Very often people are not aware of how individual actions can contribute to betterment or deterioration of vulnerability.

The urban flooding DM approach aims at institutionalising the implementation of initiatives and activities, covering all components of the DM cycle, including prevention, preparedness, mitigation, relief, rehabilitation and recovery, with a view to developing communities that are well-informed, resilient and prepared to face emergencies with minimal loss of life and property. Therefore, it will be the endeavour of the Central and State governments and the ULBs to ensure implementation of these Guidelines.

The initial activities of the DM response group comprising of State and Centre authorities, AP State Disaster Response Force, AP State Disaster Management Authority (APSDMA) and District Authorities. The Community Based Organizations (CBOs), with help of ULBs authorities and

Media can play major role in distare situation. The list of actions for in event of flood disaster is given in following Table.

Table 8-8: Action Plan for Flood Mitigation

Sr. No.	DM Stages	Activities/ Action
1.	Early Warning	Setting up Control Room/ Emergency Operation Centre round the clock
		Arrangement of vehicle and sound system for information dissemination
		Proper record keeping and transmission of information to all the level
		Ensure functioning of warning system & communication systems
		Create awareness with the target groups
2.	Evacuation	To warn people about the impending danger & to leave for safer places. Mobilize people to go to identified/ safer shelter
		Organize trained task force members
		To co-ordinate with civil defense-NGOs/ Secy. Rajya Sainik Board/ Police for support.
		Arrangement of boats/ vehicles etc. for evacuation. Deployment of Boats for evacuation
		Evacuate people of marooned areas and administer emergent relief
		Deployment of police for maintaining law & order & peace keeping during evacuation
3.	Search and Rescue	Deployment of Police/Fire Brigade for search and rescue
		Co-ordination with the NCC/ NSS/ Civil Defense/ Rajya Sainik Board etc. for rescue operation
		Ensure availability of the rescue materials
		Prepare inventory of shelter places and map indicating the shelter centers
		Provide & arrange Rescue kit at risk areas
4.	Medical aid	Deployment of Medical staff
		Stock piling of Life saving drugs/ORS packets/ Halogen tablets.
		Protocol on medical aid
		Treatment of the injured persons and Transportation of the injured to hospitals.
		Awareness message to stop the outbreak of epidemics
		Disease surveillance and transmission of reports to the higher authorities on a daily basis
		Vaccination
		Constitute mobile teams and visit the worst affected areas
		Disinfections of Drinking water sources.
		Identification of site operation camps.

Sr. No.	DM Stages	Activities/ Action
		To obtain/transmit information on natural calamities to District Control Room.
		Advance inoculation programme in the flood/Cyclone prone areas.
		Arrangement of fodder/medicines for the animals Vaccination, site operation camps, Carcasses disposal
5.	Shelter Management	Identification of Shelter/Temporary shelter at appropriate places and arrangement of tents etc.
		Arrangement of Food/Drinking water/Medicine in the shelter places.
		Arrangement of transportation
		Arrangement for safe shelter for animals
		Providing the lighting facilities for shelter places
		Deployment of Police Personnel
		Temporary supply of safe drinking water
6.	Emergent Relief/ Free Kitchen Operation	Deployment of vehicle
		Procurement and transportation of Relief materials to affected pockets/areas
		Provision of kitchen in the shelter camps & affected areas
		Assigning of free kitchen in the shelter camps & affected areas
		Assigning responsibilities to officials for distribution of emergent relief/running of free kitchen
		Coordinating with the NGOs/Other voluntary organization & PSUs / UNDP/ REDCROSS etc. for continuing Relief Operation
		Monitoring
7.	Water Supply and Sanitation	Ensuring supply of safe drinking water arrangement for supply of safe drinking water
		Disinfectant for purification of water
		Arrangement of mobile team and assigning specific operational area for supply of water
		Involvement of volunteers/village level workers inaccessible pockets health awareness campaign
8.	Infrastructure Restoration	Formation of task force with specific equipment's
		Assigning responsibilities for specific areas
		Emergency cleaning of debris to enable reconnaissance.
		Coordinate road-cleaning activities to assist relief work
		Begin clearing roads, assemble casual labor provide a work team carrying emergency tool kits
		Towing vehicles, Earth moving equipment's, cranes, construct temporary roads
		Keep National & other Highways clear from disaster effects.
		Damage assessment & Monitoring

8.7 Budgetary Provisions for Implementation of EMP

The EMP shall be integrated part of the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP items tabulated in Table 8-8 will be paid to the contractor as per items given in Bill of quantity. The contractor will ensure effective implementation of EMP during pre-construction, construction and demobilization phases.

8.8 Project & EMP Implementation Schedule for Flood Mitigations Works

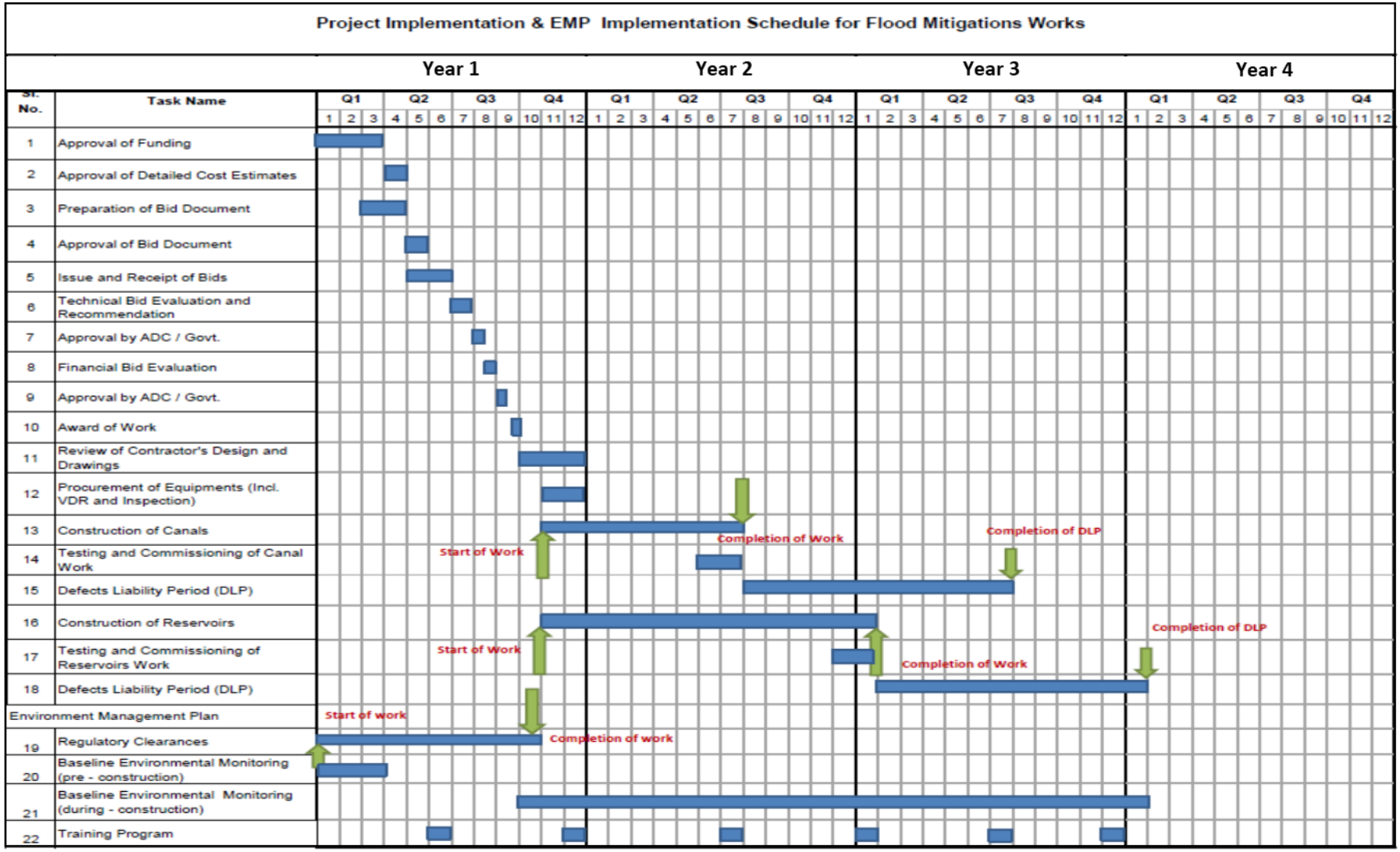


Table 8-9: Cost Estimate for EMP Implementation

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
1.	Providing and Installing 2.5m long permanent type-IV barricade with 2.15m high from road level conforming to IRC-SP 55-2014 including Provision of LED Strip lighting to MS barricades as a safety measure during night hours	Considering 6 operational areas at any given point of time & 100m length per operational area, Total length of Barricading required - Total length of barricading required - (100 mts. x 6 sites/work fronts)	600 meters	46.0
		Cost per running meter	Rs.7600	
		Total Cost of barricades	600xRs. 7600	
2.	Installation of caution/sign/diversion boards on both upstream and downstream sides of operational area as per requirement of specific stretch (including cost of boards and other materials required for fixing, shifting	No. of boards required per operational area/ segment (considering 5 nos. on each side of the work front)	10	2.86
		Total boards required for 6 operational areas at any given point of time	60	

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
	charges from one place to another with all incidental charges leads & lifts)	Cost of each board as per IRC Specifications	3 different type of signs are there, Cautionary/ Mandatory sign- Triangular (90cm side of equilateral) No. of Boards-25: (Rs.4562.55) Mandatory/regulatory sign – Octagonal (90cm side) No. of Boards-:10 (Rs.7180.57) Mandatory/ regulatory sign -Circualr (60cm dia) No. of Boards-: 25 (Rs.4017.8)	
		Total cost of boards	(25xRs.4562.55)+(10xRs.7180.57)+(25xRs.4017.8)	
3.	Provision of 2 seater mobile toilet (1 seat for man and 1 seat for woman) with separate entrances), fitted with 2000 litres overhead water storage tank and sludge tank of capacity 1000L, and stationed at a suitable place within 100 metres from operational area, with lighting and ventilation arrangement, including all material, labor, consumables,	Total no. of operational areas at any point in time	6	3.0
		Considering 1 mobile toilet/operational area, total mobile toilets required	6	
		Cost of one mobile toilet two seater (1 man & 1 women with separate entry) with labor	Rs 50000	
		Total cost of mobile toilets	Rs. 50000x6	

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
	tools & plant, including disposal of waste, etc.			
4.	Provision of mobile drinking water counter /kiosk, fabricated from stainless steel with 300 liter capacity, with at least two taps, with bottom tank to collect waste water and stationed at a suitable place	Nos of Drinking water counter/kiosk required / operational area	1	1.5
		Total number of water counter/kiosks -	6	
		Total Cost for Drinking water counter/kiosk	6x25000	
5.	Solid Waste Management: Providing and installing HDPE bin (wheel base) as per specification including loading, unloading and conveyance upto work site, including all taxes, duties etc.*	Total Cost	LS	10
6.	Deploying an on-site crew group, comprising of mason, plumber, electrician and fabricator (with	Total cost of deploying skilled workers (mason, plumber, electrician and fabricator) with		6.85

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
	assistant/s) at the work zones for the construction period including cost of providing one multi utility pick-up van and provision for keeping tools and equipment including driver and fuel, for all leads and lifts, including all materials, consumables, tools, etc. (Mobile pick up van also shall have one operational mobile number with dedicated vehicle)	vehicle and repair equipment/tools per month	Rs. 57100	
		Total Cost	12 months x Rs. 57100	
7.	Desilting by any means including removal of silt, sludge, sediments, soil, garbage, floating debris, boulders stones, etc., including	Total estimated quantity of garbage/ sludge collection and disposal	LS	10
		Cost of collection and disposal per cum		
	carriage of desilted material to disposal sites within and upto lead at approved/ designated sites including sprinkling of	Total collection and disposal of garbage and sludge from seven drains		

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
	approved disinfectants, loading, unloading and transport			
8.	Positioning of agile flagman with an orange vest and a helmet and a red flag 600 x 600 mm securely fastened to a staff 1 m in length for guiding/managing the traffic	No. of Flagmen	LS	12
		Cost of hiring services of one flagman		
		Total Cost		
9.	Personnel Protective Equipment	Personnel Protective Equipment's such as Full Body Protective Suit, hard hat or helmet, protective footwear, goggles, hand gloves, masks while handling raw sewage/waste water/solid waste from drains	200	15.0
		Cost of Full Body Protective Suit, gloves, mask etc. while handling Raw Sewage/ Waste	Rs.7500	

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
		Water/Solid Waste for one worker		
		Total Cost	200xRs. 7500	
10.	Provision for Orientation/Training for Contractors	Lump sum Cost	INR 50,000 x 14 rounds	7.0
11.	Environmental monitoring of operational areas and work campsites under the project through a NABL/MOEFCC accredited laboratory a)The parameters to be monitored under AAQ are :PM_{10} , $PM_{2.5}$, ,SO_2, , NO_2, CO as per CPCB guidelines	No. of locations	16 Locations	10.64
		Frequency & duration of monitoring	Once in month (per year)	
		Total no. of samples	12x16 = 152	
		Cost of Ambient Air Quality Monitoring and Noise Measurements @ Rs. 7000 per sample	7000 x 152	
12.	Water Sampling and Analysis for TSS, BOD,COD, pH, Turbidity, Oil	Numbers of Locations (Ground – 7, Surface – 5)	18	

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
	& Grease and Coliforms with Frequency & duration of monitoring as once in quarter and as per CPCB guidelines, etc. complete as per direction of Engineer	Frequency & duration of monitoring	Once in month (per year)	
		Total no. of samples	18 x12=216	
		Cost of Sampling and Analysis of waste water @ Rs.4000/sample	4000 x 216	8.64
13.	Soil Sampling and Analysis for PH, EC, Porosity, Sodium as Na, Potassium as K, SAR, Permeability, Moisture Content, Copper as Cu, Iron as Fe as per CPCB guidelines, etc. complete as per direction of Engineer	Numbers of Locations	12	5.76
		Frequency & duration of monitoring	Once in each quarter (per year)	
		Total no. of samples	12 x12=144	
		Cost of Sampling and Analysis of waste water @ Rs.4000/sample	4000 x 144	
14	The ambient noise levels measured and analyzed for equivalent noise levels viz. Leq (24hrly), Lday, and Lnight at all the noise monitoring locations.	Numbers of Locations	16	1.92
		Frequency & duration of monitoring	Once in each quarter (per year)	
		Total no. of samples	16 x12=192	

Sr. No.	EMP Item Particulars	Basis of Estimation	Quantity and Cost per unit	Total Amount (in lacs, INR) (Approx.)
		Cost of Sampling and Analysis of waste water @ Rs.1000/sample	1000 x 192	
15	Cost of Labor Camp which includes living unit for labors, common kitchen, common bio-toilets etc. (each block can accommodate 32 persons) – **(Drawing is presented in Annexure – XII & XXIX)**		Cost per block (8 room, 1 kitchen & 3 bio-toilets) is Rs. 11 lacs. For two (2) blocks 22 lacs	22
	Total Cost of EMP Implementation And Monitoring			**163.24**

Penalty for Non-Compliance:

(a) The contractor shall follow all environmental mitigation measures as defined in the Environmental Management Plan. A damage shall be levied at the rate of Rs 10000/- per day for per location for non-conformity of Environmental Management Plan measures.

(b) The contractor shall ensure that sufficient numbers and good quality personnel protective equipment (PPE) are provided to the staff and labour defined in the labour codes and/or regulatory requirements referred in the Environmental Management Plan (EMP). In addition, the contractor shall enforce safety discipline amongst works to use PPE. A damage shall be levied at the rate of Rs 2000/- per day per staff/labour for non-conformity in part or full.

(c) The Contractor shall prepare traffic diversion plans, obtain necessary diversion permissions, and provide adequate safety measures including barricading of all the construction sites, provision of access to private properties, etc. as defined in the Environmental Management Plan. A damage shall be levied at the rate of Rs 25000/- per day per location, in the event of non-conformity in part or full to such measures.

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

9.1 Summary of Impacts

The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the flood mitigation project. Potential negative impacts were identified in relation to both construction and operation of the improved infrastructure. The impacts are summarised as follows:

- Soil resources: The project requires excavation and re-filling in certain areas, which may have impact on Top soil. There could also be impact due to soil spillage from fuelling area for vehicles and equipment.
- Impact on water resources: Some minor impact is envisaged during construction phase of the project due to soil erosion, spillage of oil and lubricants and other construction work. The activities may lead to contamination of surface and ground water.
- Impact on air quality: Movement of vehicles and equipment during construction phase may have negative impact on air quality of the area.
- Impacts on Ecology and Biodiversity: Due loss of trees coming on the project alignment may impact the ecology of the area. Changes in land use may also have impact on ecology and biodiversity.
- Community Health and Safety: Due to air pollution and noise, the community health and safety may get impacted.

9.2 Summary of mitigation works

Mitigation works will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the ADC. There will also be longer-term surveys to monitor the expected improvements in the quality of water and the health of the population.

All the clearances required for Environmental aspects during construction shall be ensured and made available prior to start of construction activity. The excavations shall conform to the lines, grades, side slopes and levels shown in the drawings or as directed by the engineer. Topsoil will be removed prior to commencement of bulk earthwork and preserved for reuse in landscape within the project area. Tree plantation shall be carried out as per the CPCB norms, Tree Authority directives and AP WALTA Act 2002, Andhra Pradesh. Environmental and safety cell of the project shall also actively involved in imparting training and raising environmental awareness level of the construction staff.

9.3 Integration of EMP in the Project

All works undertaken towards protection of environmental resources as part of the EMP while adhering to relevant specifications shall be deemed to be incidental for the works being carried out and no separate payment will be made unless otherwise specified explicitly. The costs towards environmental management as per EMP unless otherwise provided as a separate head, will be deemed to be part of the BOQ of the project. The scope of works of the Contractor towards the Implementation of the environmental provisions shall be as follows:

- Abide by all existing environmental regulations and requirements of the GoI, during implementation.

- Compliance with all mitigation measures and monitoring requirements set out in the EMP
- Schedule of a method statement detailing how the subproject EMP will be complied with. This shall include methods and schedule of monitoring.
- Monitoring of project environmental performance and periodic submission of monitoring reports shall be done at least once during the construction phase.
- Compliance of all safety rules at work and provision of adequate health and safety measures such as water, food, sanitation, personal protective equipment, workers' insurance and medical facilities.

9.4 Potential for residual Impacts

On the basis of the assessment of potential impacts and the recommended mitigation measures in this EIA, overall, the Proposed Development is not likely to impose many significant adverse effects on the environment. As summarized in EMP Section, the majority of impacts on the environmental are either negligible in nature (and therefore significance) or of minor adverse significance.

The EIA has, however, identified some potentially moderate/ major adversely significant effects, largely surrounding the landscape and visual impacts of the proposed development during operation. Impacts on landscape character and potentially sensitive receptor points in the surrounding area are considered to be potentially major adverse.

9.5 Strategy for future review and revision of the EMP

The Amravati Sustainable Capital City Development Project (ASCCDP), supported by the World Bank, involves green-field development of selected urban infrastructure (roads, flood mitigation) and is categorized as Category A. Considering the fact that some of the sub-projects under the ASCCDP are to be designed during the course of its implementation, an Environmental and Social Management Framework (ESMF) was developed.

As specified in the ESMF, the flood mitigation sub-project requires an EIA to be undertaken and an EMP to be developed and implemented. The EIA and EMP will go through an independent technical review by a third party agency who are engaged by ADC as per the World Bank/Government of A.P requirements.

9.6 Chance find procedures

Archaeological sites are protected by The Ancient Monument and Archeological Sites and Remains Rules 1958 and The Ancient Monument and Archeological Sites and Remains Rules 1959. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents.

The objectives of the 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling.

9.6.1 Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

9.6.2 Archaeological Chance Find Procedure

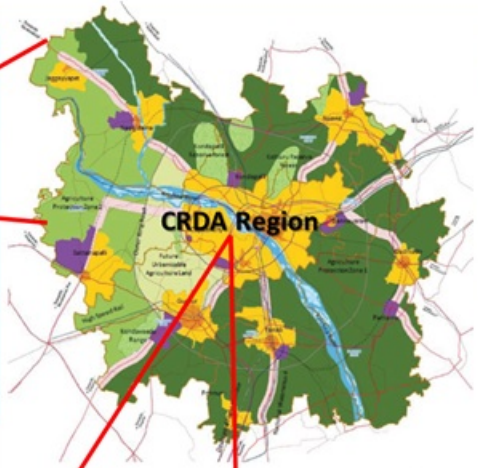
Following procedures to be adopted in case of finding any archaeological materials:

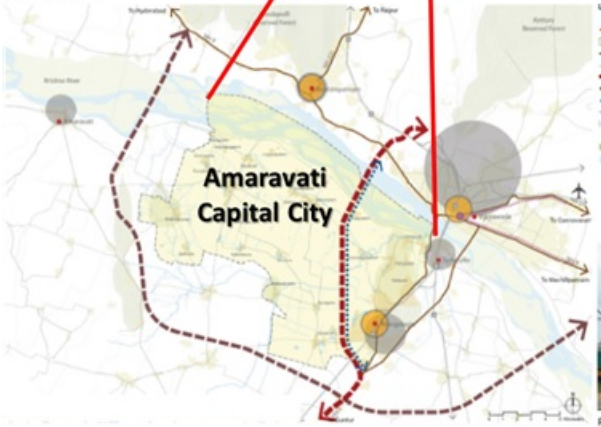
- All construction activity in the vicinity of the remains is to cease immediately.
- The find location will be recorded, and all remains will be left in place.
- The project archaeologist and Archaeology Branch will be contacted.
- Potential significance of the remains will be assessed and mitigative options will be identified.
- If the significance of the remains is judged sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the Archaeology Branch and representatives of local archaeological department will determine the appropriate course of action.
- In the case of human remains, if the remains are assessed to be archaeological, then the Archaeology Branch will be consulted to determine how to handle them. Options could include avoidance or respectful removal and reburial.

***** End of the Report ******

ANNEXURE-I

MAP SHOWING PROJECT LOCATION





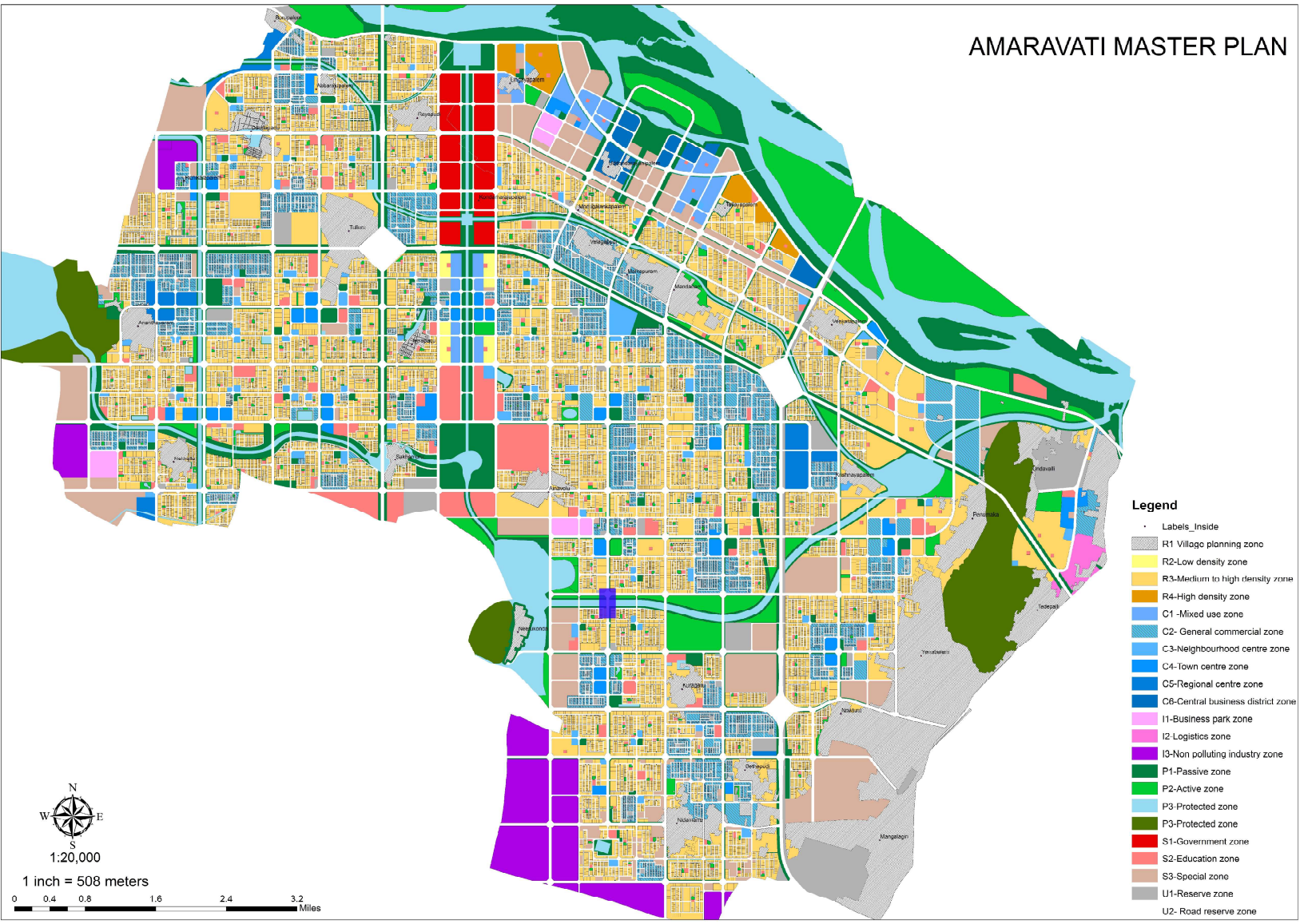
Gannavaram Airport

Vijayawada Rail Station

Road leading to Vijayawada

ANNEXURE-II

LAND USE MAP OF AMARAVATI CAPITAL CITY

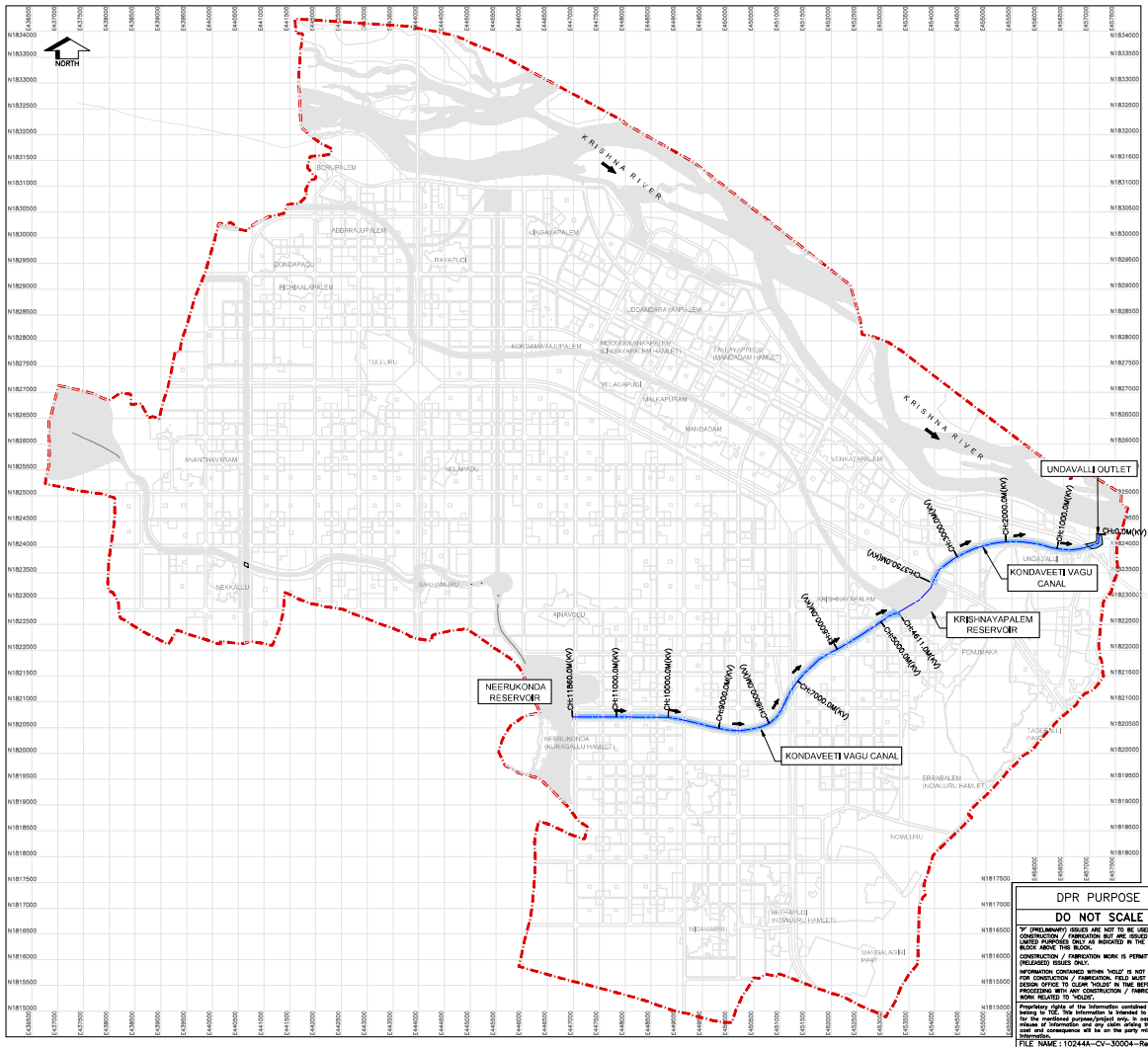

AMARAVATI MASTER PLAN
Legend
Labels_Inside
R1 Village planning zone
R2-Low density zone
R3-Medium to high density zone
R4-High density zone
C1 -Mixed use zone
C2- General commercial zone
C3-Neighbourhood centre zone
C4-Town centre zone
C5-Regional centre zone
C6-Central business district zone
I1-Business park zone
I2-Logistics zone
I3-Non polluting industry zone
P1-Passive zone
P2-Active zone
P3-Protected zone
P3-Protected zone
S1-Government zone
S2-Education zone
S3-Special zone
U1-Reserve zone
U2- Road reserve zone
N
W
E
S
1:20,000
1 inch = 508 meters
0 0.4 0.8 1.6 2.4 3.2
Miles

ANNEXURE-III

CROSS SECTIONS OF CANALS

TITLE: PROPOSED CANAL WORKS FROM UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR (CH:3750.00M)

DWG NO TCE.10244A-CV-3023-SI-30004



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE
KV – KONDAVETTI VAGU CANAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
PO	SIGN.													
	INITIALS	GK	RR	VS							AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE	

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

PROPOSED CANAL WORKS FROM UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR (CH:3750.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
1:37000	TCE.10244A-CV-3023-SI-30004	P0
DC & DSC: BLR & CV		

FILE NAME : 10244A-CV-30004-Rev-P0

FILE NAME: F:\091-Rev-R0.dwg

TCE FORM NO. 091 R0

TITLE: LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR KONDAVEETI VAGU CANAL
DWG NO TCE.10244A-CV-3023-SI-30005

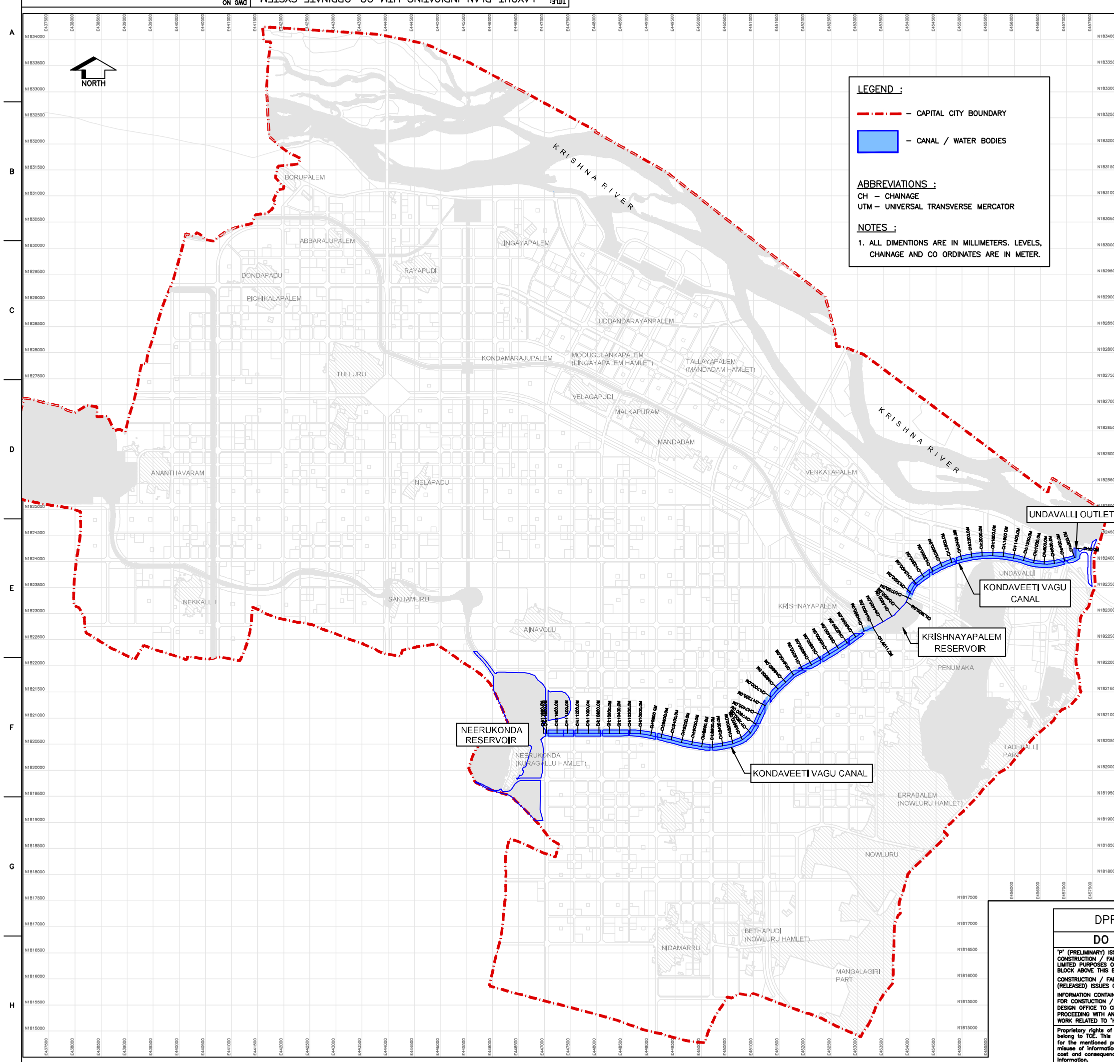


TABLE 1: DETAILS OF UTM CO ORDINATES

Chainage (m)	Easting	Northing
0	457135.72	1824254.88
25	457134.50	1824229.91
50	457133.29	1824204.94
75	457132.07	1824179.97
100	457130.85	1824155.00
125	457179.63	1824130.03
150	457178.42	1824105.06
175	457177.20	1824080.09
200	457154.76	1824070.83
225	457131.28	1824062.39
250	457107.70	1824053.94
275	457084.17	1824045.49
300	457060.64	1824037.04
325	457037.12	1824028.60
350	457013.59	1824020.15
375	456989.76	1824012.70
400	456965.43	1824006.94
425	456941.11	1824001.17
450	456916.78	1823996.40
475	456892.46	1823989.64
500	456868.13	1823983.87
525	456843.80	1823978.10
550	456819.48	1823972.34
575	456794.80	1823968.44
600	456770.04	1823964.98
625	456745.20	1823961.50
650	456720.62	1823958.07
675	456695.76	1823954.61
700	456671.00	1823951.16
725	456646.24	1823947.70
750	456621.44	1823945.68
775	456596.52	1823947.66
800	456571.60	1823949.64
825	456546.67	1823951.62
850	456521.75	1823953.61
875	456496.83	1823955.59
900	456471.91	1823957.57
925	456446.99	1823959.55
950	456422.36	1823963.62
975	456397.84	1823968.49
1000	456373.32	1823973.37
1025	456348.80	1823978.25
1050	456324.28	1823983.12
1075	456299.76	1823988.00
1100	456275.24	1823992.88
1125	456250.77	1823997.90
1150	456226.61	1824004.40
1175	456202.45	1824010.82
1200	456178.29	1824017.24
1225	456154.13	1824023.66
1250	456129.96	1824030.08
1275	456105.80	1824036.51
1300	456081.64	1824042.93
1325	456057.25	1824048.35
1350	456032.69	1824053.01
1375	456008.13	1824057.68
1400	455983.57	1824062.35
1425	455959.01	1824067.01
1450	455934.45	1824071.68
1475	455909.89	1824076.34
1500	455885.33	1824081.01
1525	455860.54	1824084.28
1550	455835.76	1824087.55
1575	455810.97	1824090.81
1600	455786.19	1824094.08
1625	455761.40	1824097.35
1650	455736.48	1824099.27
1675	455711.54	1824101.01
1700	455686.60	1824102.78
1725	455661.66	1824104.55
1750	455636.73	1824106.33
1775	455611.79	1824108.10
1800	455586.85	1824109.87
1825	455561.92	1824111.64
1850	455536.95	1824110.73
1875	455511.97	1824109.56
1900	455487.00	1824108.39
1925	455462.03	1824107.23
1950	455437.06	1824106.06
1975	455412.08	1824104.89
2000	455387.11	1824103.72
2025	455362.14	1824102.55
2050	455337.33	1824099.50
2075	455312.54	1824096.25
2100	455287.75	1824093.01
2125	455262.97	1824089.77
2150	455238.18	1824086.52
2175	455213.39	1824083.28
2200	455188.60	1824080.03
2225	455163.81	1824076.79
2250	455139.40	1824071.44
2275	455115.03	1824065.87
2300	455090.66	1824060.30
2325	455066.29	1824054.72
2350	455041.92	1824049.15
2375	455017.55	1824043.58
2400	454993.17	1824038.00
2425	454968.80	1824032.43
2450	454944.84	1824025.32
2475	454920.93	1824018.02
2500	454897.02	1824010.73
2525	454873.10	1824003.44
2550	454849.19	1823996.15
2575	454825.28	1823988.86
2600	454801.37	1823981.56
2625	454777.45	1823974.27
2650	454754.58	1823964.27
2675	454731.76	1823954.01
2700	454708.97	1823943.74
2725	454686.18	1823933.47
2750	454663.38	1823923.20
2775	454640.59	1823912.94
2800	454617.79	1823902.67
2825	454595.00	1823892.40
2850	454572.73	1823881.04
2875	454550.52	1823869.57
2900	454528.31	1823858.09
2925	454506.10	1823846.62
2950	454483.89	1823835.14

Chainage (m)	Easting	Northing
2975	454461.68	1823823.67
3000	454439.47	1823812.19
3025	454417.26	1823800.72
3050	454396.32	1823787.08
3075	454375.54	1823773.18
3100	454354.76	1823759.29
3125	454333.97	1823745.40
3150	454313.18	1823731.51
3175	454292.40	1823717.61
3200	454271.61	1823703.72
3225	454250.83	1823689.83
3250	454231.26	1823674.29
3275	454211.82	1823658.57
3300	454192.38	1823642.84
3325	454172.95	1823627.12
3350	454153.51	1823611.40
3375	454134.08	1823595.67
3400	454114.64	1823579.95
3425	454095.21	1823564.22
3450	454082.34	1823542.98
3475	454070.21	1823521.12
3500	454058.07	1823499.26
3525	454045.94	1823477.40
3550	454033.81	1823455.55
3575	454021.67	1823433.68
3600	454009.54	1823411.83
3625	453997.53	1823389.91
3650	453988.10	1823366.76
3675	453978.67	1823343.61
3700	453969.24	1823320.45
3725	453959.81	1823297.30
3750	453950.38	1823274.15
3775	KRISHNAYAPALEM RESERVOIR (Not Included in Package-1)	
3800		
3825		
3850		
3875		
3900		
3925		
3950		
3975		
4000		
4025		
4050		
4075		
4100		
4125		
4150		
4175		
4200		
4225		
4250		
4275		
4300		
4325		
4350		
4375		
4400		
4425		
4450		
4475		
4500		
4525		
4550		
4575		
4611	453290.56	1822741.10
4625	453287.64	1822730.36
4650	453264.53	1822720.83
4675	453241.41	1822711.31
4700	453218.30	1822701.78
4725	453195.18	1822692.26
4750	453172.07	1822682.74
4775	453148.95	1822673.21
4800	453125.84	1822663.69
4825	453104.32	1822651.24
4850	453083.77	1822637.00
4875	453063.22	1822622.76
4900	453042.67	1822608.52
4925	453022.13	1822594.28
4950	453001.58	1822580.04
4975	452981.03	1822565.80
5000	452960.48	1822551.56
5025	452939.93	1822537.23
5050	452919.54	1822522.86
5075	452899.08	1822508.49
5100	452878.62	1822494.12
5125	452858.16	1822479.76
5150	452837.70	1822465.39
5175	452817.24	1822451.02
5200	452796.70	1822436.65
5225	452775.89	1822422.91
5250	452754.81	1822409.50
5275	452733.72	1822396.06
5300	452712.64	1822382.63
5325	452691.56	1822369.19
5350	452670.47	1822355.76
5375	452649.39	1822342.32
5400	452628.31	1822328.89
5425	452607.11	1822315.64
5450	452585.87	1822302.45
5475	452564.63	1822289.27
5500	452543.38	1822276.08
5525	452522.14	1822262.91
5550	452500.90	1822249.72
5575	452479.66	1822236.54
5600	452458.42	1822223.36
5625	452437.18	1822210.16
5650	452415.95	1822196.96
5675	452394.72	1822183.76
5700	452373.49	1822170.56
5725	452352.26	1822157.36
5750	452331.03	1822144.15
5775	452309.80	1822130.95
5800	452288.57	1822117.75
5825	452267.34	1822105.18
5850	452245.41	1822092.52
5875	452223.78	1822079.98
5900	452202.10	1822067.44
5925	452180.52	1822054.91

Chainage (m)	Easting	Northing
5950	452158.89	1822042.37
5975	452137.26	1822029.83
6000	452115.64	1822017.29
6025	452093.32	1822006.04
6050	452070.83	1821995.13
6075	452048.34	1821984.21
6100	452025.85	1821973.30
6125	452003.35	1821962.39
6150	451980.86	1821951.47
6175	451958.37	1821940.56
6200	451935.88	1821929.65
6225	451914.71	1821916.41
6250	451893.82	1821902.67
6275	451872.94	1821888.92
6300	451852.05	1821875.18
6325	451831.17	1821861.44
6350	451810.29	1821847.70
6375	451789.40	1821833.96
6400	451768.52	1821820.21
6425	451749.81	1821803.68
6450	451731.37	1821786.80
6475	451712.92	1821769.92
6500	451694.48	1821753.04
6525	451676.04	1821736.16
6550	451657.60	1821719.28
6575	451639.16	1821702.40
6600	451620.72	1821685.52
6625	451602.10	1821668.84
6650	451583.47	1821652.17
6675	451564.84	1821635.50
6700	451546.20	1821618.83
6725	451527.57	1821602.16
6750	451508.94	1821585.50
6775	451490.31	1821568.83
6800	451471.67	1821552.16
6825	451455.15	1821533.40
6850	451438.64	1821514.63
6875	451422.13	1821495.86
6900	451405.61	1821477.09
6925	451389.10	1821458.32
6950	451372.59	1821439.55
6975	451356.08	1821420.78
7000	451339.60	1821401.97
7025	451325.27	1821381.49
7050	451310.95	1821361.00
7075	451296.62	1821340.51
7100	451282.29	1821320.03
7125	451267.96	1821299.54
7150	451253.63	1821279.05
7175	451239.31	1821258.57
7200	451225.11	1821238.00
7225	451213.68	1821215.76
7250	451202.26	1821193.53
7275	451190.83	1821171.29
7300	451179.40	1821149.06
7325	451167.97	1821126.82
7350	451156.55	1821104.59
7375	451145.12	1821082.35
7400	451133.74	1821060.09
7425	451122.93	1821037.55
7450	451112.12	1821015.01
7475	451101.32	1820992.46
7500	451090.51	1820969.92
7525	451079.70	1820947.38
7550	451068.89	1820924.83
7575	451058.09	1820902.29
7600	451047.05	1820879.87
7625	451034.24	1820858.40
7650	451021.43	1820836.93
7675	451008.63	1820815.46
7700	450995.82	1820793.99
7725	450983.01	1820772.52
7750	450970.20	1820751.05
7775	450957.39	1820729.58
7800	450943.66	1820708.91
7825	450924.34	1820693.04
7850	450905.03	1820677.16
7875	450885.72	1820661.29
7900	450866.40	1820645.42
7925	450847.08	1820629.55
7950	450827.76	1820613.68
7975	450808.45	1820597.81
8000	450788.28	1820583.33
8025	450765.33	1820573.41
8050	450742.38	1820563.50
8075	450719.43	1820553.58
8100	450696.48	1820543.67
8125	450673.54	1820533.75
8150	450650.59	1820523.84
8175	450627.64	1820513.92
8200	450604.25	1820505.37
8225	450579.80	1820500.18
8250	450555.34	1820494.99
8275	450530.88	1820489.80
8300	450506.43	1820484.61
8325	450481.97	1820479.43
8350	450457.52	1820474.24
8375	450433.06	1820469.05
8400	450408.61	1820464.43
8425	450383.73	1820461.08
8450	450358.96	1820457.73
8475	450334.18	1820454.38
8500	450309.41	1820451.02
8525	450284.64	1820447.67
8550	450259.86	1820444.32
8575	450235.09	1820440.97
8600	450210.24	1820439.16
8625	450185.27	1820440.25
8650	450160.29	1820441.35
8675	450135.32	1820442.44
8700	450110.34	1820443.54
8725	450085.36	1820444.64
8750	450060.39	1820445.73
8775	450035.41	1820446.83
8800	450010.61	1820449.35
8825	449986.07	1820454.14
8850	449961.53	1820458.92
8875	449936.99	1820463.71
8900	449912.45	1820468.49

Chainage (m)	Easting	Northing
8925	449887.92	1820473.28
8950	449863.38	1820478.07
8975	449838.84	1820482.85
9000	449814.36	1820487.88
9025	449789.94	1820493.26
9050	449765.53	1820498.65
9075	449741.11	1820504.03
9100	449716.70	1820509.41
9125	449692.28	1820514.79
9150	449667.87	1820520.17
9175	449643.46	1820525.56
9200	449619.12	1820531.27
9225	449594.88	1820537.37
9250	449570.63	1820543.47
9275	449546.39	1820549.56
9300	449522.14	1820555.66
9325	449497.90	1820561.76
9350	449473.65	1820567.86
9375	449449.41	1820573.95
9400	449425.06	1820579.63
9425	449400.63	1820584.90
9450	449376.19	1820590.17
9475	449351.75	1820595.43
9500	449327.31	1820600.70
9525	449302.87	1820605.97
9550	449278.43	1820611.24
9575	449253.99	1820616.51
9600	449229.57	1820621.84
9625	449205.16	1820627.22
9650	449180.74	1820632.61
9675	449156.33	1820637.99
9700	449131.92	1820643.37
9725	449107.50	1820648.76
9750	449083.09	1820654.14
9775	449058.68	1820659.53
9800	449034.16	1820664.38
9825	449009.55	1820668.83
9850	448984.95	1820673.27
9875	448960.35	1820677.72
9900	448935.75	1820682.16
9925	448911.15	1820686.61
9950	448886.55	1820691.06
9975	448861.95	1820695.50
10000	448837.11	1820697.63
10025	448812.12	1820698.22
10050	448787.12	1820698.81
10075	448762.13	1820699.39
10100	448737.14	1820699.98
10125	448712.14	1820700.57
10150	448687.15	1820701.15
10175	448662.16	1820701.74
10200	448637.16	1820701.88
10225	448612.16	1820701.74
10250	448587.16	1820701.60
10275	448562.16	1820701.46
10300	448537.16	1820701.32
10325	448512.16	1820701.18
10350	448487.16	1820701.04
10375	448462.16	1820700.91
10400	448437.16	1820700.80
10425	448412.16	1820700.72
10450	448387.16	1820700.63
10475	448362.16	1820700.55
10500	448337.16	1820700.47
10525	448312.16	1820700.38
10550	448287.16	1820700.30
10575	448262.16	1820700.21
10600	448237.17	1820700.77
10625	448212.19	1820701.64
10650	448187.20	1820702.52
10675	448162.22	1820703.39
10700	448137.24	1820704.26
10725	448112.25	1820705.14
10750	448087.27	1820706.01
10775	448062.28	1820706.88
10800	448037.29	1820707.10
10825	448012.29	1820707.23
10850	447987.29	1820707.28
10875	447962.29	1820707.33
10900	447937.29	1820707.38
10925	447912.29	1820707.43
10950	447887.29	1820707.48
10975	447862.29	1820707.53
11000	447837.29	1820707.67
11025	447812.29	1820707.84
11050	447787.29	1820708.02
11075	447762.29	1820708.19
11100	447737.29	1820708.37
11125	447712.29	1820708.54
11150	447687.29	1820708.72
11175	447662.29	1820708.89
11200	447637.29	1820708.92
11225	447612.29	1820708.89
11250	447587.29	1820708.86
11275	447562.29	1820708.83
11300	447537.29	1820708.80
11325	447512.29	1820708.77
11350	447487.29	1820708.75
11375	447462.29	1820708.72
11400	447437.29	1820708.69
11425	447412.29	1820708.66
11450	447387.29	1820708.63
11475	447362.29	1820708.60
11500	447337.29	1820708.57
11525	447312.29	1820708.55
11550	447287.29	1820708.52
11575	447262.29	1820708.49
11600	447237.29	1820708.42
11625	447212.29	1820708.35
11650	447187.29	1820708.27
11675	447162.29	1820708.20
11700	447137.29	1820708.12
11725	447112.29	1820708.05
11750	447087.29	1820707.97
11775	447062.29	1820707.90
11800	447037.30	1820707.34
11825	447012.31	1820706.68
11850	446987.32	1820706.01
11860	446977.27	1820705.75

	SIGN.											
	INITIALS											
	REVISIONS											
	SIGN.											
	INITIALS											
	REVISIONS											
P0	SIGN.											27-06-2017
	INITIALS	GK	RR	VS						AKM		
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE
					CLEARED							

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR KONDAVEETI VAGU CANAL

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

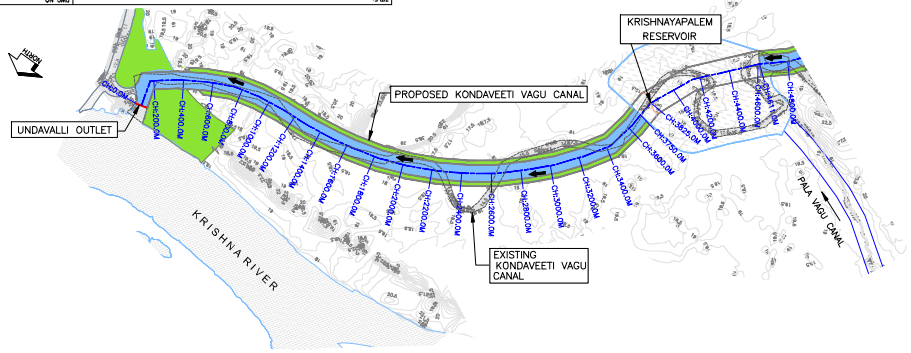
FILE NAME : 10244A-CV-30005-Rev-P0

SCALE : 1:37000
DC & DISC: BLR & CV
DWG NO. TCE.10244A-CV-3023-SI-30005
ISSUE P0
SIZE-A1
TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

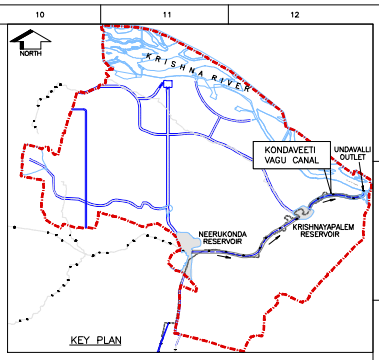
TITLE: PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR (CH:3750.00M)

DWG NO: TCE.10244A-CV-3023-SI-30006



PLAN OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR

(1:13000)



ABBREVIATIONS :

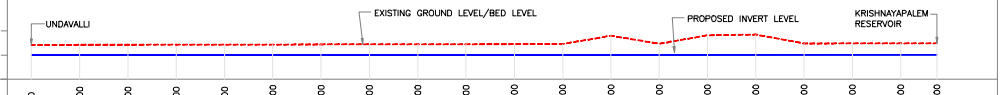
CH – CHAINAGE
H – HORIZONTAL
V – VERTICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30004.

SCALE
H-1:8000
V-1:800

DATUM: 0.0M



CHAINAGE (M)	0.00	200.00	400.00	600.00	800.00	1000.00	1200.00	1400.00	1600.00	1800.00	2000.00	2200.00	2400.00	2600.00	2800.00	3000.00	3200.00	3400.00	3600.00	3750.00
EXISTING GROUND LEVEL/BED LEVEL(M)	14.22	14.27	14.28	14.32	14.35	14.38	14.43	14.47	14.50	14.53	14.57	14.60	18.00	14.72	18.20	18.50	14.82	14.85	14.88	14.92
PROPOSED INVERT LEVEL (M)	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10

LONGITUDINAL SECTION

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
PO	SIGN.													
	INITIALS	GK	RR	VS							AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE	

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR (CH:3750.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30006	P0

DC & DSC: BLR & CV

FILE NAME: 10244A-CV-30006-Rev-P0

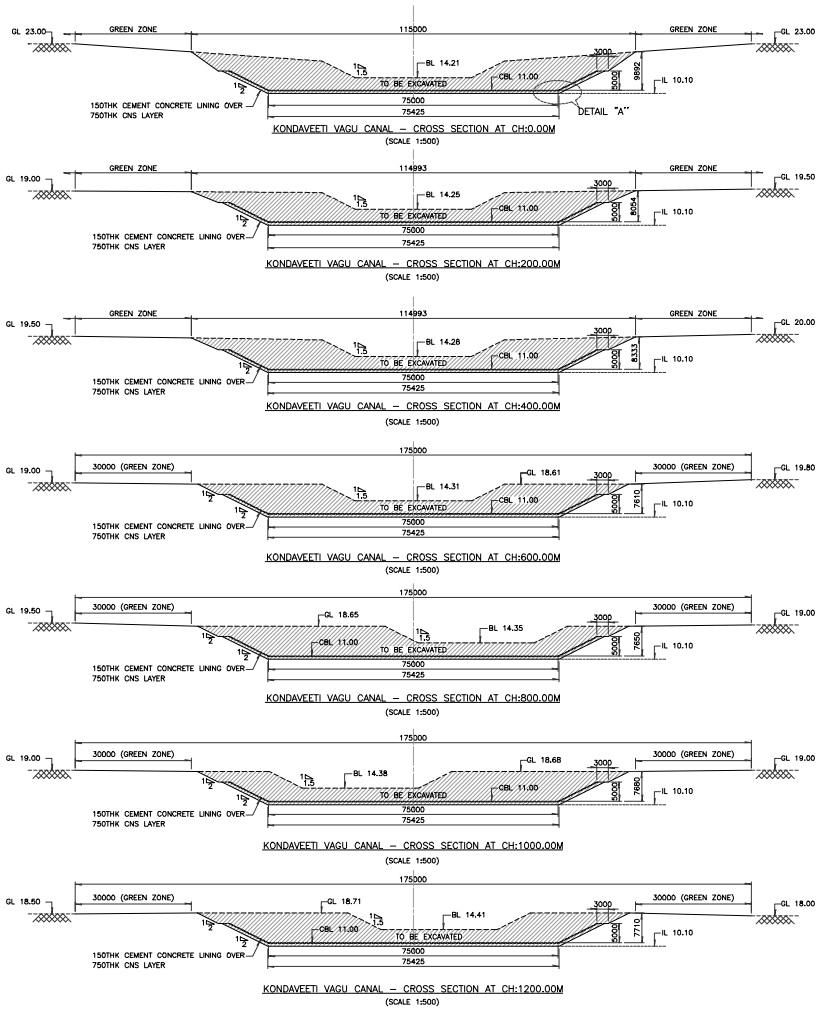
FILE NAME: F-091-Rev-R0.dwg

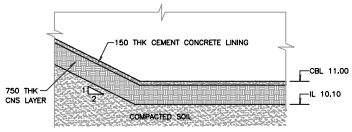
TCE FORM NO. 091 R0

SIZE-A1

TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR (SH 01 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30007





DETAIL "A"
(TYPICAL DETAIL OF CANAL)
(SCALE 1:75)

ABBREVIATIONS :
BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :
1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30006

ENGINEERING REFERENCE DRAWINGS :
1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI (CH:0.00M)TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30006

CONSTRUCTION REFERENCE DRAWINGS :
–NIL–

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR (SH 01 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	DWG NO.	ISSUE
AS SHOWN	TCE.10244A-CV-3023-SI-30007	P0
DC & DSC: BLR & CV		

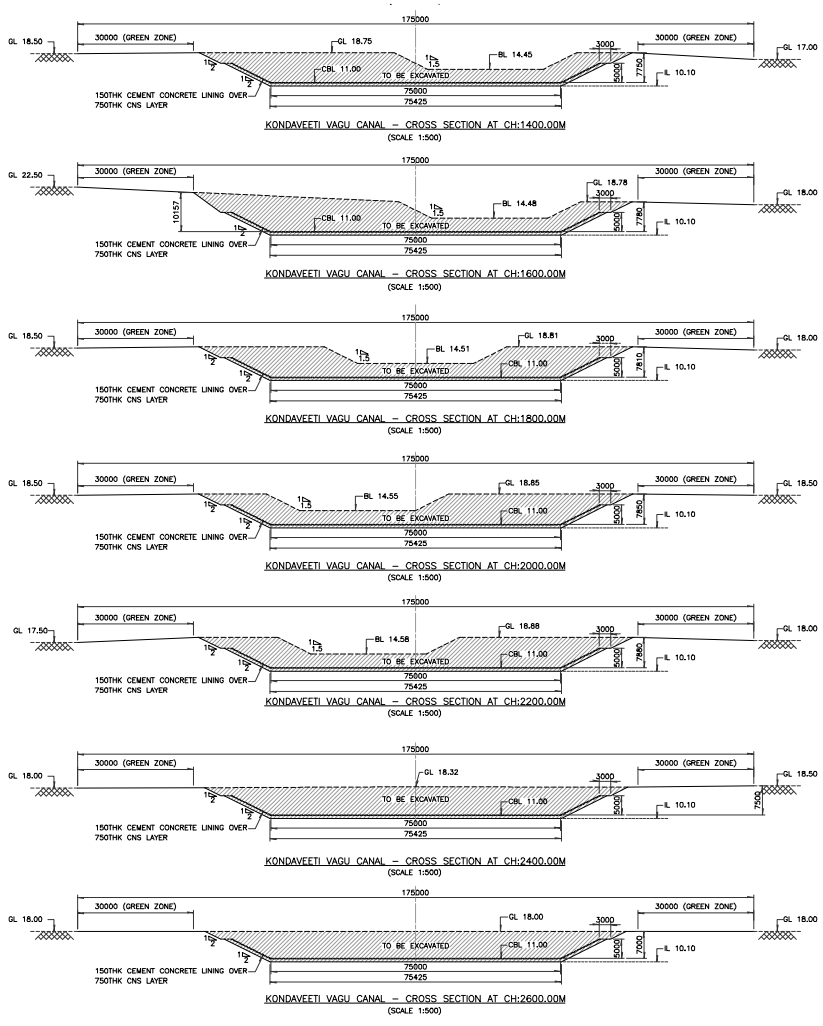
FILE NAME: 10244A-CV-30007-Rev-P0

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR (SH 02 OF 03)

DWG NO TCE.10244A-CV-3023-SI-30008



ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30006

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI (CH:0.00M)TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30006

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS						AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE	
		CLEARED											

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of release of information and any claim arising thereof, cost and consequence will be on the party releasing the information.

FILE NAME : 10244A-CV-30008-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR (SH 02 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

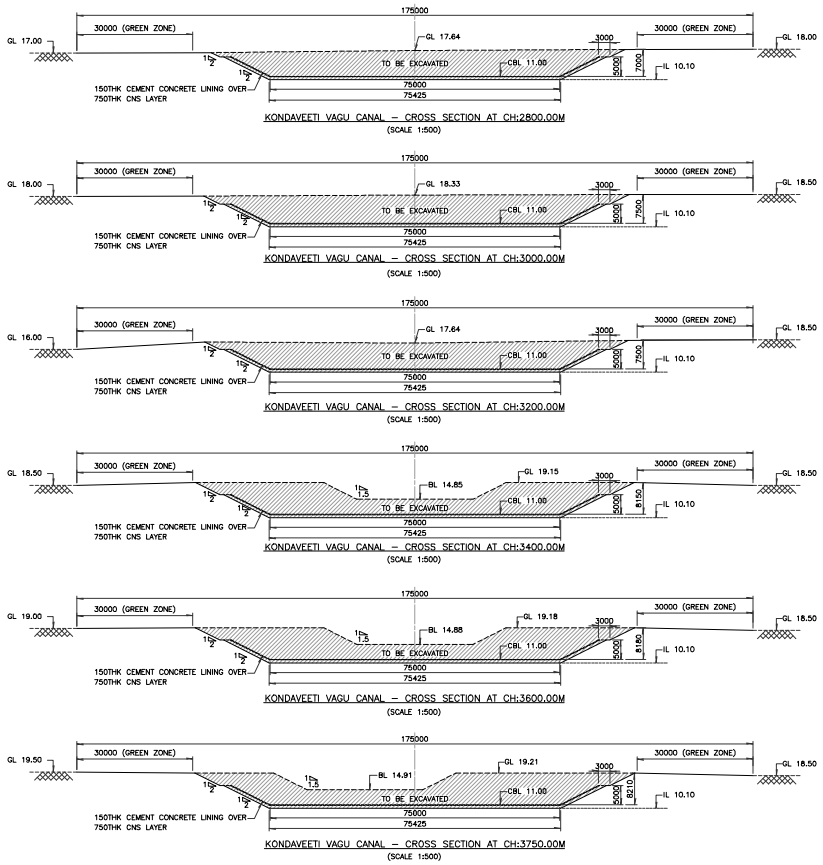
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30008	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR (SH 03 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30009



ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30006

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI (CH:0.00M)TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30006

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30009-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR (SH 03 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

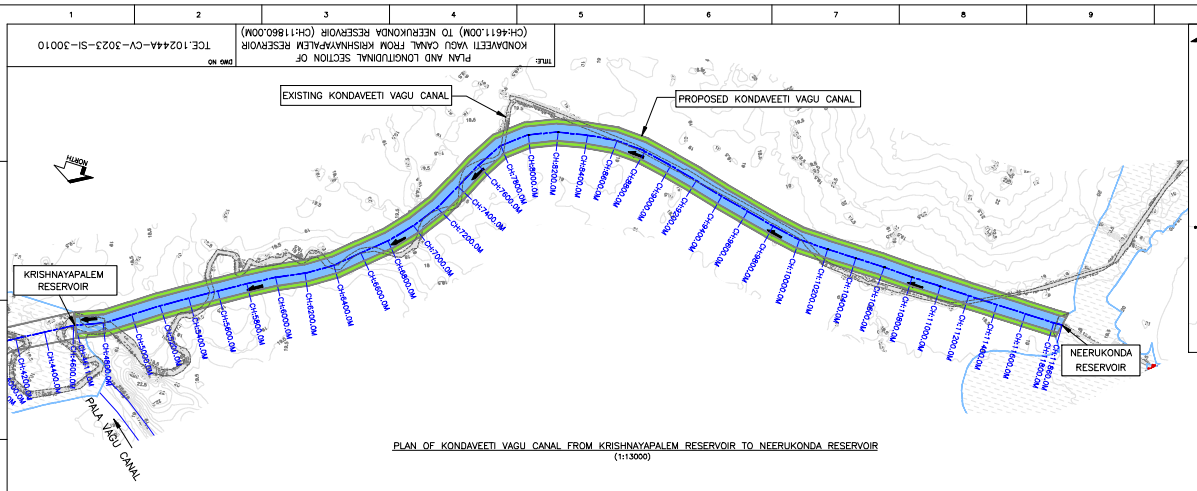
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30009	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

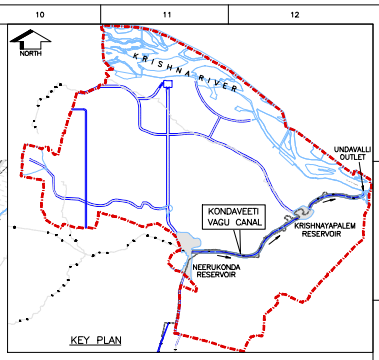
FILE NAME: F-091-Rev-R0.dwg

DWG NO: TCE.10244A-CV-3023-SI-30010

TITLE: PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:11860.00M)



PLAN OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR
(1:13000)

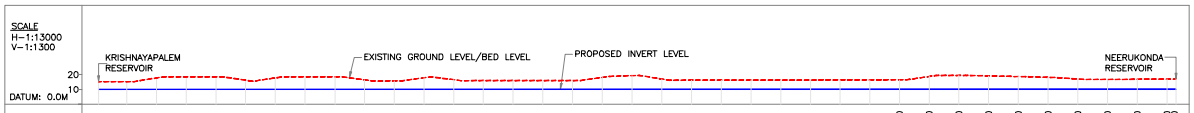


ABBREVIATIONS :

CH – CHAINAGE
H – HORIZONTAL
V – VERTICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30004



CHAINAGE (M)	4611.00	4800.00	5000.00	5200.00	5400.00	5600.00	5800.00	6000.00	6200.00	6400.00	6600.00	6800.00	7000.00	7200.00	7400.00	7600.00	7800.00	8000.00	8200.00	8400.00	8600.00	8800.00	9000.00	9200.00	9400.00	9600.00	9800.00	10000.00	10200.00	10400.00	10600.00	10800.00	11000.00	11200.00	11400.00	11600.00	11800.00	11860.00
EXISTING GROUND LEVEL/ BED LEVEL (M)	15.27	15.29	17.72	18.50	18.50	16.26	17.77	18.50	18.50	16.42	15.79	17.84	16.51	15.91	15.94	15.97	16.01	18.12	19.33	16.99	16.19	16.22	16.26	16.29	16.32	16.36	16.39	16.42	18.75	19.50	19.12	18.70	18.15	16.98	16.67	16.83	16.97	17.00
PROPOSED INVERT LEVEL (M)	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	**10.10**	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10

LONGITUDINAL SECTION

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR (CH:3750.00M) TCE.10244A-CV-3023-SI-30004

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.														
	INITIALS														
	REVISIONS														
	SIGN.														
	INITIALS														
	REVISIONS														
PO	SIGN.														
	INITIALS	GK	RR	VS								AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE	

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:11860.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30010-Rev-P0

SCALE : AS SHOWN
DC & DSC : BLR & CV

DWG NO. TCE.10244A-CV-3023-SI-30010

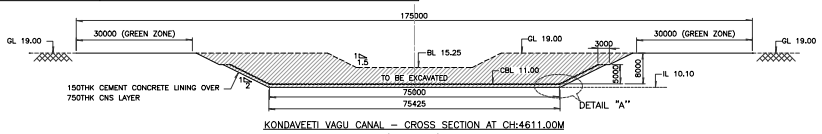
ISSUE P0

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

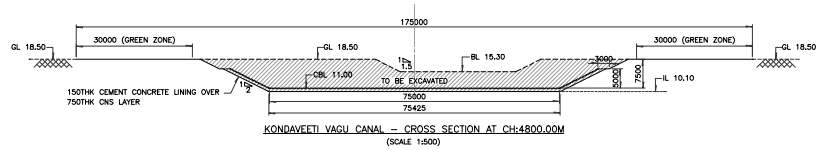
TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 01 OF 06)

DWG NO: TCE.10244A-CV-3023-SI-30011



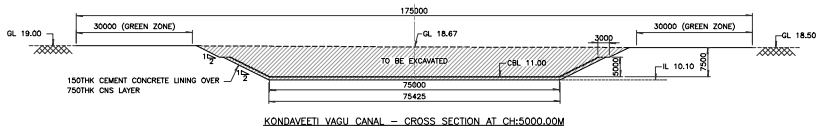
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:4611.00M

(SCALE 1:500)



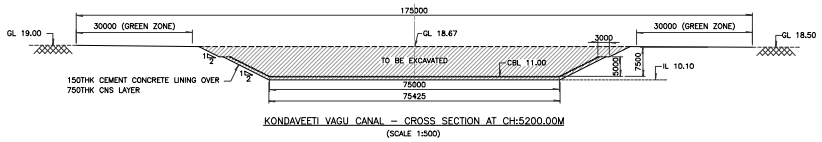
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:4800.00M

(SCALE 1:500)



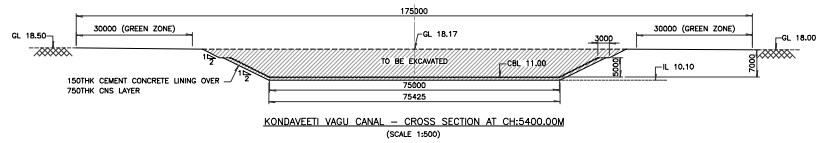
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:5000.00M

(SCALE 1:500)



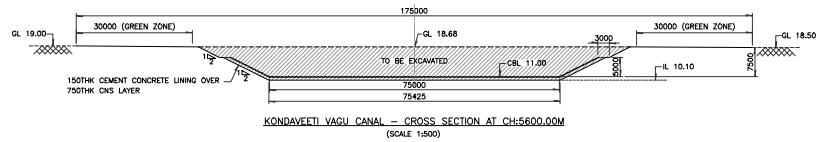
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:5200.00M

(SCALE 1:500)



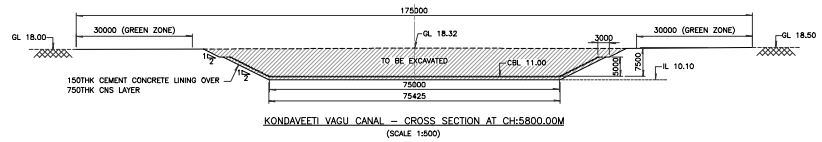
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:5400.00M

(SCALE 1:500)



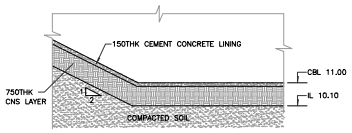
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:5600.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:5800.00M

(SCALE 1:500)



DETAIL "A"

(TYPICAL DETAIL OF CANAL)

(SCALE 1:75)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30010.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:1186.00M) TCE.10244A-CV-3023-SI-30010

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS,
RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30011-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 01 OF 06)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

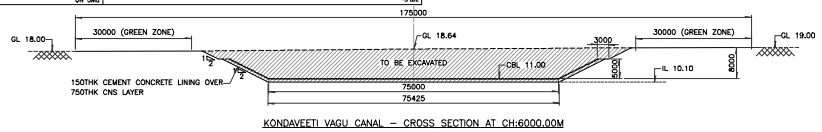
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30011	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

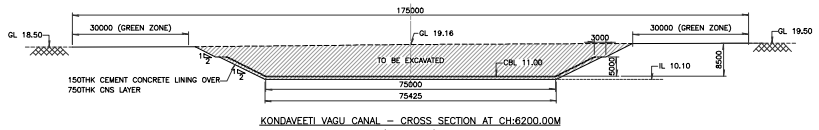
TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 02 OF 06)

DWG NO TCE.10244A-CV-3023-SI-30012



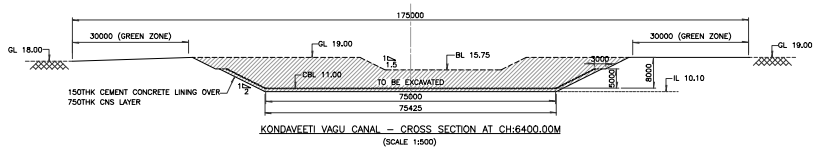
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:6000.00M

(SCALE 1:500)



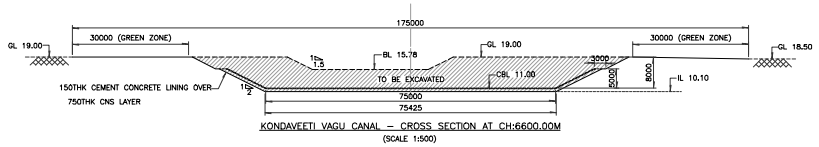
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:6200.00M

(SCALE 1:500)



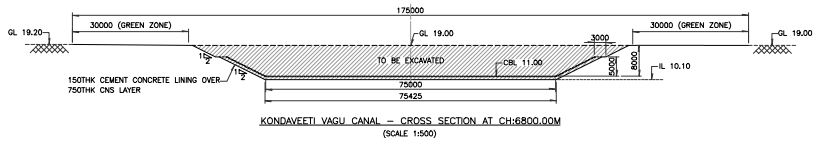
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:6400.00M

(SCALE 1:500)



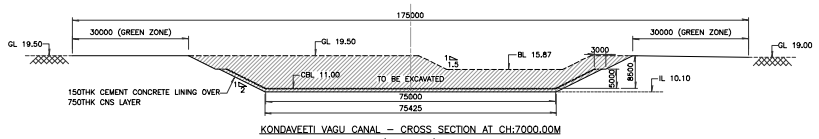
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:6600.00M

(SCALE 1:500)



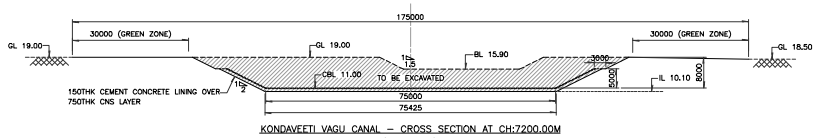
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:6800.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:7000.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:7200.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30010.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:1186.00M) TCE.10244A-CV-3023-SI-30010

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME : 10244A-CV-30012-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 02 OF 06)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

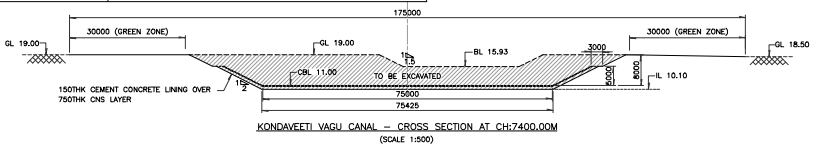
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30012	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

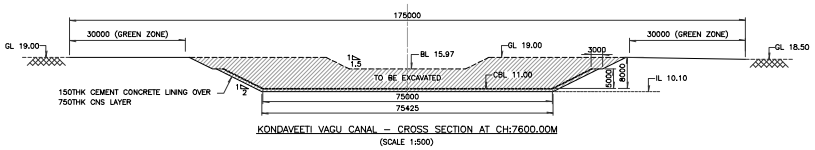
TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 03 OF 06)

DWG NO: TCE.10244A-CV-3023-SI-30013



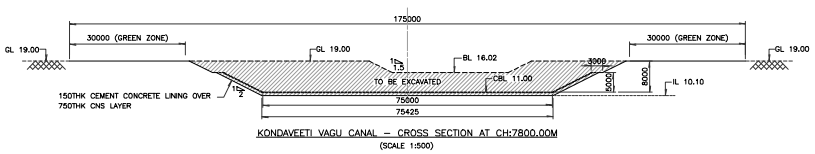
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:7400.00M

(SCALE 1:500)



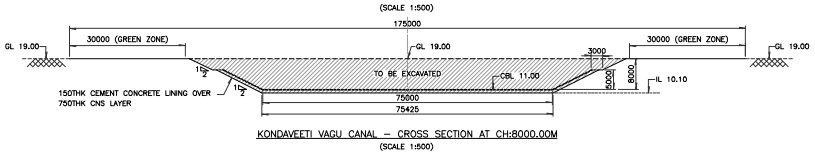
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:7600.00M

(SCALE 1:500)



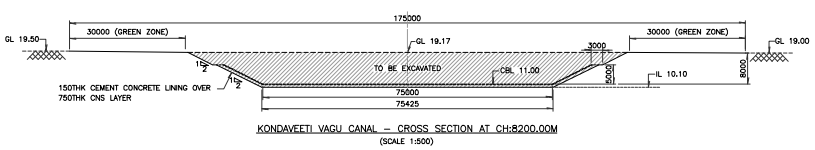
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:7800.00M

(SCALE 1:500)



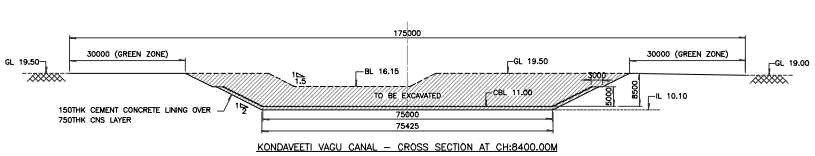
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:8000.00M

(SCALE 1:500)



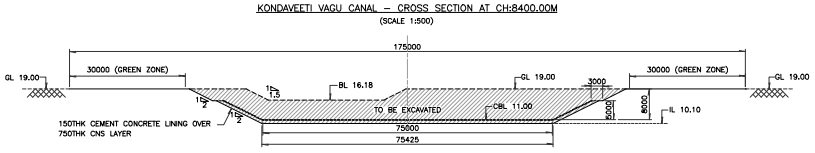
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:8200.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:8400.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:8600.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30010.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:1186.00M) TCE.10244A-CV-3023-SI-30010

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME : 10244A-CV-30013-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 03 OF 06)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

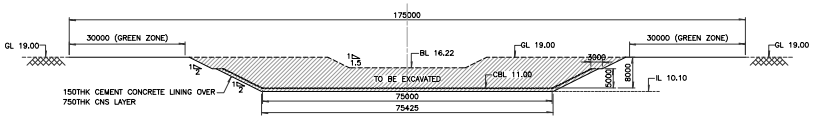
SCALE	DC & DSC: BLR & CV	DWG NO.	ISSUE
: AS SHOWN		TCE.10244A-CV-3023-SI-30013	P0

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

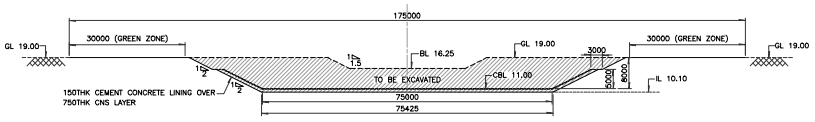
TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 04 OF 06)

DWG NO: TCE.10244A-CV-3023-SI-30014



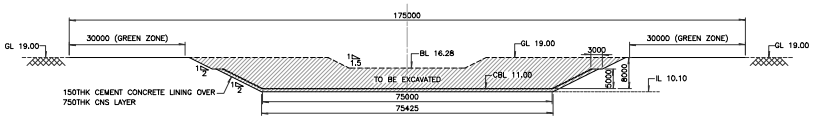
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:8800.00M

(SCALE 1:500)



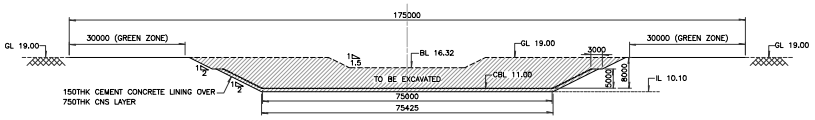
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:9000.00M

(SCALE 1:500)



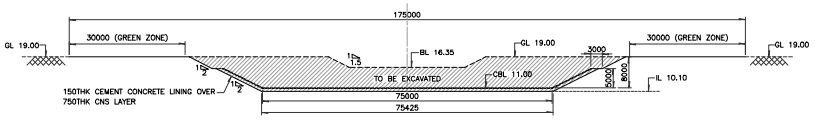
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:9200.00M

(SCALE 1:500)



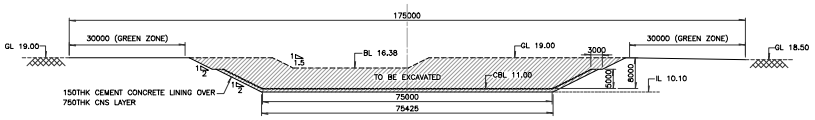
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:9400.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:9600.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:9800.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30010.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:1186.00M) TCE.10244A-CV-3023-SI-30010

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
		CLEARED											

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30014-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 04 OF 06)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

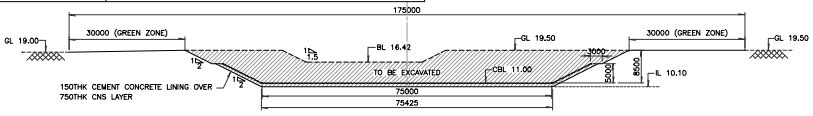
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30014	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

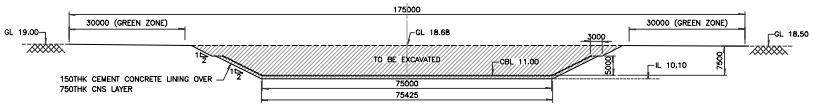
TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 05 OF 06)

DWG NO TCE.10244A-CV-3023-SI-30015



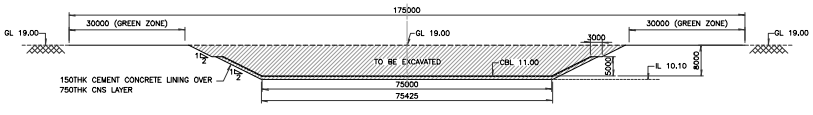
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:10000.00M

(SCALE 1:500)



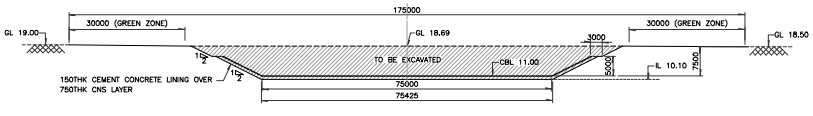
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:10200.00M

(SCALE 1:500)



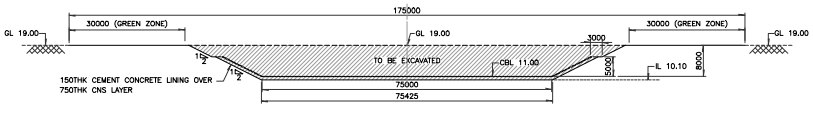
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:10400.00M

(SCALE 1:500)



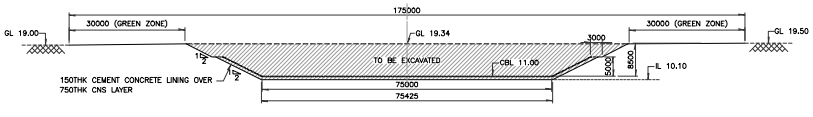
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:10600.00M

(SCALE 1:500)



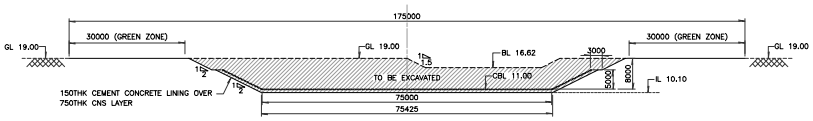
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:10800.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:11000.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:11200.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30010.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:1186.00M) TCE.10244A-CV-3023-SI-30010

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30015-Rev-P0

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 05 OF 06)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

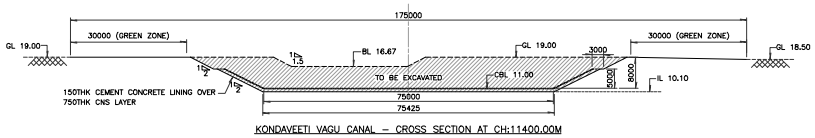
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30015	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

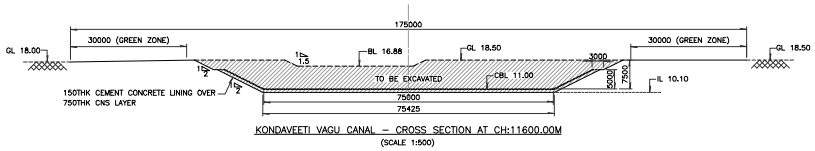
TITLE: CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 06 OF 06)

DWG NO: TCE.10244A-CV-3023-SI-30016



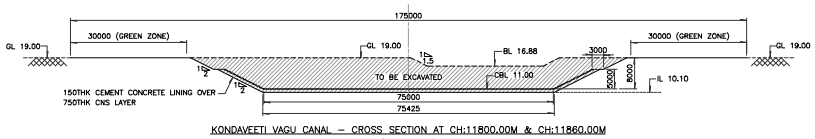
KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:11400.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:11600.00M

(SCALE 1:500)



KONDAVEETI VAGU CANAL – CROSS SECTION AT CH:11800.00M & CH:11860.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30010.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004
3. PLAN AND LONGITUDINAL SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR (CH:4611.00M) TO NEERUKONDA RESERVOIR (CH:1186.00M) TCE.10244A-CV-3023-SI-30010

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

CROSS SECTION OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR (SH 06 OF 06)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30016	P0

FILE NAME : 10244A-CV-30016-Rev-P0

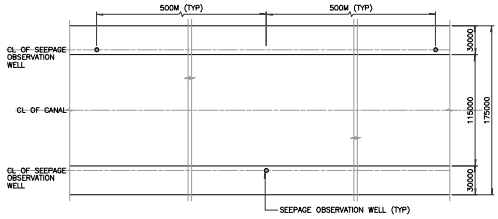
DC & DSC : BLR & CV

FILE NAME: F:\091-Rev-R0.dwg

TCE FORM NO. 091 R0

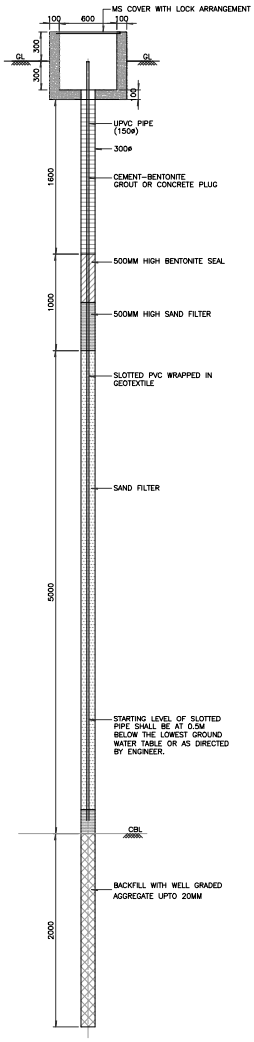
TITLE: TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR KONDAVEETI VAGU CANAL

DWG NO: TCE.10244A-CV-3023-SI-30017



TYPICAL PLAN DETAILS OF SEEPAGE OBSERVATION WELL

(SCALE 1:2000)



TYPICAL SECTIONAL VIEW OF SEEPAGE OBSERVATION WELL

(SCALE 1:20)

ABBREVIATIONS :

CBL – CANAL BED LEVEL
CL – CENTER LINE
GL – GROUND LEVEL
TYP – TYPICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. SEEPAGE OBSERVATION WELL SHALL BE BORED UP TO A DEPTH OF 10M BELOW GROUND LEVEL OR 2M BELOW CANAL BED LEVEL, WHICHEVER IS LOWER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS UNDER UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR(CH:3750.00M) TCE.10244A-CV-3023-SI-30004

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.											
	INITIALS											
	REVISIONS											
	SIGN.											
	INITIALS											
	REVISIONS											
PO	SIGN.											
	INITIALS	GK	RR	VS		CV	EL	IC	ME		AKM	27-06-2017
ISSUE		DRN	DSN	CHD	CLEARED					PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR KONDAVEETI VAGU CANAL

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

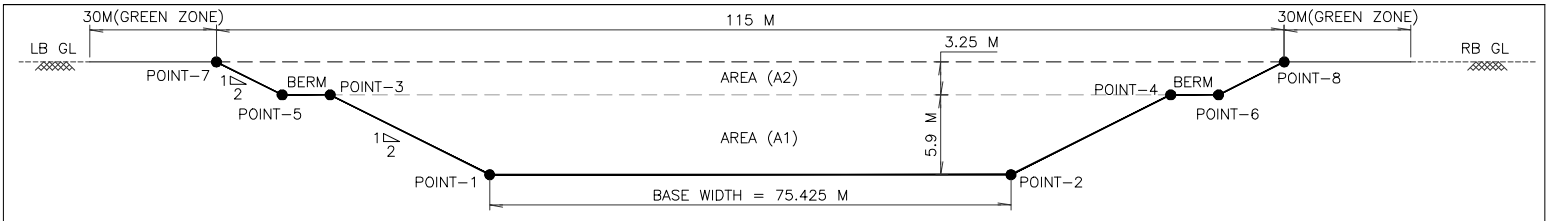
CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

SCALE	: AS SHOWN	DWG NO.	ISSUE
FILE NAME : 10244A-CV-30017-Rev-P0	DC & DSC : BLR & CV	TCE.10244A-CV-3023-SI-30017	P0

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg



DEFINITION SKETCH – PROPOSED CANAL

Chainage (m)	LB GL (m)	RB GL (m)	Avg. GL (m)	Point 1 (m)	Point 2 (m)	Point 3 (m)	Point 4 (m)	Point 5 (m)	Point 6 (m)	Point 7 (m)	Point 8 (m)
0	23.00	23.00	23.00	10.10	10.10	16.00	16.00	16.00	16.00	20.90	20.90
200	19.00	19.50	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
400	19.50	20.00	19.75	10.10	10.10	16.00	16.00	16.00	16.00	19.75	19.75
600	19.00	19.80	19.40	10.10	10.10	16.00	16.00	16.00	16.00	19.40	19.40
800	19.50	19.00	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
1000	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
1200	18.50	18.00	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
1400	18.50	17.00	17.75	10.10	10.10	16.00	16.00	16.00	16.00	17.75	17.75
1600	22.50	18.00	20.25	10.10	10.10	16.00	16.00	16.00	16.00	20.25	20.25
1800	18.50	18.00	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
2000	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
2200	17.50	18.00	17.75	10.10	10.10	16.00	16.00	16.00	16.00	17.75	17.75
2400	19.00	18.50	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
2600	18.00	18.00	18.00	10.10	10.10	16.00	16.00	16.00	16.00	18.00	18.00
2800	17.00	18.00	17.50	10.10	10.10	16.00	16.00	16.00	16.00	17.50	17.50
3000	18.00	18.50	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
3200	16.00	18.50	17.25	10.10	10.10	16.00	16.00	16.00	16.00	17.25	17.25
3400	18.50	18.50	18.50	10.10	10.10	16.00	16.00	16.00	16.00	18.50	18.50
3600	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
3750	19.50	18.50	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
3750 TO 4611	KRISHNAYAPALEM RESERVOIR (NOT INCLUDED IN PACKAGE - 1 WORKS)										
4611	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
4800	18.50	18.50	18.50	10.10	10.10	16.00	16.00	16.00	16.00	18.50	18.50
5000	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
5200	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
5400	18.50	18.00	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
5600	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
5800	18.00	18.50	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
6000	18.00	19.00	18.50	10.10	10.10	16.00	16.00	16.00	16.00	18.50	18.50
6200	18.50	19.50	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
6400	18.00	19.00	18.50	10.10	10.10	16.00	16.00	16.00	16.00	18.50	18.50

Chainage (m)	LB GL (m)	RB GL (m)	Avg. GL (m)	Point 1 (m)	Point 2 (m)	Point 3 (m)	Point 4 (m)	Point 5 (m)	Point 6 (m)	Point 7 (m)	Point 8 (m)
6600	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
6800	19.40	19.00	19.10	10.10	10.10	16.00	16.00	16.00	16.00	19.10	19.10
7000	19.50	19.00	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
7200	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
7400	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
7600	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
7800	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
8000	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
8200	19.50	19.00	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
8400	19.50	19.00	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
8600	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
8800	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
9000	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
9200	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
9400	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
9600	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
9800	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
10000	19.00	19.50	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
10200	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
10400	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
10600	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
10800	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
11000	19.00	19.50	19.25	10.10	10.10	16.00	16.00	16.00	16.00	19.25	19.25
11200	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
11400	19.00	18.50	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
11600	18.00	18.50	18.25	10.10	10.10	16.00	16.00	16.00	16.00	18.25	18.25
11880	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00

ENGINEERING REFERENCE DRAWINGS :

1. PROPOSED CANAL WORKS FROM UNDAVALLI (CH:0.00M) TO KRISHNAYAPALEM RESERVOIR (CH:3750.00M) TCE.10244A-CV-3023-SI-30004

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DEFINITION SKETCH AND PROFILE DETAILS FOR KONDAVEETI VAGU CANAL

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
P0	INITIALS	GK	RR	VS						AKM			27-06-17	
	REVISIONS													
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE		
					CLEARED									

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION/ FABRICATION WORK RELATED TO 'HOLDS'.

DO NOT SCALE

FILE NAME : 10244A-CV-30019-Rev-P0

SCALE : NTS
DC & DISC : BLR & CV

DWG NO. TCE.10244A-CV-3023-SI-30019

ISSUE P0

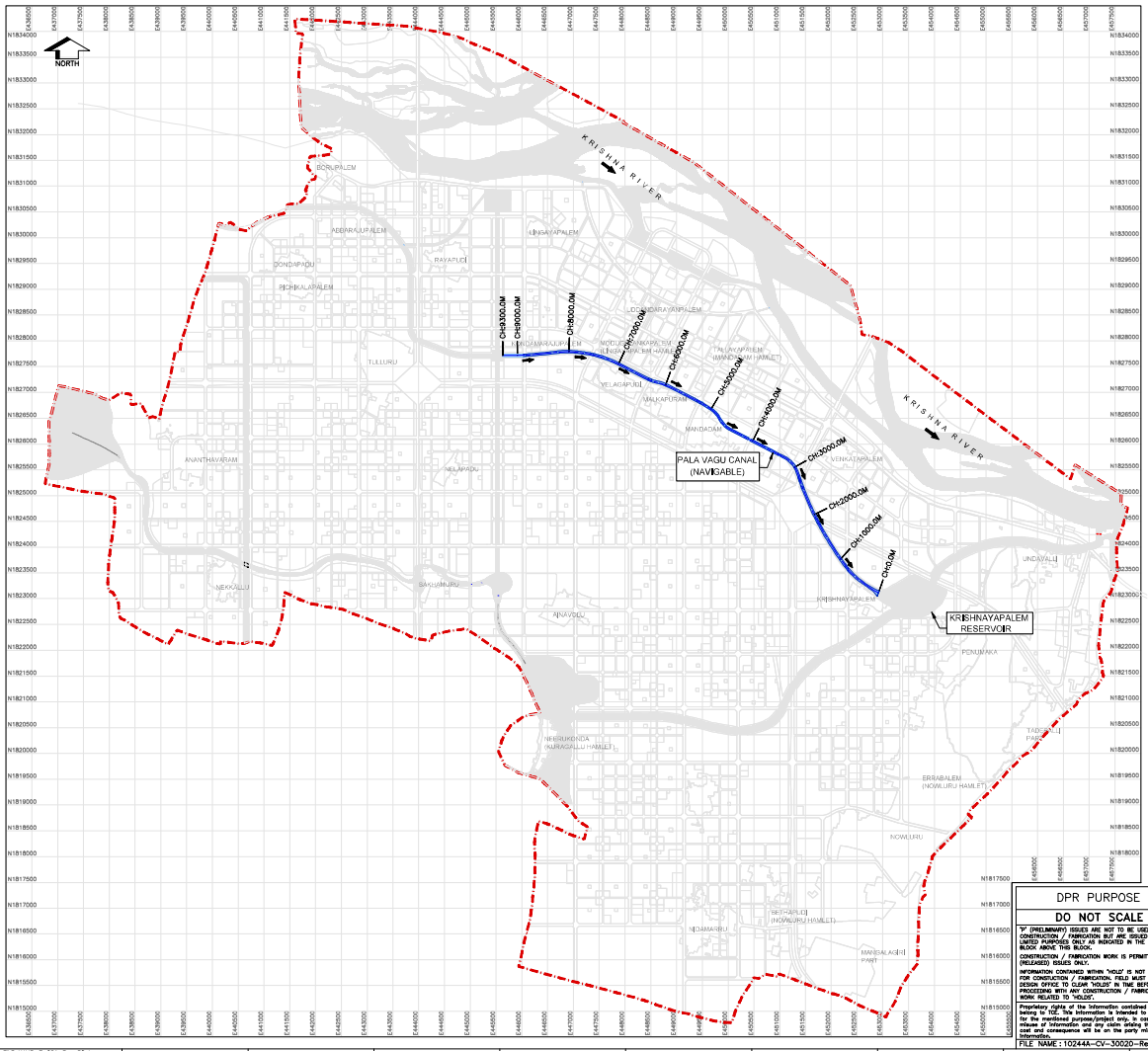
SIZE-A3

FILE NAME: F-093-Rev-R0.DWG

TCE FORM NO. 093 R0

TITLE: PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M)

DWG NO TCE.10244A-CV-3023-SI-30020



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

DPR PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

FILE NAME : 10244A-CV-30020-Rev-P0

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
P0	SIGN.													
	INITIALS	GK	RR	VS		CV	EL	IC	ME			AKM		27-06-2017
ISSUE		DRN	DSN	CHD		CLEARED						PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

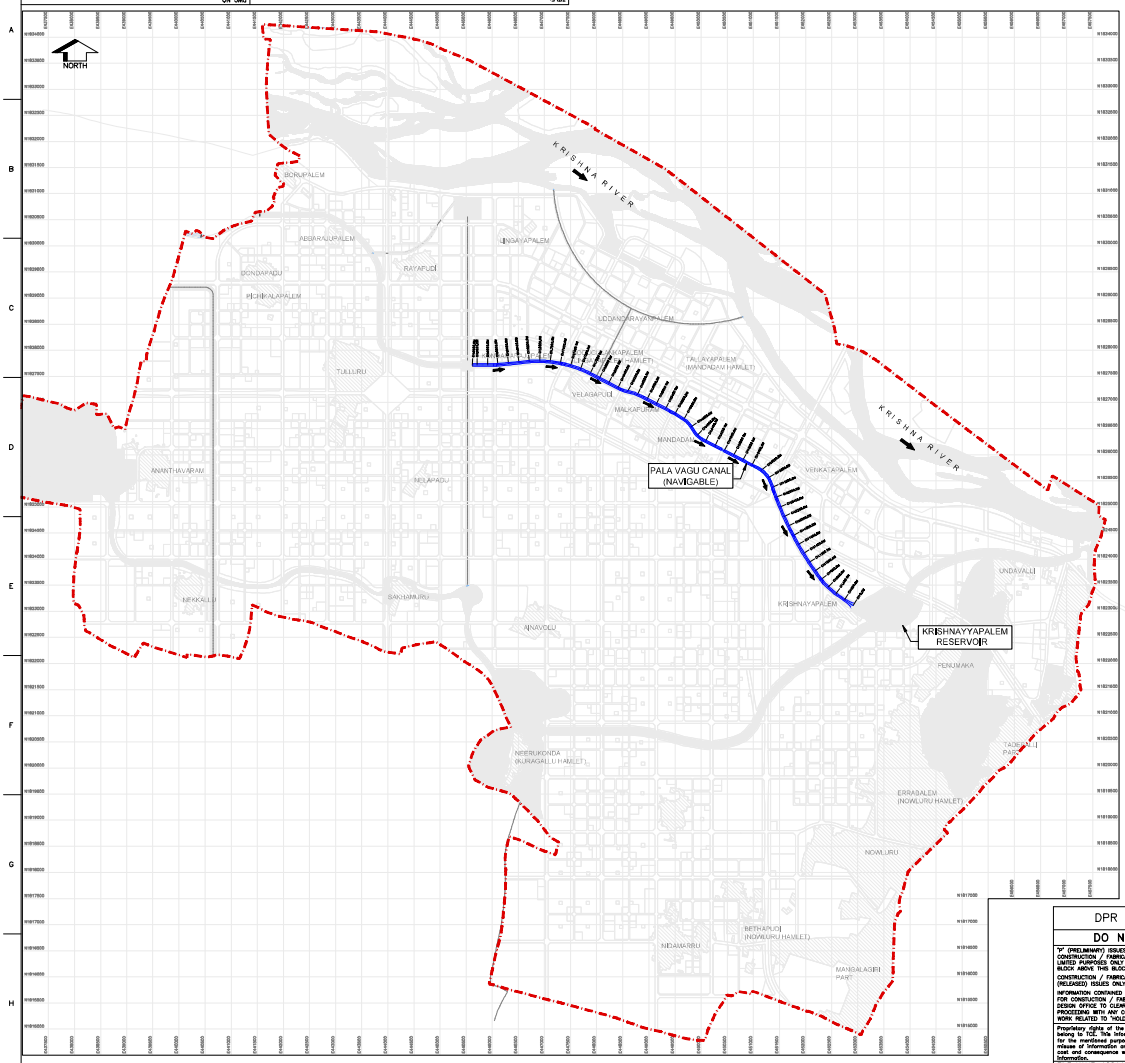
SCALE	DWG NO.	ISSUE
1:37000	TCE.10244A-CV-3023-SI-30020	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F:\091-Rev-R0.dwg

TITLE: LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 01 OF 02)

DWG NO: TCE.10244A-CV-3023-SI-30021



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE
UTM – UNIVERSAL TRANSVERSE MERCATOR

NOTES :

1. ALL DIMENTIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM(CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR(CH:0.00M) TCE.10244A-CV-3023-SI-30020

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												27-06-2017
	INITIALS	GK	RR	VS		CV	EL	IC	ME			AKM	
ISSUE		DRN	DSN	CHD		CLEARED					PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of release of information and any claim arising thereof, cost and consequence will be on the party releasing the information.

FILE NAME : 10244A-CV-30021-Rev-P0

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 01 OF 02)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	DWG NO.	ISSUE
1:37000	TCE.10244A-CV-3023-SI-30021	P0
DC & DSC : BLR & CV		TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 02 OF 02)

DWG NO TCE.10244A-CV-3023-SI-30022

TABLE 1: DETAILS OF UTM CO ORDINATES

Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing
0	452911.67	1823112.68	1475	451919.24	1824177.93	2950	451311.32	1825514.60	4425	450065.26	1826266.46	5925	448856.21	1827115.23	7400	447507.51	1827698.41	8900	446020.05	1827720.67
25	452890.59	1823125.98	1500	451906.52	1824195.45	2975	451300.26	1825537.02	4450	450043.25	1826280.20	5950	448833.94	1827125.58	7425	447483.40	1827705.94	8925	445995.06	1827720.28
50	452869.33	1823139.28	1525	451894.69	1824217.14	3000	451287.76	1825558.67	4475	450021.71	1826293.68	5975	448811.17	1827135.80	7450	447459.30	1827711.67	8950	445970.06	1827719.89
75	452848.18	1823152.58	1550	451881.25	1824238.62	3025	451274.04	1825579.57	4500	450000.97	1826306.82	6000	448788.41	1827146.23	7475	447435.19	1827718.31	8975	445945.06	1827719.49
100	452827.07	1823166.00	1575	451869.22	1824260.21	3050	451259.47	1825599.68	4525	449980.52	1826321.36	6025	448765.64	1827156.58	7500	447411.09	1827724.94	9000	445920.07	1827719.10
125	452806.24	1823179.93	1600	451856.78	1824282.20	3075	451243.45	1825619.07	4550	449961.37	1826337.36	6050	448742.88	1827166.69	7525	447386.99	1827731.57	9025	445895.07	1827719.03
150	452785.41	1823193.25	1625	451844.35	1824303.89	3100	451227.23	1825638.08	4575	449942.28	1826353.30	6075	448719.91	1827176.84	7550	447362.53	1827736.74	9050	445870.07	1827718.99
175	452764.59	1823207.48	1650	451831.91	1824325.57	3125	451209.59	1825655.79	4600	449924.69	1826371.26	6100	448695.63	1827182.59	7575	447338.05	1827741.80	9075	445845.07	1827718.96
200	452743.76	1823221.31	1675	451818.48	1824347.26	3150	451191.20	1825673.21	4625	449907.61	1826389.49	6125	448671.36	1827188.53	7600	447313.57	1827746.87	9100	445820.07	1827718.92
225	452722.93	1823235.14	1700	451807.41	1824368.15	3175	451172.05	1825688.27	4650	449891.67	1826408.75	6150	448647.06	1827194.47	7625	447289.08	1827751.93	9125	445795.07	1827718.89
250	452702.10	1823248.97	1725	451795.88	1824391.23	3200	451152.16	1825703.81	4675	449876.34	1826426.47	6175	448622.78	1827200.42	7650	447264.59	1827756.81	9150	445770.07	1827718.85
275	452681.28	1823262.79	1750	451783.46	1824413.31	3225	451131.25	1825717.61	4700	449862.22	1826449.10	6200	448598.50	1827206.36	7675	447239.88	1827760.75	9175	445745.07	1827718.82
300	452660.51	1823278.71	1775	451772.24	1824435.39	3250	451109.85	1825730.67	4725	449848.67	1826470.18	6225	448574.21	1827212.31	7700	447215.18	1827764.66	9200	445720.07	1827718.78
325	452639.91	1823290.87	1800	451760.51	1824457.48	3275	451088.08	1825742.77	4750	449835.67	1826491.45	6250	448549.93	1827218.25	7725	447190.49	1827768.45	9225	445695.07	1827718.75
350	452619.20	1823305.03	1825	451748.79	1824478.56	3300	451065.87	1825754.25	4775	449822.59	1826512.78	6275	448525.65	1827224.20	7750	447165.78	1827772.29	9250	445670.07	1827718.71
375	452598.70	1823319.19	1850	451737.07	1824501.64	3325	451043.64	1825765.68	4800	449809.50	1826534.26	6300	448502.97	1827234.65	7775	447140.95	1827775.20	9275	445645.07	1827718.68
400	452578.09	1823333.35	1875	451725.34	1824523.72	3350	451021.40	1825777.10	4825	449794.66	1826554.15	6325	448480.38	1827245.38	7800	447116.10	1827777.85	9300	445620.07	1827718.64
425	452557.49	1823347.51	1900	451714.62	1824546.80	3375	450999.18	1825788.53	4850	449779.50	1826574.03	6350	448457.82	1827256.12	7825	447091.25	1827780.89			
450	452536.25	1823361.45	1925	451703.03	1824568.46	3400	450976.82	1825799.95	4875	449763.92	1826593.56	6375	448435.24	1827266.86	7850	447066.18	1827781.15			
475	452519.14	1823379.58	1950	451692.24	1824590.91	3425	450954.68	1825811.37	4900	449746.86	1826611.83	6400	448412.66	1827277.59	7875	447041.45	1827785.01			
500	452500.34	1823396.04	1975	451681.25	1824613.37	3450	450932.45	1825822.80	4925	449728.51	1826628.81	6425	448390.09	1827288.33	7900	447016.52	1827786.86			
525	452482.28	1823413.31	2000	451670.06	1824635.82	3475	450910.21	1825834.22	4950	449706.81	1826645.14	6450	448367.51	1827299.07	7925	446991.26	1827788.26			
550	452464.19	1823430.58	2025	451659.07	1824658.28	3500	450887.97	1825845.64	4975	449688.89	1826660.51	6475	448344.93	1827309.80	7950	446966.57	1827788.78			
575	452446.11	1823447.84	2050	451648.08	1824680.73	3525	450865.73	1825857.06	5000	449669.29	1826674.85	6500	448322.74	1827321.32	7975	446941.27	1827789.29			
600	452428.03	1823465.11	2075	451637.09	1824703.19	3550	450843.50	1825868.49	5025	449648.40	1826688.38	6525	448300.55	1827332.84	8000	446916.58	1827789.81			
625	452409.95	1823482.38	2100	451626.51	1824725.83	3575	450821.26	1825879.91	5050	449627.24	1826701.70	6550	448278.37	1827344.36	8025	446891.28	1827790.33			
650	452391.87	1823499.65	2125	451616.24	1824748.83	3600	450799.02	1825891.33	5075	449606.08	1826715.01	6575	448256.18	1827355.89	8050	446866.29	1827790.29			
675	452373.80	1823516.92	2150	451605.98	1824771.42	3625	450776.78	1825902.76	5100	449584.76	1826726.06	6600	448234.00	1827367.41	8075	446841.29	1827790.13			
700	452356.56	1823534.96	2175	451595.71	1824794.22	3650	450754.55	1825914.18	5125	449563.42	1826741.09	6625	448211.81	1827378.94	8100	446816.59	1827789.86			
725	452340.82	1823554.46	2200	451585.45	1824817.02	3675	450732.31	1825925.60	5150	449542.09	1826754.12	6650	448189.63	1827390.46	8125	446791.59	1827789.60			
750	452325.27	1823573.96	2225	451575.19	1824839.81	3700	450710.07	1825937.03	5175	449520.75	1826767.15	6675	448167.44	1827401.99	8150	446766.59	1827789.34			
775	452309.63	1823593.46	2250	451564.92	1824862.61	3725	450687.83	1825948.45	5200	449498.42	1826780.18	6700	448145.24	1827413.67	8175	446741.71	1827786.99			
800	452293.98	1823612.95	2275	451554.66	1824885.40	3750	450665.60	1825959.87	5225	449477.06	1826793.20	6725	448123.23	1827425.35	8225	446691.96	1827781.98			
825	452278.34	1823632.46	2300	451544.78	1824908.37	3775	450643.36	1825971.30	5250	449456.45	1826805.75	6750	448101.13	1827437.03	8250	446667.11	1827779.30			
850	452263.87	1823652.85	2325	451535.17	1824931.45	3800	450621.12	1825982.72	5275	449434.94	1826818.49	6775	448079.03	1827448.71	8275	446642.25	1827776.58			
875	452249.41	1823673.24	2350	451525.56	1824954.53	3825	450598.88	1825994.14	5300	449412.83	1826830.16	6800	448056.92	1827460.39	8300	446617.40	1827773.87			
900	452234.94	1823693.63	2375	451515.95	1824977.61	3850	450576.64	1826005.56	5325	449390.60	1826841.58	6825	448034.82	1827472.08	8325	446592.55	1827771.15			
925	452220.48	1823714.02	2400	451506.35	1825000.69	3875	450554.41	1826016.99	5350	449368.36	1826853.00	6850	448012.71	1827483.74	8350	446567.70	1827768.44			
950	452206.01	1823734.41	2425	451496.74	1825023.76	3900	450532.17	1826028.41	5375	449346.12	1826864.42	6875	447990.60	1827495.40	8375	446542.84	1827765.72			
975	452191.55	1823754.80	2450	451487.13	1825046.84	3925	450509.93	1826039.83	5400	449323.88	1826876.85	6900	447998.18	1827506.46	8400	446517.99	1827763.01			
1000	452177.08	1823775.19	2475	451477.52	1825069.92	3950	450487.69	1826051.26	5425	449301.64	1826887.27	6925	447945.75	1827517.51	8425	446493.14	1827760.31			
1025	452162.62	1823795.58	2500	451468.19	1825093.12	3975	450465.46	1826062.68	5450	449279.41	1826898.69	6950	447923.33	1827528.57	8450	446468.26	1827757.61			
1050	452148.15	1823815.97	2525	451459.04	1825116.36	4000	450443.22	1826074.10	5475	449257.17	1826910.11	6975	447900.91	1827539.63	8475	446443.39	1827755.32			
1075	452133.69	1823836.36	2550	451449.88	1825139.64	4025	450420.98	1826085.53	5500	449234.97	1826921.60	7000	447878.49	1827550.68	8500	446418.51	1827752.82			
1100	452119.54	1823856.97	2575	451440.72	1825162.91	4050	450398.74	1826096.95	5525	449212.77	1826933.10	7025	447856.07	1827561.74	8525	446393.64	1827750.22			
1125	452105.83	1823877.87	2600	451431.57	1825186.17	4075	450376.51	1826108.38	5550	449190.57	1826944.61	7050	447833.64	1827572.80	8550	446368.76	1827747.62			
1150	452092.11	1823898.77	2625	451422.41	1825209.43	4100	450354.28	1826119.81	5575	449168.37	1826956.11	7075	447811.13	1827583.87	8575	446343.89	1827745.33			
1175	452078.39	1823919.67	2650	451413.25	1825232.69	4125	450332.04	1826131.24	5600	449145.16	1826967.61	7100	447788.38	1827594.93	8600	446319.01	1827742.83			
1200	452064.68	1823940.57	2675	451404.10	1825255.96	4150	450309.81	1826142.68	5625	449123.96	1826979.11	7125	447765.63	1827604.99	8625	446294.14	1827740.34			
1225	452050.96	1823961.47	2700	451395.24	1825279.33	4175	450287.58	1826154.11	5650	449101.76	1826990.61	7150	447742.88	1827614.76	8650	446269.26	1827737.87			
1250	452037.24	1823982.38	2725	451387.70	1825303.16	4200	450265.35	1826165.55	5675	449079.58	1827002.11	7175	447720.08	1827625.01	8675	446244.38	1827735.40			
1275	452023.53	1824003.28	2750	451380.16	1825327.00	4225	450242.12	1826176.98	5700	449057.41	1827013.66	7200	447698.52	1827633.93	8700	446219.51	1827732.92			
1300	452010.15	1824024.39	2775	451372.62	1825350.83	4250	450220.89	1826188.42	5725	449034.24	1827025.21	7225	447673.16	1827642.25	8725	446194.63	1827730.45			
1325	451997.16	1824045.75	2800	451364.83	1825374.59	4275	450198.65	1826199.85	5750	449011.06	1827036.75	7250	447649.28	1827650.27	8750	446169.75	1827727.98			
1350	451984.18	1824067.12	2825	451356.58	1825398.18	4300	450176.42	1826211.29	5800	448988.72	1827059.85	7275	447626.17	1827659.27	8775	446144.87	1827725.51			
1375	451971.19	1824088.48	2850	451348.32	1825421.78	4325	450154.19	1826222.72	5825	448966.55	1827071.40	7300	447602.63	1827667.78	8800	446120.00	1827723.24			
1400	451958.20	1824109.84	2875	451339.92	1825445.33	4350	450131.96	1826234.16	5850	448944.38	1827082.95	7325	447579.08	1827676.18	8825	446095.04	1827721.85			
1425	451945.22	1824131.20	2900	451330.92	1825468.65	4375	450109.73	1826245.59	5875	448922.20	1827094.28	7350	447555.54	1827684.59	8850	446070.15	1827721.46			
1450	451932.23	1824152.56	2925	451321.93	1825491.98	4400	450087.50	1826257.03	5900	448878.47	1827104.90	7375	447531.61	1827691.78	8875	446045.25	1827721.27			

ENGINEERING REFERENCE DRAWINGS :

1. LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL (SH 01 OF 02) TCE.10244A-CV-3023-SI-30021

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

	SIGN.	INITIALS	REVISIONS
PO			
ISSUE			

	GK	RR	VS					AKM	
	DRN	DSN	CHD	CV	EL	IC	ME	PE/PM	APPD
CLEARED									

27-06-2017

DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 02 OF 02)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30022	P0
DC & DSC : BLR & CV		

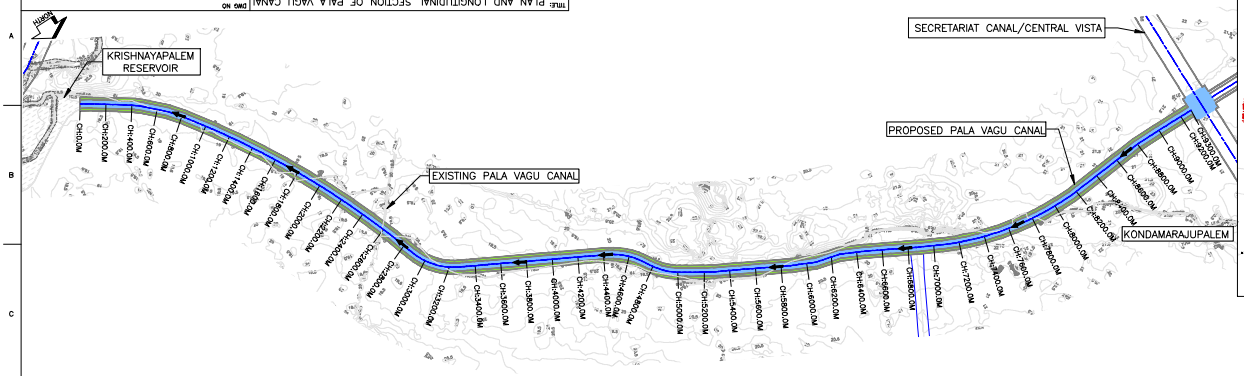
FILE NAME : 10244A-CV-30022-Rev-P0

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

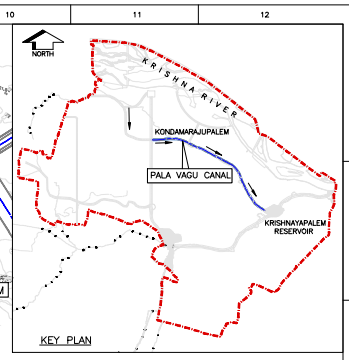
TITLE: PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M)

DWG NO TCE.10244A-CV-3023-SI-30023



PLAN OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR

(SCALE 1:15000)

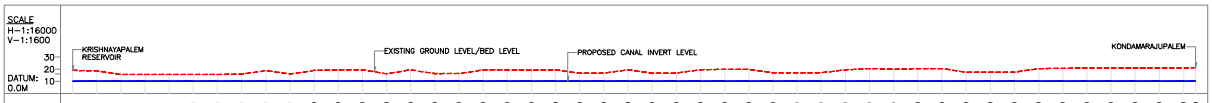


ABBREVIATIONS :

CH – CHAINAGE
H – HORIZONTAL
V – VERTICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30020.



CHAINAGE (M)	0.00	200.00	400.00	600.00	800.00	1000.00	1200.00	1400.00	1600.00	1800.00	2000.00	2200.00	2400.00	2600.00	2800.00	3000.00	3200.00	3400.00	3600.00	3800.00	4000.00	4200.00	4400.00	4600.00	4800.00	5000.00	5200.00	5400.00	5600.00	5800.00	6000.00	6200.00	6400.00	6600.00	6800.00	7000.00	7200.00	7400.00	7600.00	7800.00	8000.00	8200.00	8400.00	8600.00	8800.00	9000.00	9200.00	9300.00
EXISTING GROUND/ BED LEVEL (M)	19.00	18.70	15.60	15.65	15.70	15.75	15.80	15.85	19.00	15.95	19.00	19.50	19.50	16.25	19.50	16.37	16.42	19.50	19.50	19.20	19.50	16.68	16.73	19.50	16.82	16.87	19.50	20.00	19.80	17.10	17.15	17.17	19.50	20.50	20.00	20.50	20.50	17.51	17.57	17.65	20.50	20.80	21.00	21.00	21.00	21.00	21.00	21.50
PROPOSED CANAL INVERT LEVEL (M)	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10

LONGITUDINAL SECTION

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30020

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.														
	INITIALS														
	REVISIONS														
	SIGN.														
	INITIALS														
	REVISIONS														
PO	SIGN.														
	INITIALS	GK	RR	VS								AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE	

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	: AS SHOWN	DWG NO.	ISSUE
DC & DSC : BLR & CV		TCE.10244A-CV-3023-SI-30023	P0

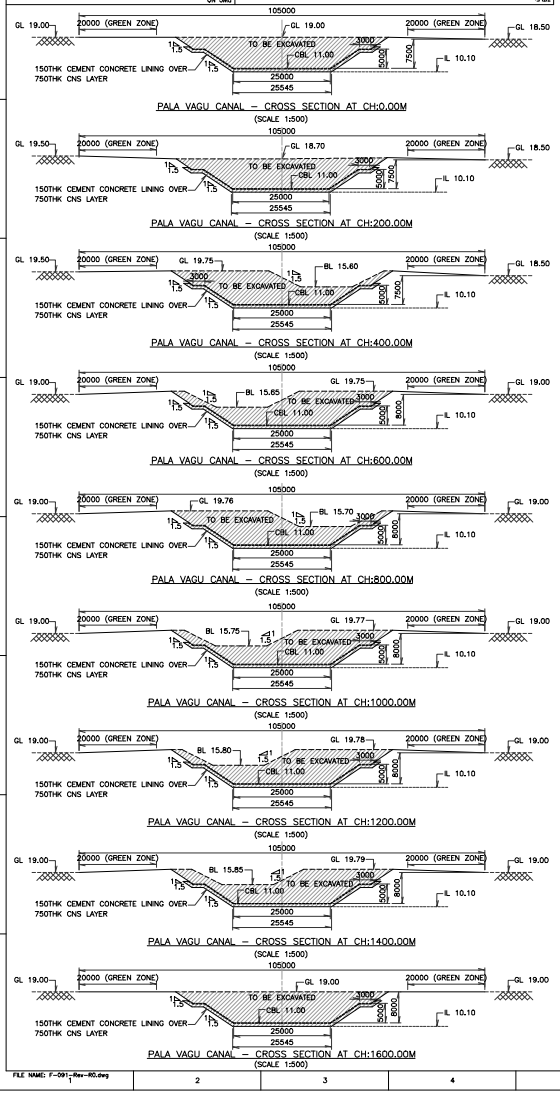
FILE NAME : 10244A-CV-30023-Rev-P0

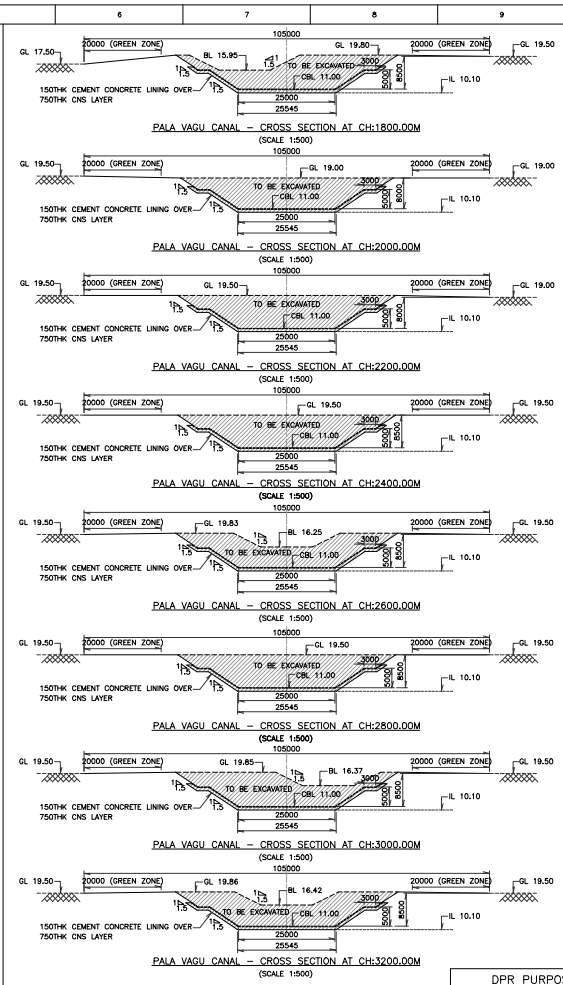
FILE NAME: F-091-Rev-R0.dwg

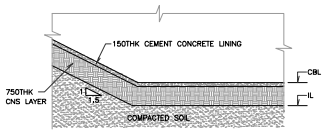
TCE FORM NO. 091 R0

TITLE: CROSS SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 01 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30024







DETAIL "A"
(TYPICAL DETAIL OF CANAL)
(SCALE 1:75)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30023

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30020
3. PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30023

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
		CLEARED											

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30024-Rev-P0

CROSS SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 01 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

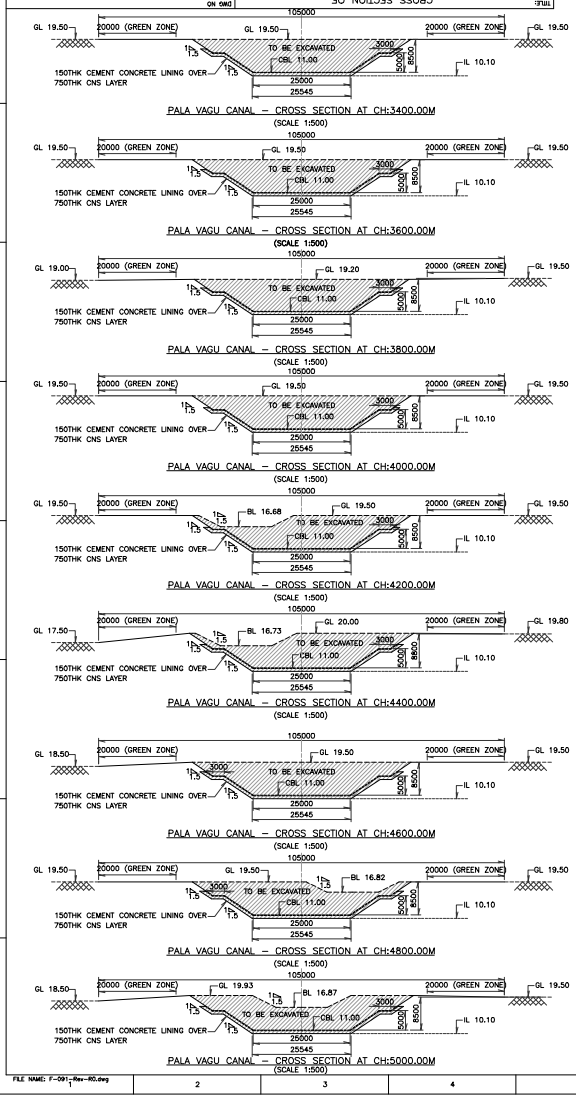
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30024	P0
DC & DSC: BLR & CV		

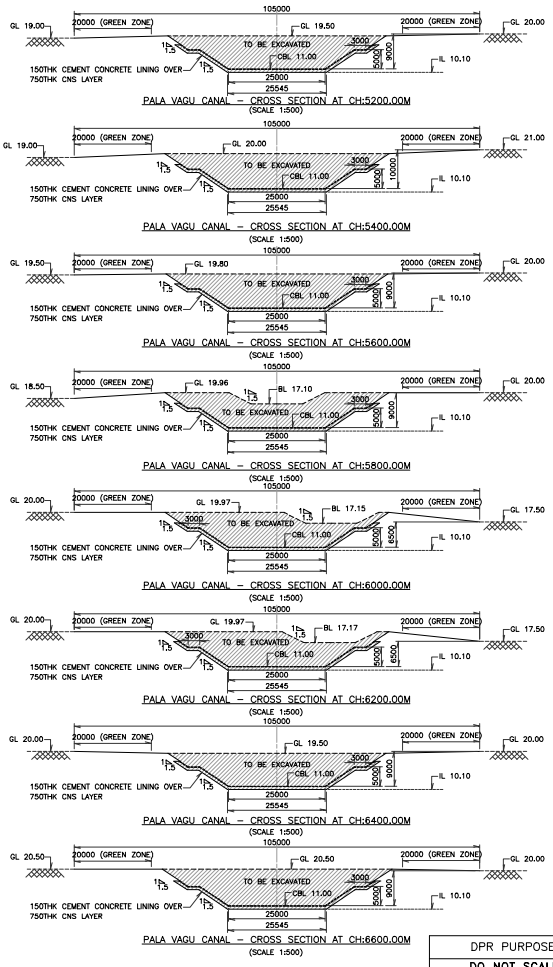
TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: CROSS SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 02 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30025





ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30023

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30020
3. PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30023

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.											
	INITIALS											
	REVISIONS											
	SIGN.											
	INITIALS											
	REVISIONS											
PO	SIGN.											
	INITIALS	GK	RR	VS						AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE
		CLEARED										

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30025-Rev-P0

CROSS SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 02 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

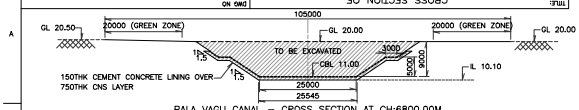
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30025	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

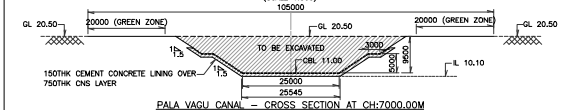
TITLE: CROSS SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 03 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30026



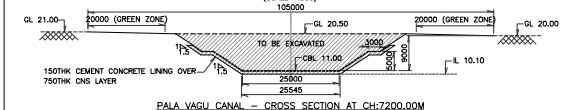
PALA VAGU CANAL – CROSS SECTION AT CH:6800.00M

(SCALE 1:500)



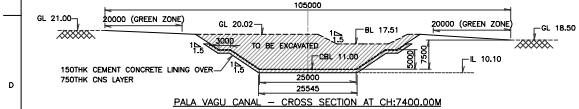
PALA VAGU CANAL – CROSS SECTION AT CH:7000.00M

(SCALE 1:500)



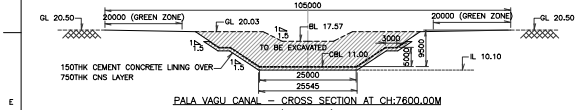
PALA VAGU CANAL – CROSS SECTION AT CH:7200.00M

(SCALE 1:500)



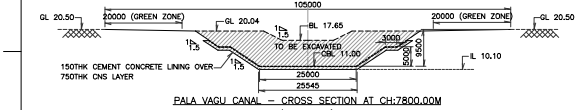
PALA VAGU CANAL – CROSS SECTION AT CH:7400.00M

(SCALE 1:500)



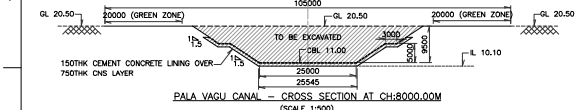
PALA VAGU CANAL – CROSS SECTION AT CH:7600.00M

(SCALE 1:500)



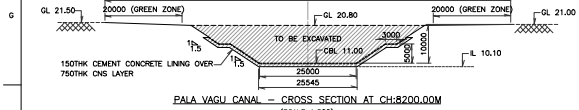
PALA VAGU CANAL – CROSS SECTION AT CH:7800.00M

(SCALE 1:500)



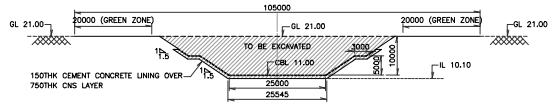
PALA VAGU CANAL – CROSS SECTION AT CH:8000.00M

(SCALE 1:500)



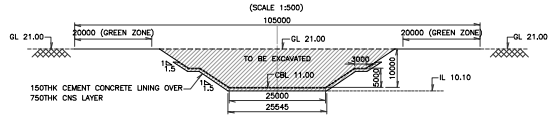
PALA VAGU CANAL – CROSS SECTION AT CH:8200.00M

(SCALE 1:500)



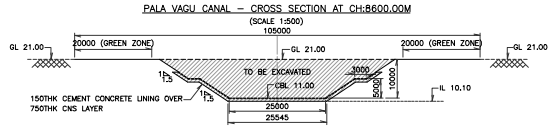
PALA VAGU CANAL – CROSS SECTION AT CH:8400.00M

(SCALE 1:500)



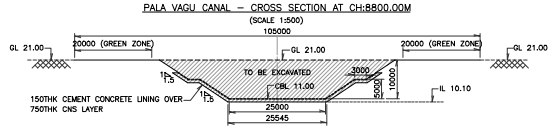
PALA VAGU CANAL – CROSS SECTION AT CH:8600.00M

(SCALE 1:500)



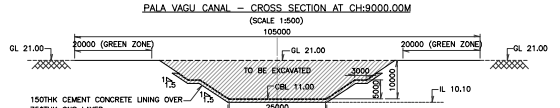
PALA VAGU CANAL – CROSS SECTION AT CH:8800.00M

(SCALE 1:500)



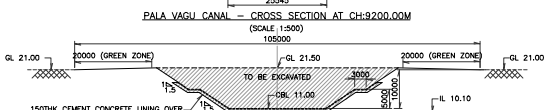
PALA VAGU CANAL – CROSS SECTION AT CH:9000.00M

(SCALE 1:500)



PALA VAGU CANAL – CROSS SECTION AT CH:9200.00M

(SCALE 1:500)



PALA VAGU CANAL – CROSS SECTION AT CH:9300.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30023

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30020
3. PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR (CH:0.00M) TCE.10244A-CV-3023-SI-30023

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
PO	SIGN.													
	INITIALS	GK	RR	VS								AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30026-Rev-P0

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

CROSS SECTION OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR (SH 03 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

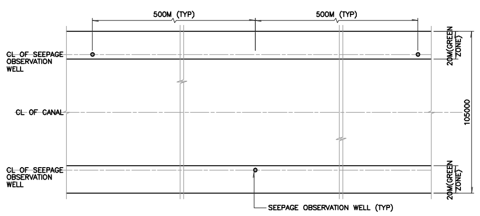
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30026	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

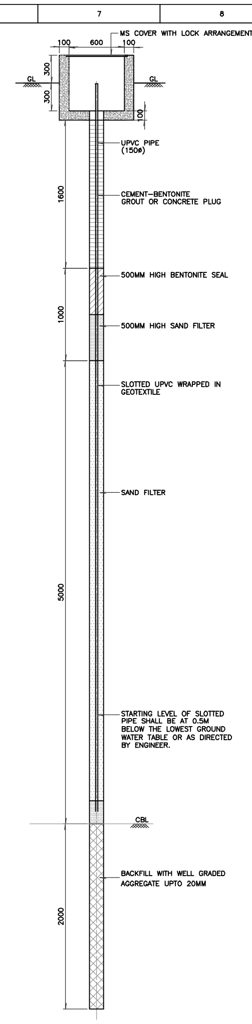
TITLE: TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR

DWG NO: TCE.10244A-CV-3023-SI-30027



TYPICAL PLAN DETAILS OF SEEPAGE OBSERVATION WELL

(SCALE 1:2000)



TYPICAL SECTIONAL VIEW OF SEEPAGE OBSERVATION WELL

(SCALE 1:20)

ABBREVIATIONS :

CBL - CANAL BED LEVEL
CL - CENTER LINE
GL - GROUND LEVEL
TYP - TYPICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. SEEPAGE OBSERVATION WELL SHALL BE BORED UP TO A DEPTH OF 10M BELOW GROUND LEVEL OR 2M BELOW CANAL BED LEVEL, WHICHEVER IS LOWER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY
   TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM(CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR(CH:0.00M)
   TCE.10244A-CV-3023-SI-30020

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.											
	INITIALS											
	REVISIONS											
	SIGN.											
	INITIALS											
	REVISIONS											
P0	SIGN.											27-06-2017
	INITIALS	GK	RR	VS						AKM		
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE
					CLEARED							

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

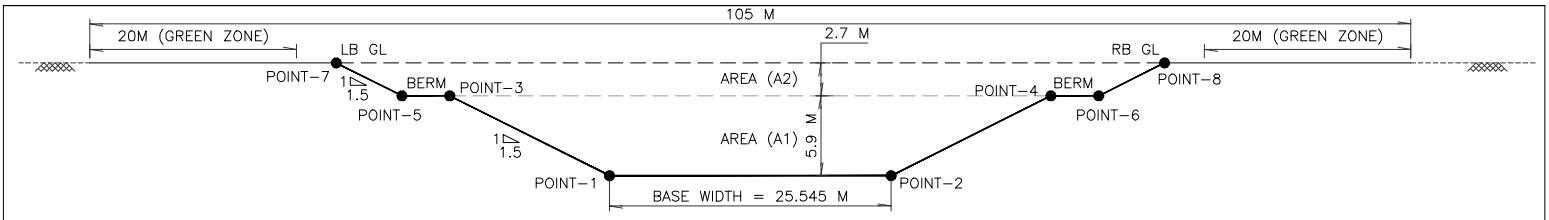
INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME: 10244A-CV-30027-Rev-P0

SCALE : AS SHOWN | DC & DISC: BLR & CV | DWG NO. TCE.10244A-CV-3023-SI-30027 | ISSUE P0 | SIZE-A1

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0



DEFINITION SKETCH – PROPOSED CANAL

Chainage	LB GL	RB GL	Avg. GL	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
0	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
200	18.70	18.70	18.70	10.10	10.10	16.00	16.00	16.00	16.00	18.70	18.70
400	18.75	18.75	18.75	10.10	10.10	16.00	16.00	16.00	16.00	18.75	18.75
600	19.75	19.75	19.75	10.10	10.10	16.00	16.00	16.00	16.00	19.75	19.75
800	19.76	19.76	19.76	10.10	10.10	16.00	16.00	16.00	16.00	19.76	19.76
1000	19.77	19.77	19.77	10.10	10.10	16.00	16.00	16.00	16.00	19.77	19.77
1200	19.78	19.78	19.78	10.10	10.10	16.00	16.00	16.00	16.00	19.78	19.78
1400	19.79	19.79	19.79	10.10	10.10	16.00	16.00	16.00	16.00	19.79	19.79
1600	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
1800	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
2000	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
2200	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
2400	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
2600	19.83	19.83	19.83	10.10	10.10	16.00	16.00	16.00	16.00	19.83	19.83
2800	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
3000	19.85	19.85	19.85	10.10	10.10	16.00	16.00	16.00	16.00	19.85	19.85
3200	19.86	19.86	19.86	10.10	10.10	16.00	16.00	16.00	16.00	19.86	19.86
3400	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
3600	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
3800	19.20	19.20	19.20	10.10	10.10	16.00	16.00	16.00	16.00	19.20	19.20
4000	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
4200	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
4400	20.00	20.00	20.00	10.10	10.10	16.00	16.00	16.00	16.00	20.00	20.00
4600	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
4800	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
5000	19.03	19.03	19.03	10.10	10.10	16.00	16.00	16.00	16.00	19.03	19.03
5200	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
5400	20.00	20.00	20.00	10.10	10.10	16.00	16.00	16.00	16.00	20.00	20.00
5600	19.00	19.00	19.00	10.10	10.10	16.00	16.00	16.00	16.00	19.00	19.00
5800	19.06	19.06	19.06	10.10	10.10	16.00	16.00	16.00	16.00	19.06	19.06
6000	19.97	19.97	19.97	10.10	10.10	16.00	16.00	16.00	16.00	19.97	19.97
6200	19.97	19.97	19.97	10.10	10.10	16.00	16.00	16.00	16.00	19.97	19.97
6400	19.50	19.50	19.50	10.10	10.10	16.00	16.00	16.00	16.00	19.50	19.50
6600	20.50	20.50	20.50	10.10	10.10	16.00	16.00	16.00	16.00	20.50	20.50

Chainage	LB GL	RB GL	Avg. GL	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
6800	20.00	20.00	20.00	10.10	10.10	16.00	16.00	16.00	16.00	20.00	20.00
7000	20.60	20.60	20.60	10.10	10.10	16.00	16.00	16.00	16.00	20.60	20.60
7200	20.50	20.50	20.50	10.10	10.10	16.00	16.00	16.00	16.00	20.50	20.50
7400	20.02	20.02	20.02	10.10	10.10	16.00	16.00	16.00	16.00	20.02	20.02
7600	20.03	20.03	20.03	10.10	10.10	16.00	16.00	16.00	16.00	20.03	20.03
7800	20.04	20.04	20.04	10.10	10.10	16.00	16.00	16.00	16.00	20.04	20.04
8000	20.50	20.50	20.50	10.10	10.10	16.00	16.00	16.00	16.00	20.50	20.50
8200	20.80	20.80	20.80	10.10	10.10	16.00	16.00	16.00	16.00	20.80	20.80
8400	21.00	21.00	21.00	10.10	10.10	16.00	16.00	16.00	16.00	21.00	21.00
8600	21.00	21.00	21.00	10.10	10.10	16.00	16.00	16.00	16.00	21.00	21.00
8800	21.00	21.00	21.00	10.10	10.10	16.00	16.00	16.00	16.00	21.00	21.00
9000	21.00	21.00	21.00	10.10	10.10	16.00	16.00	16.00	16.00	21.00	21.00
9200	21.00	21.00	21.00	10.10	10.10	16.00	16.00	16.00	16.00	21.00	21.00
9300	21.50	21.50	21.50	10.10	10.10	16.00	16.00	16.00	16.00	21.50	21.50

ENGINEERING REFERENCE DRAWINGS :

1. PROPOSED CANAL WORKS FROM KONDAMARAJUPALEM (CH:9300.00M) TO KRISHNAYAPALEM RESERVOIR(CH:0.00M) TCE.10244A-CV-3023-SI-30020

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DEFINITION SKETCH AND PROFILE DETAILS
FOR PALA VAGU CANAL FROM KONDAMARAJUPALEM
TO KRISHNAYAPALEM RESERVOIR

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
P0	INITIALS	GK	RR	VS						AKM				27-06-17
	REVISIONS													
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE		
					CLEARED									

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION/ FABRICATION WORK RELATED TO 'HOLDS'.

DO NOT SCALE

FILE NAME :10244A-CV-30029-Rev-P0

SCALE : NTS
DC & DISC: BLR & CV

DWG NO. TCE.10244A-CV-3023-SI-30029

ISSUE P0

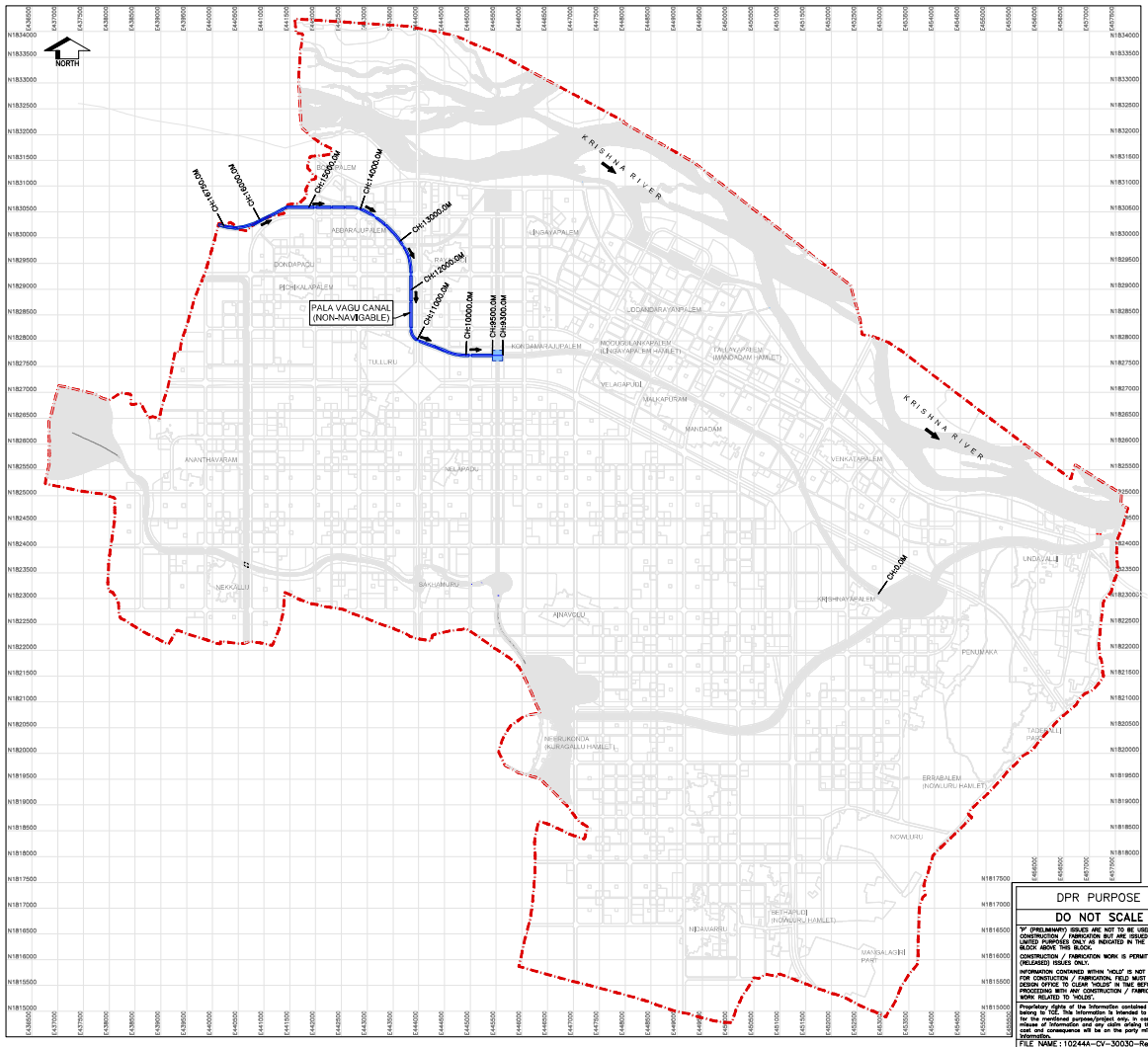
SIZE-A3

FILE NAME: F-093-Rev-R0.DWG

TCE FORM NO. 093 R0

TITLE: PROPOSED CANAL WORKS FROM DONDAPADU (CH:1675.00M) TO KONDAMARAJUPALEM (CH:9300.00M)

DWG NO: TCE.10244A-CV-3023-SI-30030



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. CHAINAGE "0.00M" CORRESPONDS TO KRISHNAYAPALEM RESERVOIR.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained hereto belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
P0	SIGN.													
	INITIALS	GK	RR	VS								AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

PROPOSED CANAL WORKS FROM DONDAPADU (CH:1675.00M) TO KONDAMARAJUPALEM (CH:9300.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

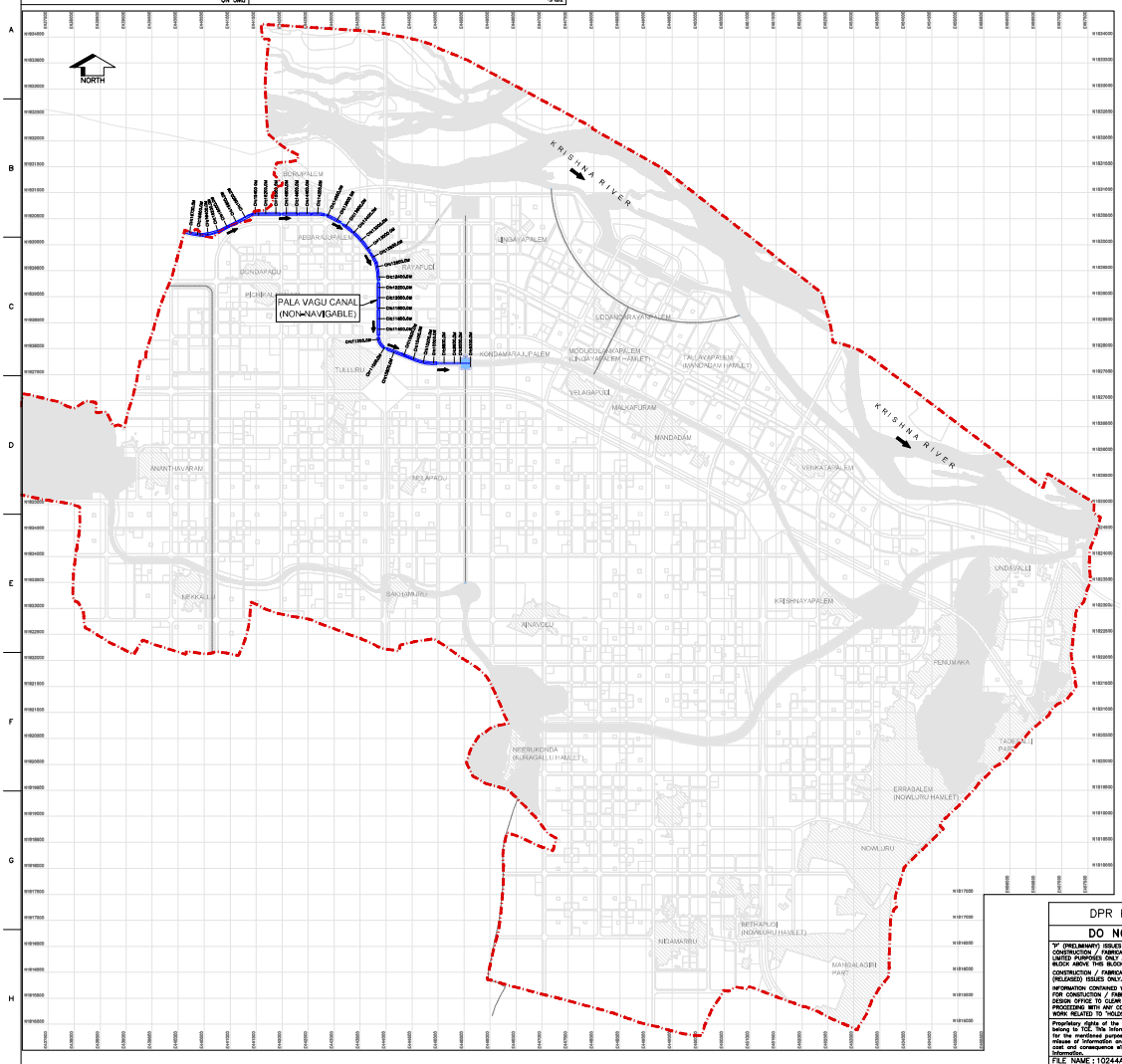
ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
1:37000	TCE.10244A-CV-3023-SI-30030	P0
DC & DSC: BLR & CV		

FILE NAME: F-091-Rev-R0.dwg

FILE NAME : 10244A-CV-30030-Rev-P0

TCE FORM NO. 091 R0



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE
UTM – UNIVERSAL TRANSVERSE MERCATOR

NOTES :

1. ALL DIMENTIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY
   TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M)
   TO KONDAMARAJUPALEM (CH:9300.00M)
   TCE.10244A-CV-3023-SI-30030

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS								AKM	27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30031-Rev-P0

DC & DSC : BLR & CV

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 01 OF 02)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE : 1:37000

DWG NO. TCE.10244A-CV-3023-SI-30031

ISSUE P0

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 02 OF 02)

DWG NO: TCE.10244A-CV-3023-SI-30032

TABLE 1: DETAILS OF UTM CO ORDINATES

Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing
9300.000	445613.14	1827716.62	11150.000	443874.47	1828130.78	13000.000	443636.97	1829827.25	14850.000	442605.18	1830592.04	16700.000	440273.23	1830216.81
9325.000	445588.14	1827716.59	11175.000	443862.02	1828154.23	13025.000	443623.72	1829947.29	14875.000	442605.18	1830592.04	16725.000	440249.11	1830215.89
9350.000	445563.14	1827716.55	11200.000	443855.50	1828178.36	13050.000	443608.77	1829967.13	14900.000	441981.18	1830592.04	16750.000	440224.56	1830221.40
9375.000	445538.14	1827716.51	11225.000	443851.48	1828202.83	13075.000	443593.82	1829987.17	14925.000	441955.18	1830592.04			
9400.000	445513.14	1827716.47	11250.000	443850.81	1828227.30	13100.000	443578.88	1830007.21	14950.000	441930.18	1830592.04			
9425.000	445488.14	1827716.44	11275.000	443850.81	1828252.00	13125.000	443563.55	1830026.95	14975.000	441905.18	1830592.04			
9450.000	445463.14	1827716.40	11300.000	443850.05	1828277.88	13150.000	443547.64	1830046.23	15000.000	441880.19	1830592.04			
9475.000	445438.14	1827716.36	11325.000	443848.88	1828302.86	13175.000	443531.73	1830065.51	15025.000	441855.19	1830592.04			
9500.000	445413.14	1827716.33	11350.000	443847.88	1828327.83	13200.000	443515.81	1830084.80	15050.000	441830.19	1830592.04			
9525.000	445388.14	1827716.29	11375.000	443846.02	1828352.83	13225.000	443498.78	1830103.09	15075.000	441805.19	1830592.04			
9550.000	445363.14	1827716.25	11400.000	443846.07	1828377.83	13250.000	443481.60	1830121.25	15100.000	441780.19	1830592.04			
9575.000	445338.14	1827716.22	11425.000	443846.11	1828402.83	13275.000	443464.43	1830139.42	15125.000	441755.19	1830592.04			
9600.000	445313.14	1827716.18	11450.000	443846.16	1828427.83	13300.000	443447.25	1830157.58	15150.000	441730.19	1830592.04			
9625.000	445288.14	1827716.12	11475.000	443846.20	1828452.83	13325.000	443429.91	1830175.27	15175.000	441705.19	1830592.04			
9650.000	445263.14	1827716.38	11500.000	443846.25	1828477.83	13350.000	443411.98	1830191.94	15200.000	441680.19	1830592.04			
9675.000	445238.14	1827716.44	11525.000	443846.29	1828502.83	13375.000	443392.15	1830208.61	15225.000	441655.19	1830592.04			
9700.000	445213.14	1827716.50	11550.000	443846.34	1828527.83	13400.000	443373.72	1830225.28	15250.000	441630.19	1830592.04			
9725.000	445188.14	1827716.56	11575.000	443846.38	1828552.83	13425.000	443355.59	1830241.95	15275.000	441605.19	1830592.04			
9750.000	445163.14	1827716.62	11600.000	443846.43	1828577.83	13450.000	443338.46	1830258.62	15300.000	441580.19	1830592.04			
9775.000	445138.14	1827716.68	11625.000	443846.47	1828602.83	13475.000	443317.83	1830275.29	15325.000	441555.19	1830592.04			
9800.000	445113.14	1827716.58	11650.000	443846.52	1828627.83	13500.000	443299.20	1830291.96	15350.000	441530.19	1830592.31			
9825.000	445088.14	1827716.48	11675.000	443846.57	1828652.83	13525.000	443281.19	1830308.17	15375.000	441505.19	1830592.77			
9850.000	445063.14	1827716.38	11700.000	443846.61	1828677.83	13550.000	443261.00	1830322.62	15400.000	441480.20	1830593.22			
9875.000	445038.14	1827716.28	11725.000	443846.66	1828702.83	13575.000	443239.82	1830337.67	15425.000	441455.20	1830595.68			
9900.000	445013.14	1827716.18	11750.000	443846.62	1828727.83	13600.000	443218.63	1830352.41	15450.000	441430.82	1830596.76			
9925.000	444988.14	1827716.08	11775.000	443846.52	1828752.83	13625.000	443198.44	1830367.16	15475.000	441407.59	1830581.51			
9950.000	444963.14	1827717.98	11800.000	443846.41	1828777.83	13650.000	443178.25	1830381.90	15500.000	441384.37	1830572.26			
9975.000	444938.14	1827717.99	11825.000	443846.31	1828802.83	13675.000	443159.07	1830396.65	15525.000	441361.14	1830563.02			
10000.000	444913.15	1827718.76	11850.000	443846.20	1828827.83	13700.000	443138.88	1830411.40	15550.000	441337.93	1830553.74			
10025.000	444888.16	1827719.52	11875.000	443846.10	1828852.83	13725.000	443118.41	1830425.71	15575.000	441316.48	1830540.90			
10050.000	444863.17	1827720.29	11900.000	443847.99	1828877.83	13750.000	443098.99	1830437.90	15600.000	441295.02	1830528.06			
10075.000	444838.19	1827721.05	11925.000	443847.89	1828902.83	13775.000	443074.76	1830458.10	15625.000	441273.57	1830515.22			
10100.000	444813.24	1827723.83	11950.000	443847.86	1828927.83	13800.000	443053.64	1830462.29	15650.000	441253.12	1830502.38			
10125.000	444788.60	1827726.65	11975.000	443847.86	1828952.83	13825.000	443031.12	1830474.49	15675.000	441230.67	1830489.54			
10150.000	444763.66	1827728.47	12000.000	443847.86	1828977.83	13850.000	443009.29	1830486.69	15700.000	441208.22	1830476.70			
10175.000	444738.66	1827733.11	12025.000	443847.86	1829002.83	13875.000	442987.47	1830498.88	15725.000	441187.77	1830463.86			
10200.000	444714.62	1827738.79	12050.000	443847.86	1829027.83	13900.000	442965.65	1830511.08	15750.000	441166.05	1830451.51			
10225.000	444690.27	1827744.47	12075.000	443847.86	1829052.83	13925.000	442943.73	1830523.09	15775.000	441145.83	1830440.47			
10250.000	444665.92	1827750.15	12100.000	443847.86	1829077.83	13950.000	442921.05	1830533.81	15800.000	441121.20	1830428.42			
10275.000	444641.80	1827756.65	12125.000	443847.86	1829102.83	13975.000	442898.38	1830544.14	15825.000	441098.77	1830418.38			
10300.000	444617.97	1827764.20	12150.000	443847.91	1829127.83	14000.000	442875.70	1830554.67	15850.000	441076.34	1830407.33			
10325.000	444594.14	1827771.74	12175.000	443847.97	1829152.83	14025.000	442852.62	1830564.00	15875.000	441053.92	1830396.28			
10350.000	444570.30	1827779.29	12200.000	443848.03	1829177.83	14050.000	442828.19	1830569.30	15900.000	441031.49	1830385.24			
10375.000	444547.10	1827785.42	12225.000	443845.99	1829202.83	14075.000	442803.76	1830574.60	15925.000	441009.06	1830374.19			
10400.000	444524.65	1827789.41	12250.000	443845.15	1829227.83	14100.000	442779.33	1830579.91	15950.000	440986.71	1830363.00			
10425.000	444502.20	1827810.41	12275.000	443844.31	1829252.83	14125.000	442754.88	1830585.07	15975.000	440964.55	1830351.42			
10450.000	444479.28	1827820.31	12300.000	443845.27	1829277.83	14150.000	442729.96	1830587.29	16000.000	440942.39	1830339.84			
10475.000	444455.80	1827828.88	12325.000	443845.13	1829302.83	14175.000	442705.07	1830589.50	16025.000	440921.24	1830328.27			
10500.000	444432.31	1827837.46	12350.000	443847.92	1829327.83	14200.000	442680.17	1830591.72	16050.000	440898.08	1830318.69			
10525.000	444408.83	1827846.03	12375.000	443847.52	1829352.83	14225.000	442655.19	1830592.03	16075.000	440875.92	1830305.11			
10550.000	444385.34	1827854.61	12400.000	443847.11	1829377.82	14250.000	442630.19	1830592.03	16100.000	440853.76	1830293.53			
10575.000	444361.91	1827863.32	12425.000	443846.12	1829402.79	14275.000	442605.19	1830592.04	16125.000	440831.61	1830281.96			
10600.000	444338.51	1827872.12	12450.000	443843.98	1829427.70	14300.000	442580.19	1830592.04	16150.000	440808.17	1830271.01			
10625.000	444315.11	1827880.92	12475.000	443841.84	1829452.61	14325.000	442555.19	1830592.04	16175.000	440785.72	1830262.35			
10650.000	444291.71	1827888.72	12500.000	443839.70	1829477.51	14350.000	442530.19	1830592.04	16200.000	440762.26	1830253.70			
10675.000	444268.31	1827896.52	12525.000	443837.12	1829502.36	14375.000	442505.19	1830592.04	16225.000	440738.81	1830245.04			
10700.000	444244.91	1827907.32	12550.000	443831.95	1829526.82	14400.000	442480.19	1830592.04	16250.000	440715.35	1830236.38			
10725.000	444221.51	1827916.12	12575.000	443826.77	1829551.27	14425.000	442455.19	1830592.04	16275.000	440691.90	1830227.73			
10750.000	444198.11	1827924.92	12600.000	443821.60	1829575.73	14450.000	442430.19	1830592.04	16300.000	440668.45	1830219.07			
10775.000	444174.75	1827933.83	12625.000	443816.43	1829600.19	14475.000	442405.19	1830592.04	16325.000	440644.99	1830210.42			
10800.000	444151.41	1827942.78	12650.000	443811.25	1829624.65	14500.000	442380.19	1830592.04	16350.000	440621.48	1830202.03			
10825.000	444128.07	1827951.73	12675.000	443805.80	1829649.01	14525.000	442355.19	1830592.04	16375.000	440598.53	1830200.42			
10850.000	444104.73	1827960.68	12700.000	443794.00	1829671.05	14550.000	442330.19	1830592.04	16400.000	440577.59	1830198.81			
10875.000	444081.39	1827969.64	12725.000	443782.19	1829693.03	14575.000	442305.19	1830592.04	16425.000	440554.64	1830197.21			
10900.000	444058.04	1827978.59	12750.000	443769.93	1829714.87	14600.000	442280.19	1830592.04	16450.000	440531.69	1830195.60			
10925.000	444034.70	1827987.54	12775.000	443757.77	1829736.71	14625.000	442255.19	1830592.04	16475.000	440496.74	1830193.99			
10950.000	444011.36	1827996.49	12800.000	443745.61	1829758.56	14650.000	442230.19	1830592.04	16500.000	440471.79	1830192.38			
10975.000	443989.21	1828006.06	12825.000	443733.44	1829780.40	14675.000	442205.19	1830592.04	16525.000	440448.84	1830190.78			
11000.000	443967.20	1828019.91	12850.000	443721.28	1829802.24	14700.000	442180.19	1830592.04	16550.000	440421.91	1830189.51			
11025.000	443946.28	1828033.76	12875.000	443709.12	1829824.08	14725.000	442155.19	1830592.04	16575.000	440397.98	1830192.47			
11050.000	443926.93	1828049.21	12900.000	443696.96	1829845.92	14750.000	442130.19	1830592.04	16600.000	440373.26	1830195.44			
11075.000	443909.86	1828067.40	12925.000	443683.52	1829866.84	14775.000	442105.19	1830592.04	16625.000	440347.43	1830198.40			
11100.000	443894.71	1828087.20	12950.000	443668.57	1829886.36	14800.000	442080.19	1830592.04	16650.000	440322.81	1830201.36			
11125.000	443881.23	1828108.26	12975.000	443653.62	1829907.01	14825.000	442055.19	1830592.04	16675.000	440297.94	1830205.23			

ENGINEERING REFERENCE DRAWINGS :

1. LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL (SH 01 OF 02) TCE.10244A-CV-3023-SI-30031

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
PO	SIGN.													
	INITIALS	GK	RR	VS								AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME				PE/PM	APPD	DATE
					CLEARED									

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 02 OF 02)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural & built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

SCALE	: AS SHOWN	DWG NO.	ISSUE
DC & DSC : BLR & CV		TCE.10244A-CV-3023-SI-30032	PO

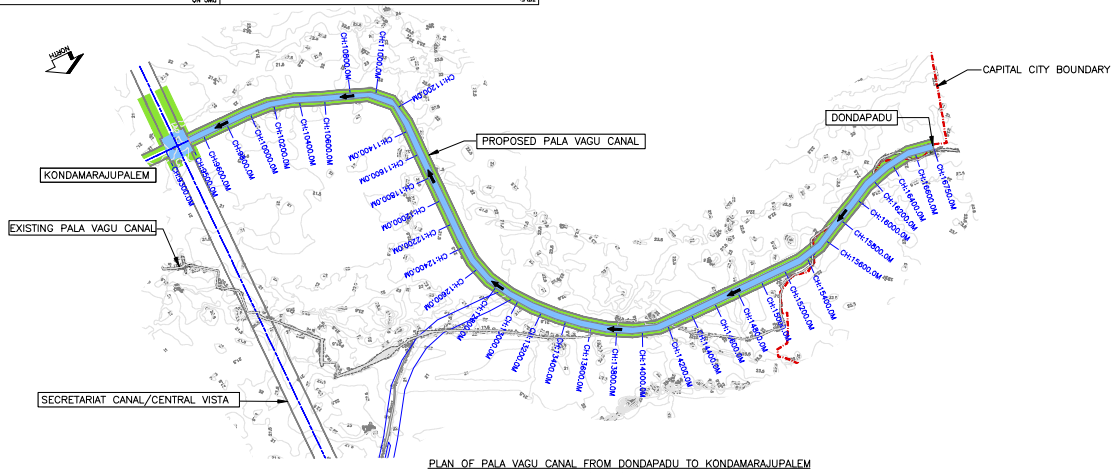
FILE NAME : 10244A-CV-30032-Rev-PO

FILE NAME: F-091-Rev-R0.dwg

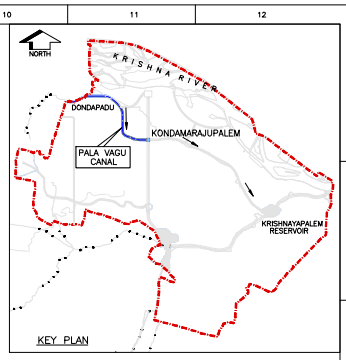
TCE FORM NO. 091 R0

DWG NO: TCE.10244A-CV-3023-SI-30033

TITLE: PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M)



PLAN OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM
(1:15000)



KEY PLAN

ABBREVIATIONS :

CH – CHAINAGE
H – HORIZONTAL
V – VERTICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30030

CHAINAGE (M)	EXISTING GROUND/BED LEVEL (M)	PROPOSED CANAL INVERT LEVEL (M)
9300.00	21.50	10.10
9500.00	21.50	12.10
9600.00	21.50	12.10
9800.00	21.50	12.10
10000.00	21.50	12.10
10200.00	21.50	12.10
10400.00	21.50	12.10
10600.00	21.70	12.10
10800.00	22.00	12.10
11000.00	21.50	12.10
11200.00	22.00	12.10
11400.00	22.00	12.10
11600.00	22.00	12.10
11800.00	22.00	12.10
12000.00	21.70	12.10
12200.00	21.50	12.10
12400.00	21.50	12.10
12600.00	22.00	12.10
12800.00	22.50	12.10
13000.00	22.50	12.10
13200.00	22.50	12.10
13400.00	21.50	12.10
13600.00	19.26	12.10
13800.00	19.29	12.10
14000.00	19.44	12.10
14200.00	19.54	12.10
14400.00	23.00	12.10
14600.00	23.00	12.10
14800.00	24.00	12.10
15000.00	22.50	12.10
15200.00	22.00	12.10
15400.00	20.37	12.60
15600.00	22.00	13.10
15800.00	20.59	13.30
16000.00	20.69	13.50
16200.00	20.79	13.70
16400.00	22.50	13.85
16600.00	21.02	14.05
16750.00	21.07	14.10

LONGITUDINAL SECTION

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30030

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
1:AS SHOWN	TCE.10244A-CV-3023-SI-30033	P0
DC & DSC: BLR & CV		

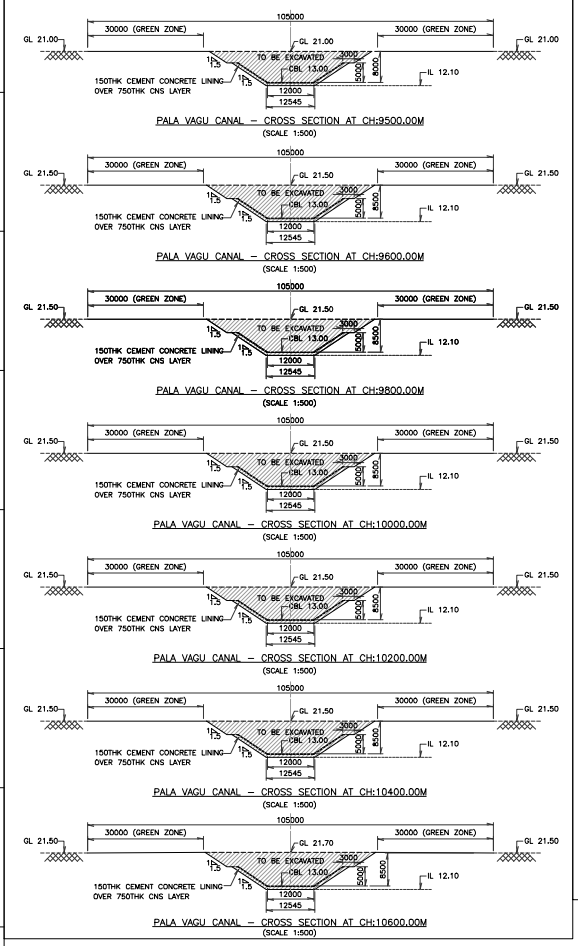
FILE NAME: 10244A-CV-30033-Rev-P0

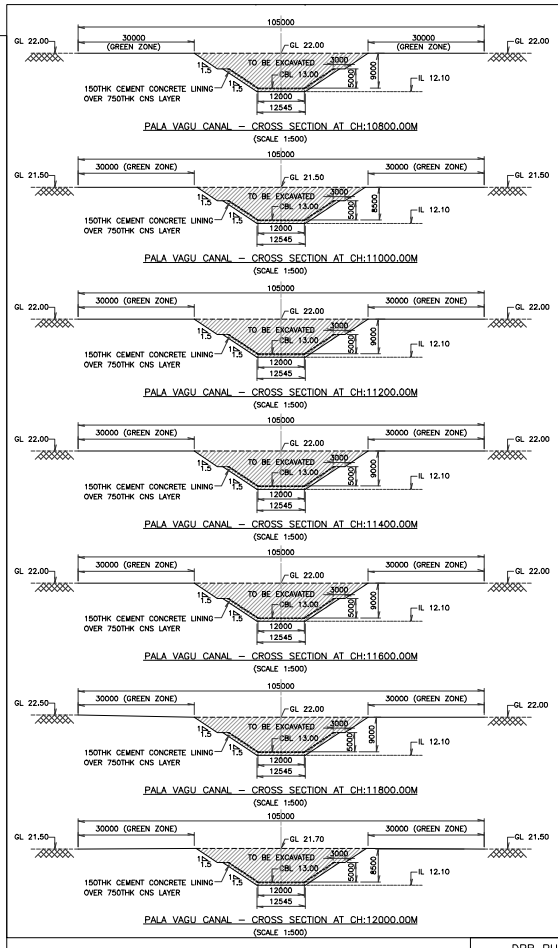
FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

TITLE: CROSS SECTION OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 01 OF 03)

DWG NO TCE.10244A-CV-3023-SI-30034





ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30033

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30030
3. PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30033

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.											
	INITIALS											
	REVISIONS											
	SIGN.											
	INITIALS											
	REVISIONS											
PO	SIGN.											27-06-2017
	INITIALS	GK	RR	VS		CV	EL	IC	ME		AKM	
ISSUE		DRN	DSN	CHD	CLEARED					PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

CROSS SECTION OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 01 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30034	P0
DC & DSC: BLR & CV		

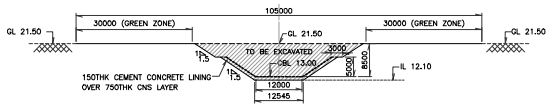
FILE NAME : 10244A-CV-30034-Rev-P0

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

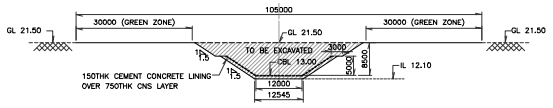
TITLE: CROSS SECTION OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 02 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30035



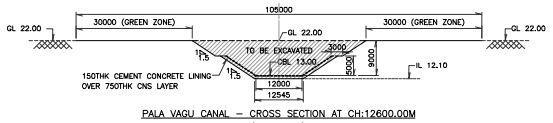
PALA VAGU CANAL – CROSS SECTION AT CH:12200.00M

(SCALE 1:500)



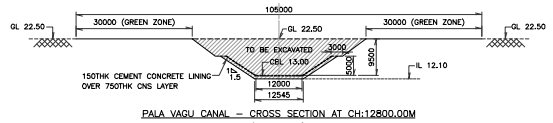
PALA VAGU CANAL – CROSS SECTION AT CH:12400.00M

(SCALE 1:500)



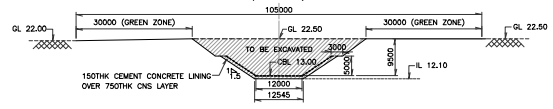
PALA VAGU CANAL – CROSS SECTION AT CH:12600.00M

(SCALE 1:500)



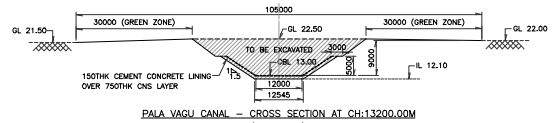
PALA VAGU CANAL – CROSS SECTION AT CH:12800.00M

(SCALE 1:500)



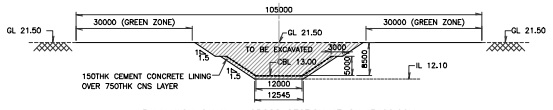
PALA VAGU CANAL – CROSS SECTION AT CH:13000.00M

(SCALE 1:500)



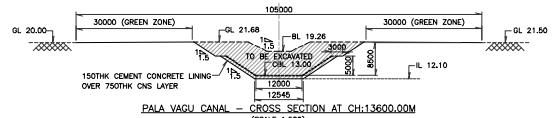
PALA VAGU CANAL – CROSS SECTION AT CH:13200.00M

(SCALE 1:500)



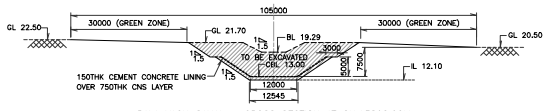
PALA VAGU CANAL – CROSS SECTION AT CH:13400.00M

(SCALE 1:500)



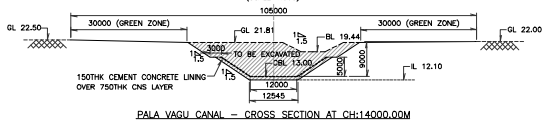
PALA VAGU CANAL – CROSS SECTION AT CH:13600.00M

(SCALE 1:500)



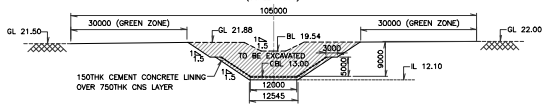
PALA VAGU CANAL – CROSS SECTION AT CH:13800.00M

(SCALE 1:500)



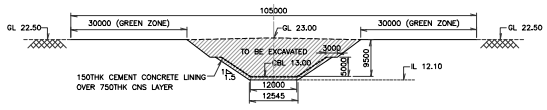
PALA VAGU CANAL – CROSS SECTION AT CH:14000.00M

(SCALE 1:500)



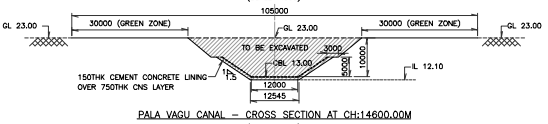
PALA VAGU CANAL – CROSS SECTION AT CH:14200.00M

(SCALE 1:500)



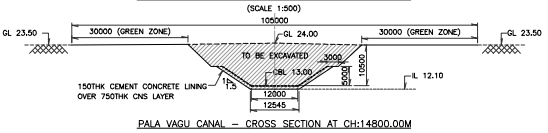
PALA VAGU CANAL – CROSS SECTION AT CH:14400.00M

(SCALE 1:500)



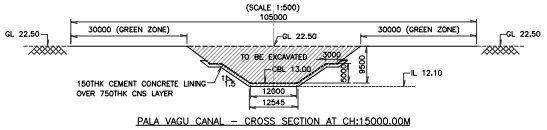
PALA VAGU CANAL – CROSS SECTION AT CH:14600.00M

(SCALE 1:500)



PALA VAGU CANAL – CROSS SECTION AT CH:14800.00M

(SCALE 1:500)



PALA VAGU CANAL – CROSS SECTION AT CH:15000.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30033

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30030
3. PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30033

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
					CLEARED								

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30035-Rev-P0

CROSS SECTION OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 02 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

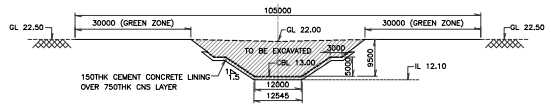
SCALE	DWG NO.	ISSUE
AS SHOWN	TCE.10244A-CV-3023-SI-30035	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

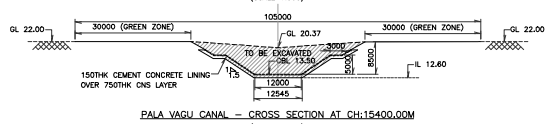
TITLE: CROSS SECTION OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 03 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30036



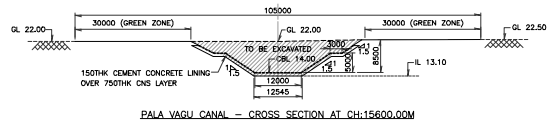
PALA VAGU CANAL – CROSS SECTION AT CH:15200.00M

(SCALE 1:500)



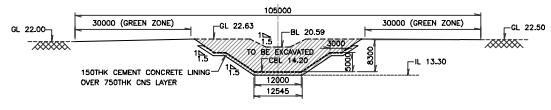
PALA VAGU CANAL – CROSS SECTION AT CH:15400.00M

(SCALE 1:500)



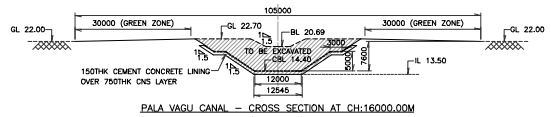
PALA VAGU CANAL – CROSS SECTION AT CH:15600.00M

(SCALE 1:500)



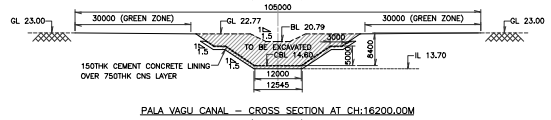
PALA VAGU CANAL – CROSS SECTION AT CH:15800.00M

(SCALE 1:500)



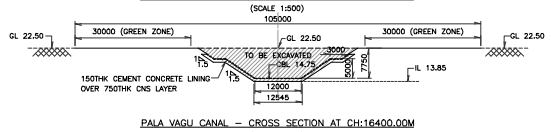
PALA VAGU CANAL – CROSS SECTION AT CH:16000.00M

(SCALE 1:500)



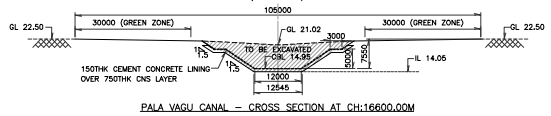
PALA VAGU CANAL – CROSS SECTION AT CH:16200.00M

(SCALE 1:500)



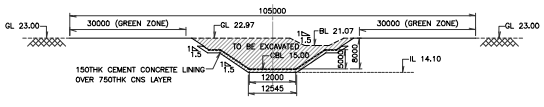
PALA VAGU CANAL – CROSS SECTION AT CH:16400.00M

(SCALE 1:500)



PALA VAGU CANAL – CROSS SECTION AT CH:16600.00M

(SCALE 1:500)



PALA VAGU CANAL – CROSS SECTION AT CH:16750.00M

(SCALE 1:500)

ABBREVIATIONS :

BL – BED LEVEL (EXISTING)
CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30033

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30030
3. PLAN AND LONGITUDINAL SECTION OF PALA VAGU CANAL FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30033

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS						AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE	
		CLEARED											

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30036-Rev-P0

CROSS SECTION OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM (SH 03 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

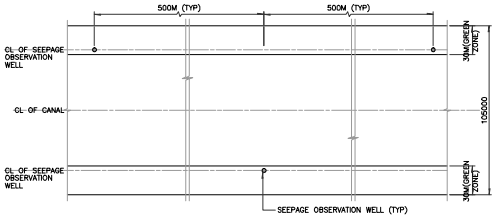
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30036	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

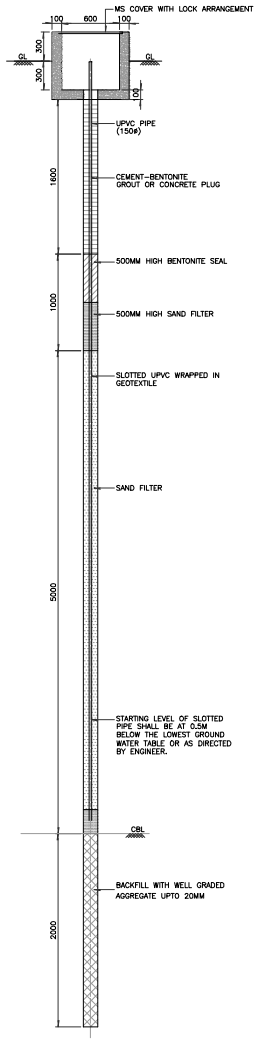
DWG NO: TCE.10244A-CV-3023-SI-30038

TITLE: TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM



TYPICAL PLAN DETAILS OF SEEPAGE OBSERVATION WELL

(SCALE 1:2000)



TYPICAL SECTIONAL VIEW OF SEEPAGE OBSERVATION WELL

(SCALE 1:20)

ABBREVIATIONS :

CBL – CANAL BED LEVEL
CL – CENTER LINE
GL – GROUND LEVEL
TYP – TYPICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. SEEPAGE OBSERVATION WELL SHALL BE BORED UP TO A DEPTH OF 10M BELOW GROUND LEVEL OR 2M BELOW CANAL BED LEVEL, WHICHEVER IS LOWER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M) TCE.10244A-CV-3023-SI-30030

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	RR	VS								AKM	27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION. BLF ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME : 10244A-CV-30038-Rev-P0

SCALE : AS SHOWN
DC & DSC: BLR & CV

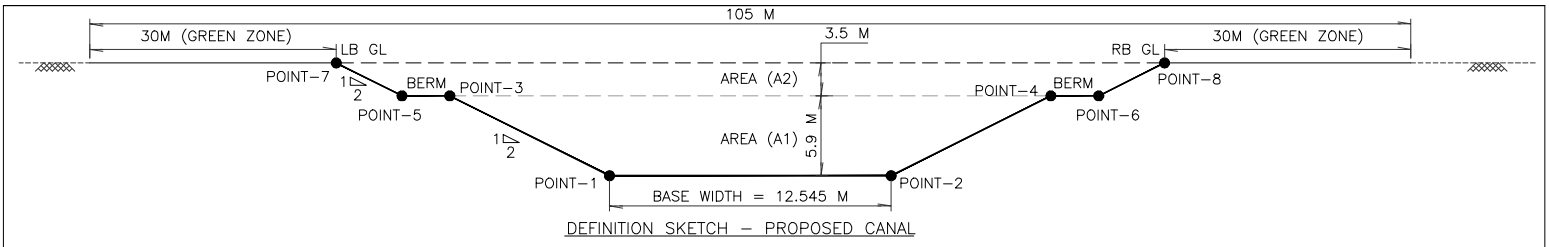
DWG NO. TCE.10244A-CV-3023-SI-30038

ISSUE P0

SIZE-A1

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg



DEFINITION SKETCH – PROPOSED CANAL

Chainage	LB GL	RB GL	Avg. GL	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
9500	21.00	21.00	21.00	12.10	12.10	18.00	18.00	18.00	18.00	21.00	21.00
9600	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
9800	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
10000	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
10200	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
10400	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
10600	21.70	21.70	21.70	12.10	12.10	18.00	18.00	18.00	18.00	21.70	21.70
10800	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
11000	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
11200	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
11400	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
11600	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
11800	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
12000	21.70	21.70	21.70	12.10	12.10	18.00	18.00	18.00	18.00	21.70	21.70
12200	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
12400	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
12600	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
12800	22.50	22.50	22.50	12.10	12.10	18.00	18.00	18.00	18.00	22.50	22.50
13000	22.50	22.50	22.50	12.10	12.10	18.00	18.00	18.00	18.00	22.50	22.50
13200	22.50	22.50	22.50	12.10	12.10	18.00	18.00	18.00	18.00	22.50	22.50
13400	21.50	21.50	21.50	12.10	12.10	18.00	18.00	18.00	18.00	21.50	21.50
13600	21.68	21.68	21.68	12.10	12.10	18.00	18.00	18.00	18.00	21.68	21.68
13800	21.70	21.70	21.70	12.10	12.10	18.00	18.00	18.00	18.00	21.70	21.70
14000	21.81	21.81	21.81	12.10	12.10	18.00	18.00	18.00	18.00	21.81	21.81
14200	21.88	21.88	21.88	12.10	12.10	18.00	18.00	18.00	18.00	21.88	21.88

Chainage	LB GL	RB GL	Avg. GL	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
14400	23.00	23.00	23.00	12.10	12.10	18.00	18.00	18.00	18.00	23.00	23.00
14600	23.00	23.00	23.00	12.10	12.10	18.00	18.00	18.00	18.00	23.00	23.00
14800	24.00	24.00	24.00	12.10	12.10	18.00	18.00	18.00	18.00	24.00	24.00
15000	22.50	22.50	22.50	12.10	12.10	18.00	18.00	18.00	18.00	22.50	22.50
15200	22.00	22.00	22.00	12.10	12.10	18.00	18.00	18.00	18.00	22.00	22.00
15400	20.37	20.37	20.37	12.60	12.60	18.50	18.50	18.50	18.50	20.37	20.37
15600	22.00	22.00	22.00	13.10	13.10	19.00	19.00	19.00	19.00	22.00	22.00
15800	22.63	22.63	22.63	13.30	13.30	19.20	19.20	19.20	19.20	22.63	22.63
16000	22.70	22.70	22.70	13.50	13.50	19.40	19.40	19.40	19.40	22.70	22.70
16200	22.77	22.77	22.77	13.70	13.70	19.60	19.60	19.60	19.60	22.77	22.77
16400	22.50	22.50	22.50	13.85	13.85	19.75	19.75	19.75	19.75	22.50	22.50
16600	21.02	21.02	21.02	14.05	14.05	19.95	19.95	19.95	19.95	21.02	21.02
16750	22.97	22.97	22.97	14.10	14.10	20.00	20.00	20.00	20.00	22.97	22.97

ENGINEERING REFERENCE DRAWINGS :

1. PROPOSED CANAL WORKS FROM DONDAPADU (CH:16750.00M) TO KONDAMARAJUPALEM (CH:9300.00M)
   TCE.10244A-CV-3023-SI-30030

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DEFINITION SKETCH AND PROFILE DETAILS FOR PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

	SIGN.													
	INITIALS													
	REVISIONS													
P0	SIGN.													
	INITIALS	GK	RR	VS						AKM			27-06-17	
	REVISIONS													
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE		
					CLEARED									

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION/ FABRICATION WORK RELATED TO 'HOLDS'.

DO NOT SCALE

FILE NAME :10244A-CV-30040-Rev-P0

SCALE : NTS
DC & DISC: BLR & CV

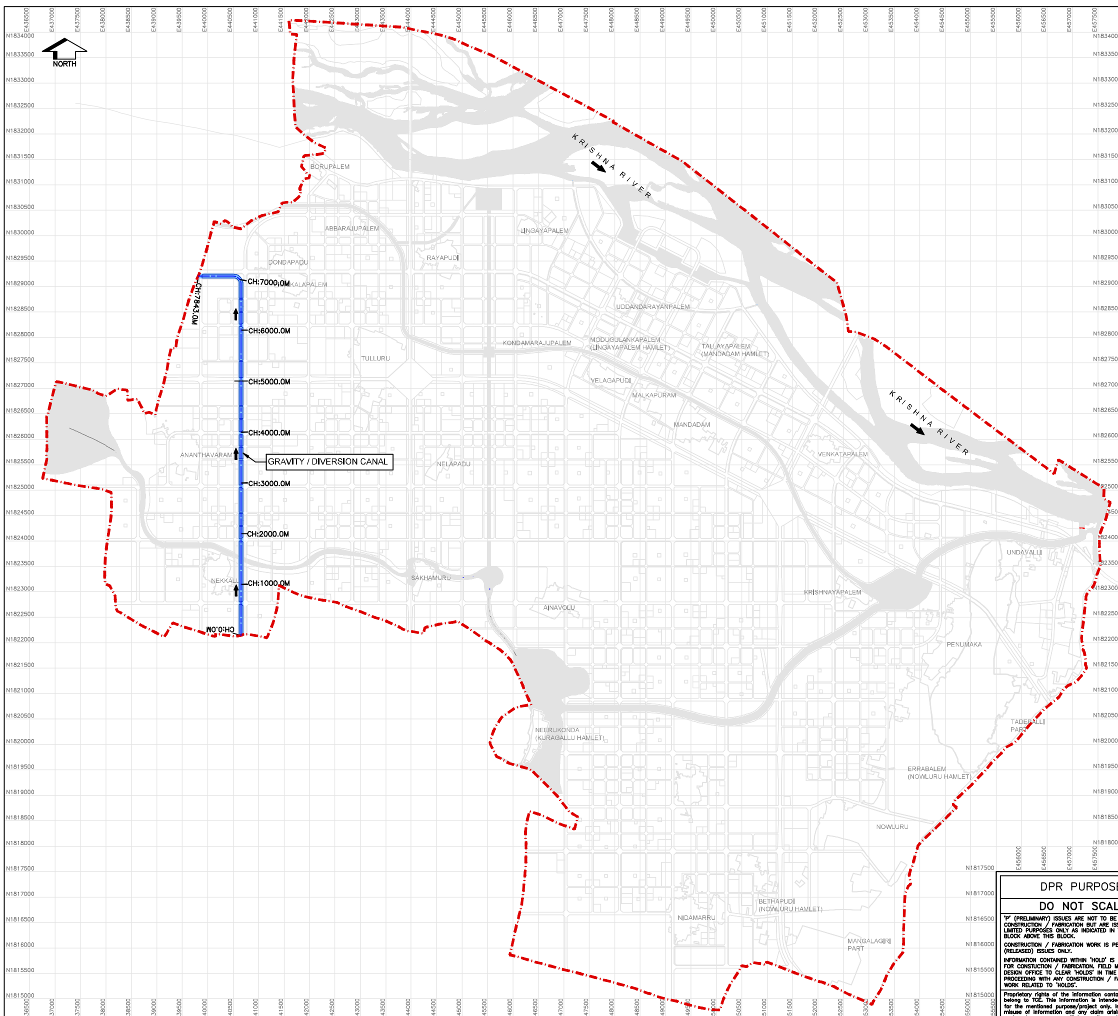
DWG NO. TCE.10244A-CV-3023-SI-30040

ISSUE P0

SIZE-A3

FILE NAME: F-093-Rev-R0.DWG

TCE FORM NO. 093 R0



LEGEND :

— CAPITAL CITY BOUNDARY

— CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY
TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												27-06-2017
	INITIALS	GK	RR	VS							AKM		
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
					CLEARED								

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

FILE NAME : 10244A-CV-30041-Rev-P0

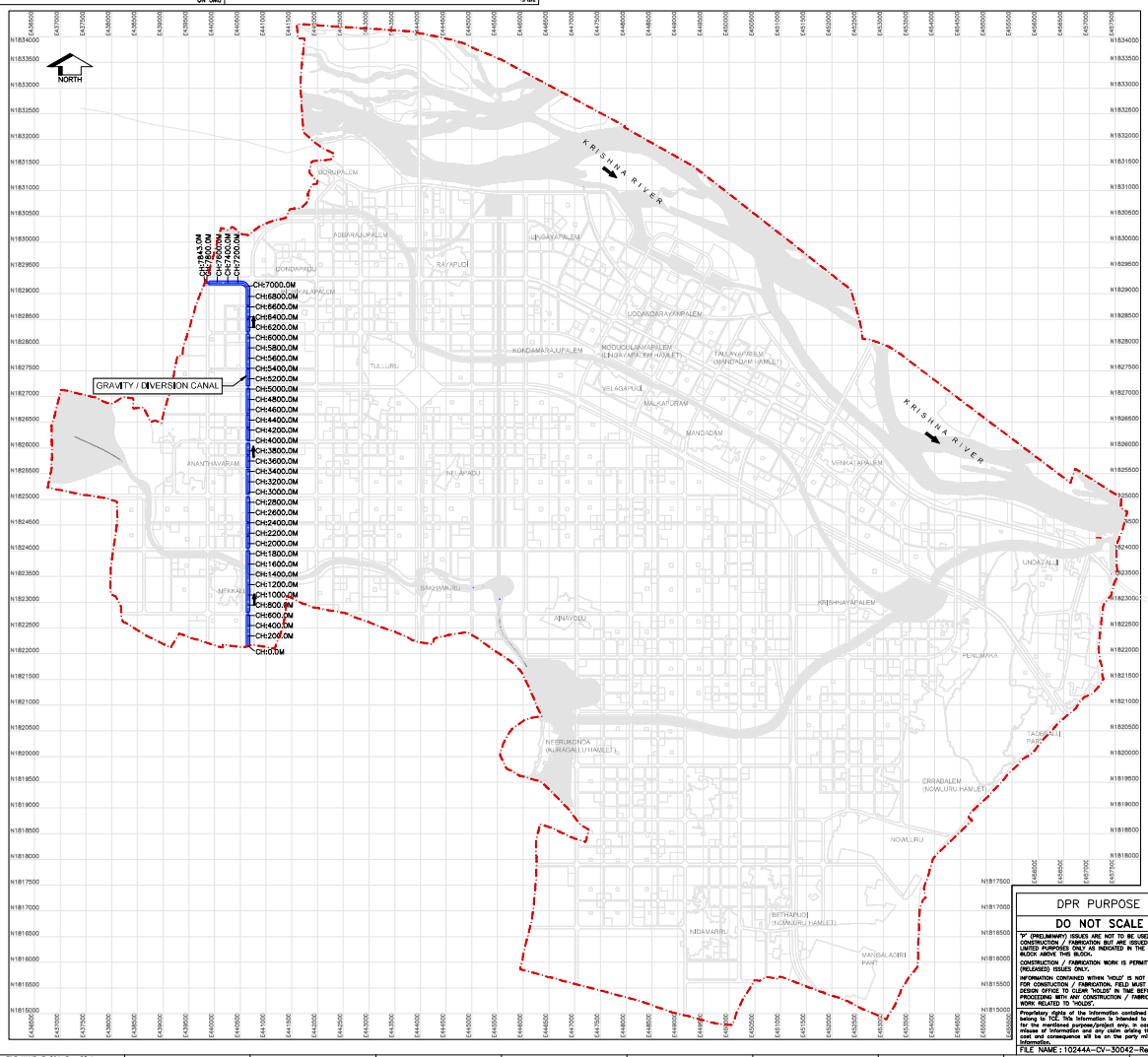
SCALE : 1:37000
DC & DISC: BLR & CV
DWG NO. TCE.10244A-CV-3023-SI-30041
ISSUE P0
SIZE-A1
TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M)
DWG NO TCE.10244A-CV-3023-SI-30041

TITLE: LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR GRAVITY/DIVERSION CANAL (SH 01 OF 02)

DWG NO: TCE.10244A-CV-3023-SI-30042



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

CH – CHAINAGE
UTM – UNIVERSAL TRANSVERSE MERCATOR

NOTES :

1. ALL DIMENTIONS ARE IN MILLIMETERS, LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30041

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

	SIGN.														
	INITIALS														
	REVISIONS														
	SIGN.														
	INITIALS														
	REVISIONS														
PO	SIGN.														
	INITIALS	GK	RR	VS								AKM			27-06-2017
ISSUE		DRN		DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE	

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR GRAVITY/DIVERSION CANAL (SH 01 OF 02)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	DWG NO.	ISSUE
1:37000	TCE.10244A-CV-3023-SI-30042	P0

DC & DSC: BLR & CV

FILE NAME: 10244A-CV-30042-Rev-P0

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

TITLE	DWG NO
LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR GRAVITY/DIVERSION CANAL (SH 02 OF 02)	TCE.10244A-CV-3023-SI-30043

TABLE 1: DETAILS OF UTM CO ORDINATES

Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing	Chainage (m)	Easting	Northing
0	440653.07	1822144.08	1375	440653.07	1823519.08	2750	440653.07	1824894.08	4125	440653.07	1826269.08	5500	440653.07	1827644.08	6875	440653.07	1829019.08
25	440653.07	1822169.08	1400	440653.07	1823544.08	2775	440653.07	1824919.08	4150	440653.07	1826294.08	5525	440653.07	1827669.08	6900	440653.07	1829044.08
50	440653.07	1822194.08	1425	440653.07	1823569.08	2800	440653.07	1824944.08	4175	440653.07	1826319.08	5550	440653.07	1827694.08	6925	440653.07	1829069.08
75	440653.07	1822219.08	1450	440653.07	1823594.08	2825	440653.07	1824969.08	4200	440653.07	1826344.08	5575	440653.07	1827719.08	6950	440649.71	1829093.74
100	440653.07	1822244.08	1475	440653.07	1823619.08	2850	440653.07	1824994.08	4225	440653.07	1826369.08	5600	440653.07	1827744.08	6975	440641.46	1829117.31
125	440653.07	1822269.08	1500	440653.07	1823644.08	2875	440653.07	1825019.08	4250	440653.07	1826394.08	5625	440653.07	1827769.08	7000	440629.43	1829139.20
150	440653.07	1822294.08	1525	440653.07	1823669.08	2900	440653.07	1825044.08	4275	440653.07	1826419.08	5650	440653.07	1827794.08	7025	440613.94	1829158.78
175	440653.07	1822319.08	1550	440653.07	1823694.08	2925	440653.07	1825069.08	4300	440653.07	1826444.08	5675	440653.07	1827819.08	7050	440595.43	1829175.54
200	440653.07	1822344.08	1575	440653.07	1823719.08	2950	440653.07	1825094.08	4325	440653.07	1826469.08	5700	440653.07	1827844.08	7075	440574.39	1829188.99
225	440653.07	1822369.08	1600	440653.07	1823744.08	2975	440653.07	1825119.08	4350	440653.07	1826494.08	5725	440653.07	1827869.08	7100	440551.42	1829198.78
250	440653.07	1822394.08	1625	440653.07	1823769.08	3000	440653.07	1825144.08	4375	440653.07	1826519.08	5750	440653.07	1827894.08	7125	440527.14	1829204.63
275	440653.07	1822419.08	1650	440653.07	1823794.08	3025	440653.07	1825169.08	4400	440653.07	1826544.08	5775	440653.07	1827919.08	7150	440502.23	1829206.40
300	440653.07	1822444.08	1675	440653.07	1823819.08	3050	440653.07	1825194.08	4425	440653.07	1826569.08	5800	440653.07	1827944.08	7175	440477.23	1829206.41
325	440653.07	1822469.08	1700	440653.07	1823844.08	3075	440653.07	1825219.08	4450	440653.07	1826594.08	5825	440653.07	1827969.08	7200	440452.23	1829206.43
350	440653.07	1822494.08	1725	440653.07	1823869.08	3100	440653.07	1825244.08	4475	440653.07	1826619.08	5850	440653.07	1827994.08	7225	440427.23	1829206.44
375	440653.07	1822519.08	1750	440653.07	1823894.08	3125	440653.07	1825269.08	4500	440653.07	1826644.08	5875	440653.07	1828019.08	7250	440402.23	1829206.46
400	440653.07	1822544.08	1775	440653.07	1823919.08	3150	440653.07	1825294.08	4525	440653.07	1826669.08	5900	440653.07	1828044.08	7275	440377.23	1829206.47
425	440653.07	1822569.08	1800	440653.07	1823944.08	3175	440653.07	1825319.08	4550	440653.07	1826694.08	5925	440653.07	1828069.08	7300	440352.23	1829206.48
450	440653.07	1822594.08	1825	440653.07	1823969.08	3200	440653.07	1825344.08	4575	440653.07	1826719.08	5950	440653.07	1828094.08	7325	440327.23	1829206.50
475	440653.07	1822619.08	1850	440653.07	1823994.08	3225	440653.07	1825369.08	4600	440653.07	1826744.08	5975	440653.07	1828119.08	7350	440302.23	1829206.51
500	440653.07	1822644.08	1875	440653.07	1824019.08	3250	440653.07	1825394.08	4625	440653.07	1826769.08	6000	440653.07	1828144.08	7375	440277.23	1829206.53
525	440653.07	1822669.08	1900	440653.07	1824044.08	3275	440653.07	1825419.08	4650	440653.07	1826794.08	6025	440653.07	1828169.08	7400	440252.23	1829206.54
550	440653.07	1822694.08	1925	440653.07	1824069.08	3300	440653.07	1825444.08	4675	440653.07	1826819.08	6050	440653.07	1828194.08	7425	440227.23	1829206.55
575	440653.07	1822719.08	1950	440653.07	1824094.08	3325	440653.07	1825469.08	4700	440653.07	1826844.08	6075	440653.07	1828219.08	7450	440202.23	1829206.57
600	440653.07	1822744.08	1975	440653.07	1824119.08	3350	440653.07	1825494.08	4725	440653.07	1826869.08	6100	440653.07	1828244.08	7475	440177.23	1829206.58
625	440653.07	1822769.08	2000	440653.07	1824144.08	3375	440653.07	1825519.08	4750	440653.07	1826894.08	6125	440653.07	1828269.08	7500	440152.23	1829206.59
650	440653.07	1822794.08	2025	440653.07	1824169.08	3400	440653.07	1825544.08	4775	440653.07	1826919.08	6150	440653.07	1828294.08	7525	440127.23	1829206.61
675	440653.07	1822819.08	2050	440653.07	1824194.08	3425	440653.07	1825569.08	4800	440653.07	1826944.08	6175	440653.07	1828319.08	7550	440102.23	1829206.62
700	440653.07	1822844.08	2075	440653.07	1824219.08	3450	440653.07	1825594.08	4825	440653.07	1826969.08	6200	440653.07	1828344.08	7575	440077.23	1829206.64
725	440653.07	1822869.08	2100	440653.07	1824244.08	3475	440653.07	1825619.08	4850	440653.07	1826994.08	6225	440653.07	1828369.08	7600	440052.23	1829206.65
750	440653.07	1822894.08	2125	440653.07	1824269.08	3500	440653.07	1825644.08	4875	440653.07	1827019.08	6250	440653.07	1828394.08	7625	440027.23	1829206.66
775	440653.07	1822919.08	2150	440653.07	1824294.08	3525	440653.07	1825669.08	4900	440653.07	1827044.08	6275	440653.07	1828419.08	7650	440002.23	1829206.68
800	440653.07	1822944.08	2175	440653.07	1824319.08	3550	440653.07	1825694.08	4925	440653.07	1827069.08	6300	440653.07	1828444.08	7675	439977.23	1829206.69
825	440653.07	1822969.08	2200	440653.07	1824344.08	3575	440653.07	1825719.08	4950	440653.07	1827094.08	6325	440653.07	1828469.08	7700	439952.23	1829206.71
850	440653.07	1822994.08	2225	440653.07	1824369.08	3600	440653.07	1825744.08	4975	440653.07	1827119.08	6350	440653.07	1828494.08	7725	439927.23	1829206.72
875	440653.07	1823019.08	2250	440653.07	1824394.08	3625	440653.07	1825769.08	5000	440653.07	1827144.08	6375	440653.07	1828519.08	7750	439902.23	1829206.73
900	440653.07	1823044.08	2275	440653.07	1824419.08	3650	440653.07	1825794.08	5025	440653.07	1827169.08	6400	440653.07	1828544.08	7775	439877.23	1829206.75
925	440653.07	1823069.08	2300	440653.07	1824444.08	3675	440653.07	1825819.08	5050	440653.07	1827194.08	6425	440653.07	1828569.08	7800	439852.23	1829206.76
950	440653.07	1823094.08	2325	440653.07	1824469.08	3700	440653.07	1825844.08	5075	440653.07	1827219.08	6450	440653.07	1828594.08	7825	439827.23	1829206.78
975	440653.07	1823119.08	2350	440653.07	1824494.08	3725	440653.07	1825869.08	5100	440653.07	1827244.08	6475	440653.07	1828619.08	7843	439809.63	1829206.79
1000	440653.07	1823144.08	2375	440653.07	1824519.08	3750	440653.07	1825894.08	5125	440653.07	1827269.08	6500	440653.07	1828644.08			
1025	440653.07	1823169.08	2400	440653.07	1824544.08	3775	440653.07	1825919.08	5150	440653.07	1827294.08	6525	440653.07	1828669.08			
1050	440653.07	1823194.08	2425	440653.07	1824569.08	3800	440653.07	1825944.08	5175	440653.07	1827319.08	6550	440653.07	1828694.08			
1075	440653.07	1823219.08	2450	440653.07	1824594.08	3825	440653.07	1825969.08	5200	440653.07	1827344.08	6575	440653.07	1828719.08			
1100	440653.07	1823244.08	2475	440653.07	1824619.08	3850	440653.07	1825994.08	5225	440653.07	1827369.08	6600	440653.07	1828744.08			
1125	440653.07	1823269.08	2500	440653.07	1824644.08	3875	440653.07	1826019.08	5250	440653.07	1827394.08	6625	440653.07	1828769.08			
1150	440653.07	1823294.08	2525	440653.07	1824669.08	3900	440653.07	1826044.08	5275	440653.07	1827419.08	6650	440653.07	1828794.08			
1175	440653.07	1823319.08	2550	440653.07	1824694.08	3925	440653.07	1826069.08	5300	440653.07	1827444.08	6675	440653.07	1828819.08			
1200	440653.07	1823344.08	2575	440653.07	1824719.08	3950	440653.07	1826094.08	5325	440653.07	1827469.08	6700	440653.07	1828844.08			
1225	440653.07	1823369.08	2600	440653.07	1824744.08	3975	440653.07	1826119.08	5350	440653.07	1827494.08	6725	440653.07	1828869.08			
1250	440653.07	1823394.08	2625	440653.07	1824769.08	4000	440653.07	1826144.08	5375	440653.07	1827519.08	6750	440653.07	1828894.08			
1275	440653.07	1823419.08	2650	440653.07	1824794.08	4025	440653.07	1826169.08	5400	440653.07	1827544.08	6775	440653.07	1828919.08			
1300	440653.07	1823444.08	2675	440653.07	1824819.08	4050	440653.07	1826194.08	5425	440653.07	1827569.08	6800	440653.07	1828944.08			
1325	440653.07	1823469.08	2700	440653.07	1824844.08	4075	440653.07	1826219.08	5450	440653.07	1827594.08	6825	440653.07	1828969.08			
1350	440653.07	1823494.08	2725	440653.07	1824869.08	4100	440653.07	1826244.08	5475	440653.07	1827619.08	6850	440653.07	1828994.08			

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY
   TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M)
   TO PICHIKALAPALEM (CH:7843.00M)
   TCE.10244A-CV-3023-SI-30041

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												27-06-2017
	INITIALS	GK	RR	VS								AKM	
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LAYOUT PLAN INDICATING UTM CO-ORDINATE SYSTEM FOR GRAVITY/DIVERSION CANAL (SH 02 OF 02)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

SCALE	: NTS	DWG NO.		ISSUE
DC & DSC : BLR & CV		TCE.10244A-CV-3023-SI-30043	P0	

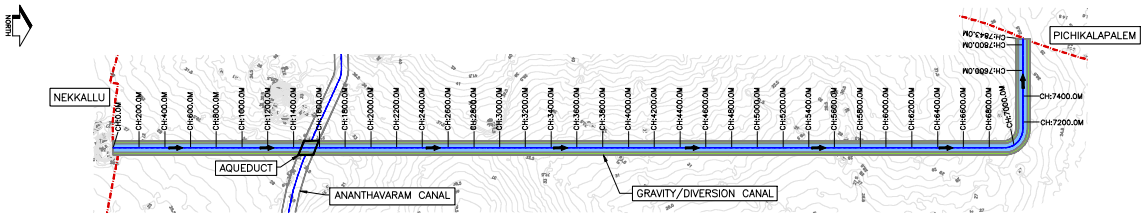
FILE NAME : 10244A-CV-30043-Rev-P0

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

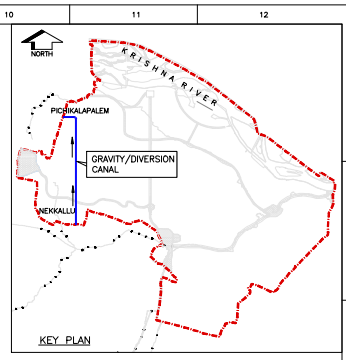
TITLE: PLAN AND LONGITUDINAL SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M)

DWG NO: TCE.10244A-CV-3023-SI-30044



PLAN OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM

(SCALE 1:15000)

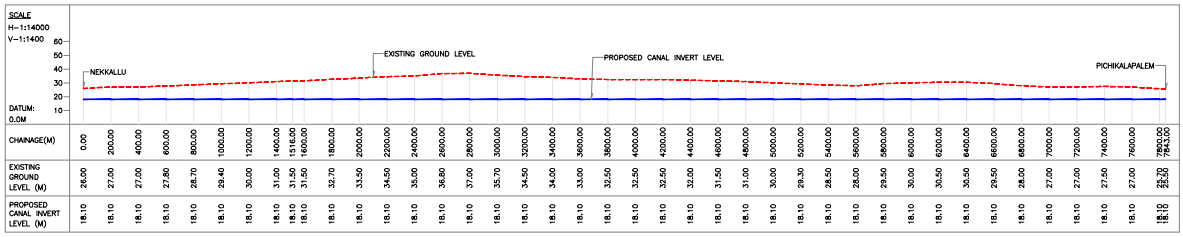


ABBREVIATIONS :

CH – CHAINAGE
H – HORIZONTAL
V – VERTICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30041



CHAINAGE(M)	0.00	200.00	400.00	600.00	800.00	1000.00	1200.00	1400.00	1516.00	1600.00	1800.00	2000.00	2200.00	2400.00	2600.00	2800.00	3000.00	3200.00	3400.00	3600.00	3800.00	4000.00	4200.00	4400.00	4600.00	4800.00	5000.00	5200.00	5400.00	5600.00	5800.00	6000.00	6200.00	6400.00	6600.00	6800.00	7000.00	7200.00	7400.00	7600.00	7800.00 7843.00
EXISTING GROUND LEVEL (M)	26.00	27.00	27.00	27.80	28.70	29.40	30.00	31.00	31.50	31.50	32.70	33.50	34.50	35.00	36.80	37.00	35.70	34.50	34.00	33.00	32.50	32.50	32.50	32.00	31.50	31.00	30.00	29.30	28.50	28.00	29.50	30.00	30.50	30.50	29.50	28.00	27.00	27.00	27.50	27.00	25.70 25.50
PROPOSED CANAL INVERT LEVEL (M)	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10

LONGITUDINAL SECTION

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30041

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

PLAN AND LONGITUDINAL SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME : 10244A-CV-30044-Rev-P0

SCALE : AS SHOWN
DC & DSC : BLR & CV

DWG NO. TCE.10244A-CV-3023-SI-30044

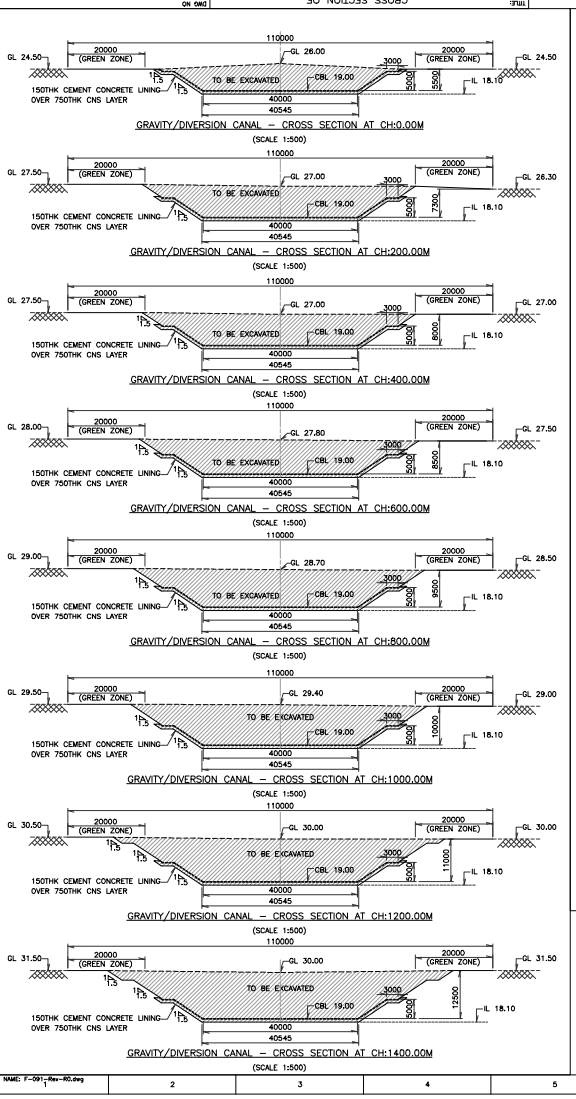
ISSUE P0

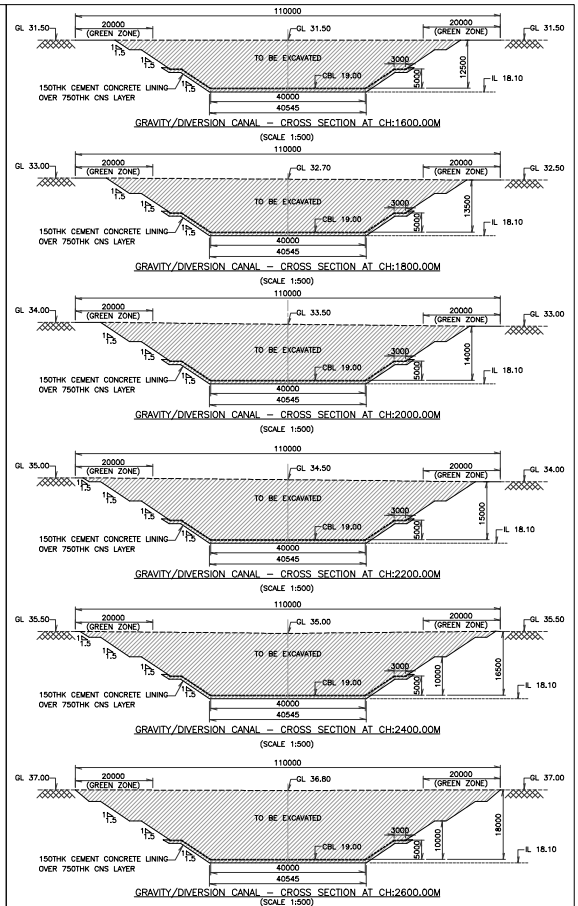
TCE FORM NO. 091 R0

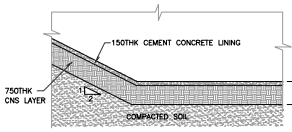
FILE NAME: F-091-Rev-R0.dwg

DWG NO: TCE.10244A-CV-3023-SI-30045

TITLE: CROSS SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM (SH 01 OF 03)







DETAIL "A"
(TYPICAL DETAIL OF CANAL)
(SCALE 1:75)

ABBREVIATIONS :

CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30044

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30041
3. PLAN AND LONGITUDINAL SECTION OF DIVERSION CANAL/ GRAVITY CANAL FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30044

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.													
	INITIALS													
	REVISIONS													
	SIGN.													
	INITIALS													
	REVISIONS													
PO	SIGN.													
	INITIALS	GK	RR	VS							AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE	

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

CROSS SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM (SH 01 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	DWG NO.	ISSUE
1:AS SHOWN	TCE.10244A-CV-3023-SI-30045	P0

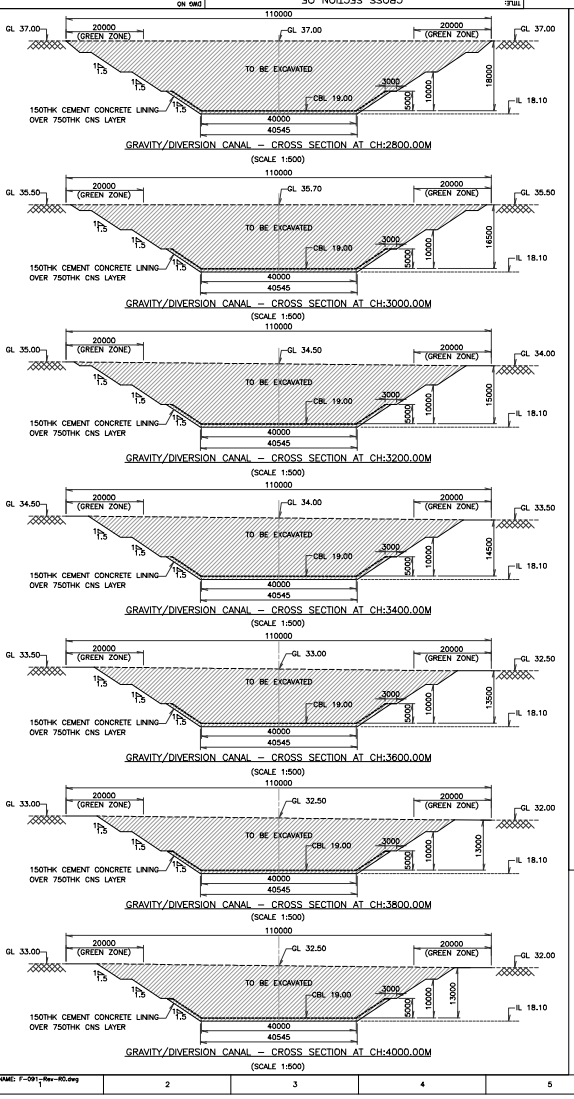
FILE NAME: 10244A-CV-30045-Rev-P0 | DC & DSC: BLR & CV

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

DWG NO: TCE.10244A-CV-3023-SI-30046

TITLE: CROSS SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM (SH 02 OF 03)



GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:2800.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:3000.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:3200.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:3400.00M

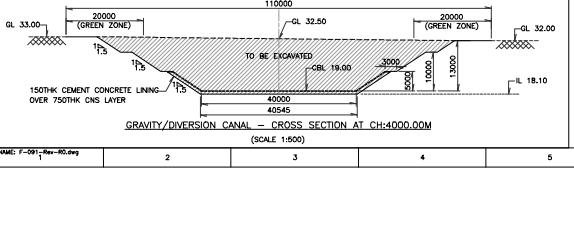
(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:3600.00M

(SCALE 1:500)

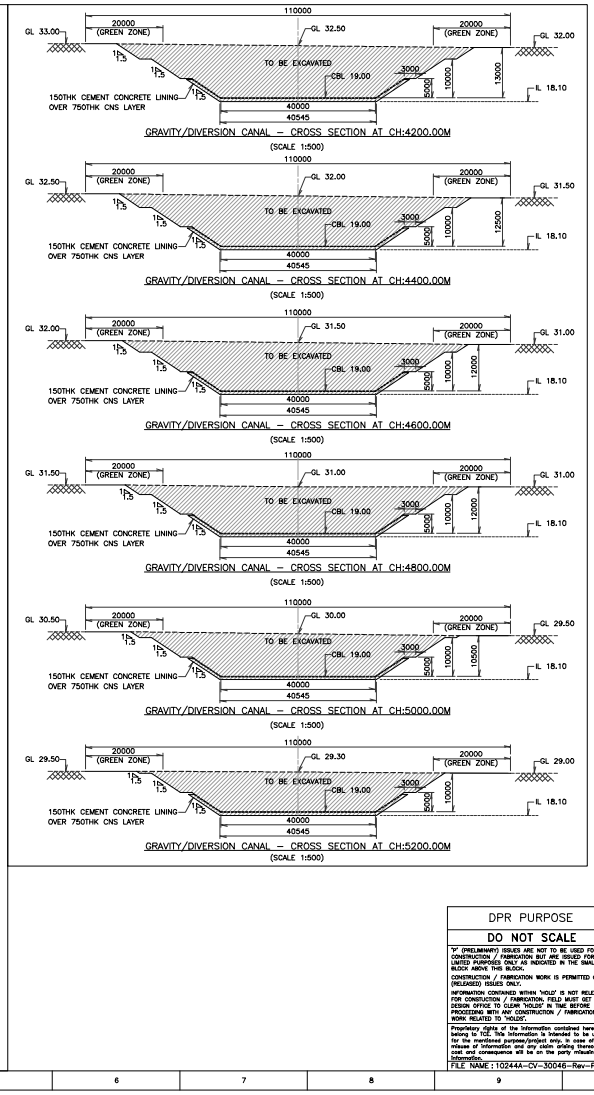
GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:3800.00M

(SCALE 1:500)



GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:4000.00M

(SCALE 1:500)



GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:4200.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:4400.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:4600.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:4800.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:5000.00M

(SCALE 1:500)

GRAVITY/DIVERSION CANAL – CROSS SECTION AT CH:5200.00M

(SCALE 1:500)

ABBREVIATIONS :

CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30044

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30041
3. PLAN AND LONGITUDINAL SECTION OF DIVERSION CANAL/ GRAVITY CANAL FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30044

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS						AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE	
		CLEARED											

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30046-Rev-P0

CROSS SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM (SH 02 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

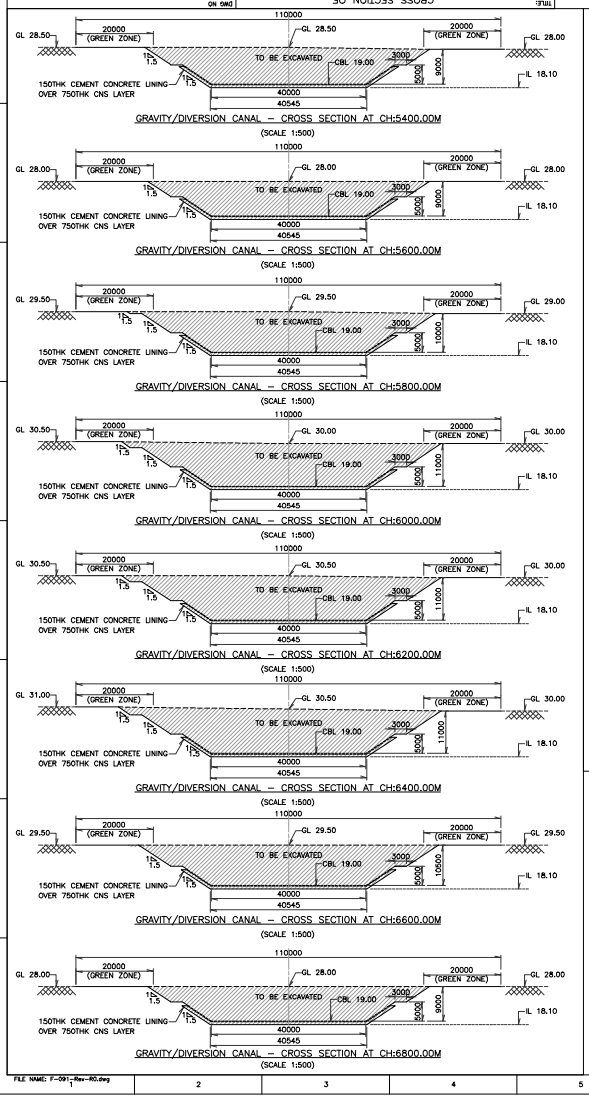
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30046	P0
DC & DSC: BLR & CV		

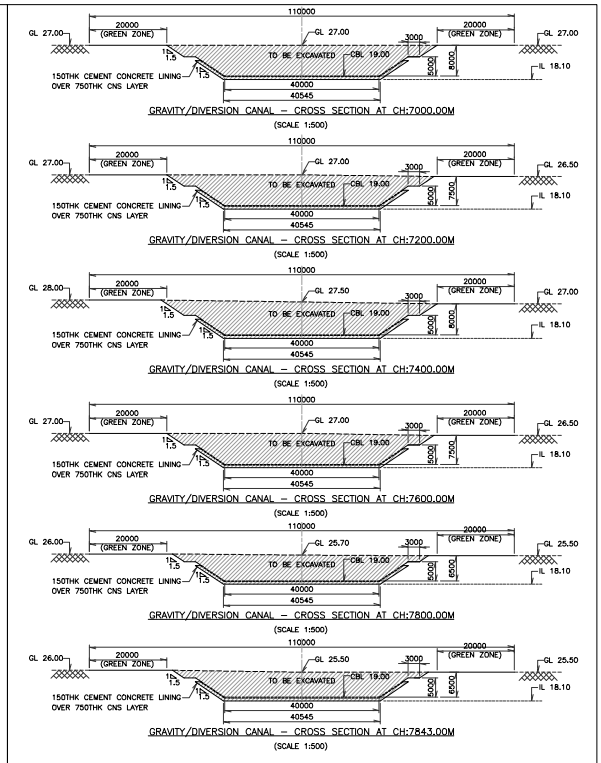
TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: CROSS SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM (SH 03 OF 03)

DWG NO: TCE.10244A-CV-3023-SI-30047





ABBREVIATIONS :

CBL – CANAL BED LEVEL
CH – CHAINAGE
CNS – COHESIVE NON-SWELLING
EL – ELEVATION
GL – GROUND LEVEL
IL – INVERT LEVEL
THK – THICK

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. **CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED** MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED.
4. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
5. CANAL SHALL BE EXCAVATED UPTO THE INVERT LEVEL.
6. CANAL LINING WORKS (150THK CC LINING AND 750THK CNS LAYER) ARE EXCLUDED.
7. LAYOUT AND OTHER DETAILS REFER DRAWING NO : TCE.10244A-CV-3023-SI-30044

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30041
3. PLAN AND LONGITUDINAL SECTION OF DIVERSION CANAL/ GRAVITY CANAL FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30044

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	RR	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30047-Rev-P0

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

CROSS SECTION OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM (SH 03 OF 03)

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

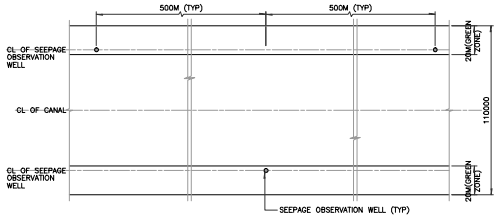
SCALE	DWG NO.	ISSUE
: AS SHOWN	TCE.10244A-CV-3023-SI-30047	P0
DC & DSC : BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

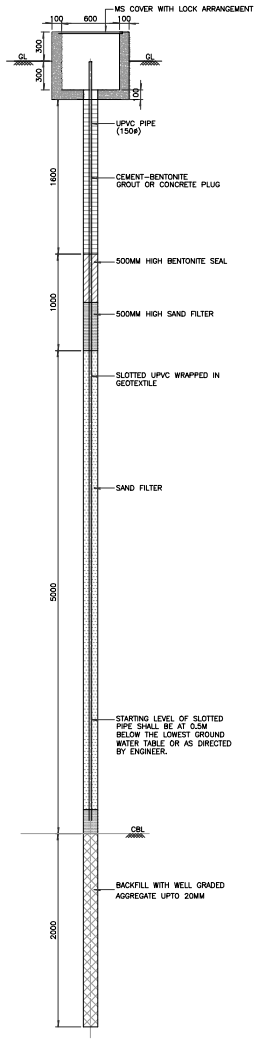
DWG NO: TCE.10244A-CV-3023-SI-30053

TITLE: TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR GRAVITY / DIVERSION CANAL



TYPICAL PLAN DETAILS OF SEEPAGE OBSERVATION WELL

(SCALE 1:2000)



TYPICAL SECTIONAL VIEW OF SEEPAGE OBSERVATION WELL

(SCALE 1:20)

ABBREVIATIONS :

CBL – CANAL BED LEVEL
CL – CENTER LINE
GL – GROUND LEVEL
TYP – TYPICAL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. SEEPAGE OBSERVATION WELL SHALL BE BORED UP TO A DEPTH OF 10M BELOW GROUND LEVEL OR 2M BELOW CANAL BED LEVEL, WHICHEVER IS LOWER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY TCE.10244A-CV-MP-30003
2. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A-CV-3023-SI-30041

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												27-06-2017
	INITIALS	GK	RR	VS		CV	EL	IC	ME			AKM	
ISSUE		DRN	DSN	CHD	CLEARED						PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

TYPICAL DETAILS OF SEEPAGE OBSERVATION WELL FOR GRAVITY / DIVERSION CANAL

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION. BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

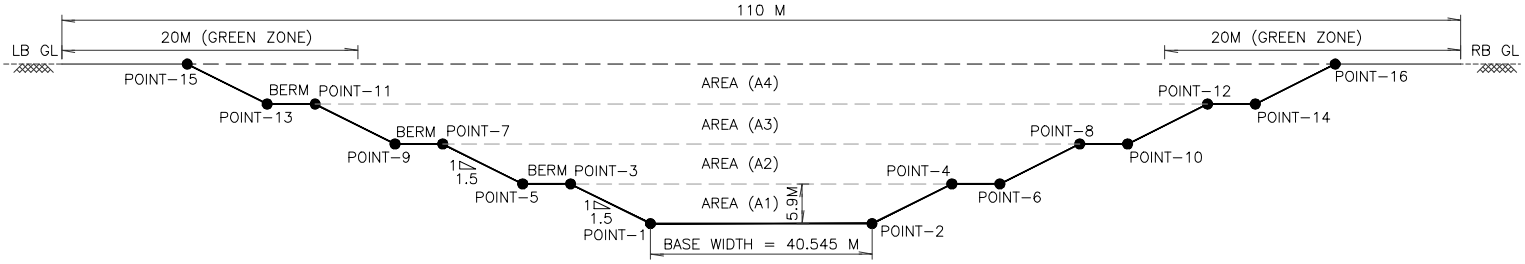
INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

SCALE	DWG NO.	ISSUE
:AS SHOWN	TCE.10244A-CV-3023-SI-30053	P0
DC & DSC: BLR & CV		SIZE-A1

FILE NAME: TCE.10244A-CV-30053-Rev-P0

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0



DEFINITION SKETCH – PROPOSED CANAL

Chainage	LB GL	RB GL	Avg. GL	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16
(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
0	24.50	24.50	24.50	18.10	18.10	24.00	24.00	24.00	24.00	24.50	24.50	-	-	-	-	-	-	-	-
200	27.50	27.00	27.25	18.10	18.10	24.00	24.00	24.00	24.00	27.25	27.25	-	-	-	-	-	-	-	-
400	27.50	27.00	27.25	18.10	18.10	24.00	24.00	24.00	24.00	27.25	27.25	-	-	-	-	-	-	-	-
600	28.00	27.50	27.75	18.10	18.10	24.00	24.00	24.00	24.00	27.75	27.75	-	-	-	-	-	-	-	-
800	29.00	28.50	28.75	18.10	18.10	24.00	24.00	24.00	24.00	28.75	28.75								
1000	29.50	29.00	29.25	18.10	18.10	24.00	24.00	24.00	24.00	29.25	29.25	-	-	-	-	-	-	-	-
1200	30.50	30.00	30.25	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	30.25	30.25	-	-	-	-
1400	31.50	31.50	31.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	31.50	31.50	-	-	-	-
1600	31.50	31.50	31.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	31.50	31.50				
1800	33.00	32.50	32.75	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	32.75	32.75	-	-	-	-
2000	34.00	33.00	33.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	33.50	33.50	-	-	-	-
2200	35.00	34.00	34.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.00	34.00	34.00	34.00	35.00	-
2400	35.50	35.50	35.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.00	34.00	34.00	34.00	35.50	35.50
2600	37.00	37.00	37.00	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.00	34.00	34.00	34.00	37.00	37.00
2800	37.00	37.00	37.00	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.00	34.00	34.00	34.00	37.00	37.00
3000	35.50	35.50	35.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.00	34.00	34.00	34.00	35.50	35.50
3200	35.00	34.00	34.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.00	34.00	34.00	34.00	35.00	
3400	34.50	33.50	34.00	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	34.50	33.50	-	-	-	-
3600	33.50	32.50	33.00	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	33.50	32.50	-	-	-	-
3800	33.00	32.00	32.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	33.00	32.00	-	-	-	-
4000	33.00	32.00	32.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	33.00	32.00				
4200	33.00	32.00	32.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	33.00	32.00	-	-	-	-

Chainage	LB GL	RB GL	Avg. GL	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16
(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
4400	32.50	31.50	32.00	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	32.50	31.50	-	-	-	-
4600	32.00	31.00	31.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	32.00	31.00	-	-	-	-
4800	31.00	31.00	31.25	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	31.50	31.00	-	-	-	-
5000	30.50	30.50	30.00	18.10	18.10	24.00	24.00	24.00	24.00	29.00	20.00	20.00	20.00	30.50	30.50	-	-	-	-
5200	29.50	29.00	29.25	18.10	18.10	24.00	24.00	24.00	24.00	29.00	29.00	29.00	29.00	29.50					
5400	28.50	28.00	28.25	18.10	18.10	24.00	24.00	24.00	24.00	28.50	28.00	-	-	-	-	-	-	-	-
5600	28.00	28.00	28.00	18.10	18.10	24.00	24.00	24.00	24.00	28.00	28.00	-	-	-	-	-	-	-	-
5800	20.50	20.00	20.25	18.10	18.10	24.00	24.00	24.00	24.00	20.50	20.00	-	-	-	-	-	-	-	-
6000	30.50	30.00	30.25	18.10	18.10	24.00	24.00	24.00	24.00	29.00	30.00	29.00	30.00	30.50	-	-	-	-	-
6200	30.50	30.00	30.25	18.10	18.10	24.00	24.00	24.00	24.00	29.00	30.00	29.00	30.00	30.50	-	-	-	-	-
6400	31.00	30.00	30.50	18.10	18.10	24.00	24.00	24.00	24.00	29.00	30.00	29.00	30.00	31.00	-	-	-	-	-
6600	20.50	20.50	20.50	18.10	18.10	24.00	24.00	24.00	24.00	20.50	20.50	-	-	-	-	-	-	-	-
6800	28.00	28.00	28.00	18.10	18.10	24.00	24.00	24.00	24.00	28.00	28.00	-	-	-	-	-	-	-	-
7000	27.00	27.00	27.00	18.10	18.10	24.00	24.00	24.00	24.00	27.00	27.00	-	-	-	-	-	-	-	-
7200	27.00	26.50	26.75	18.10	18.10	24.00	24.00	24.00	24.00	27.00	26.50	-	-	-	-	-	-	-	-
7400	28.00	27.00	27.50	18.10	18.10	24.00	24.00	24.00	24.00	28.00	27.00	-	-	-	-	-	-	-	-
7600	27.00	26.50	26.75	18.10	18.10	24.00	24.00	24.00	24.00	27.00	26.50	-	-	-	-	-	-	-	-
7800	26.00	25.50	25.75	18.10	18.10	24.00	24.00	24.00	24.00	26.00	25.50	-	-	-	-	-	-	-	-
7843	26.00	25.50	25.75	18.10	18.10	24.00	24.00	24.00	24.00	26.00	25.50	-	-	-	-	-	-	-	-

ENGINEERING REFERENCE DRAWINGS :

1. PROPOSED CANAL WORKS FROM NEKKALLU (CH:0.00M) TO PICHIKALAPALEM (CH:7843.00M) TCE.10244A–CV–3023–SI–30041

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DEFINITION SKETCH AND PROFILE DETAILS FOR GRAVITY / DIVERSION CANAL

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

	SIGN.													
	INITIALS													
	REVISIONS													
P0	SIGN.													27-06-17
	INITIALS	GK	RR	VS						AKM				
	REVISIONS													
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE		
					CLEARED									

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION/ FABRICATION WORK RELATED TO 'HOLDS'.

DO NOT SCALE

FILE NAME :10244A–CV–30055–Rev–P0

SCALE : NTS
DC & DISC: BLR & CV

DWG NO. TCE.10244A–CV–3023–SI–30055

ISSUE P0

SIZE–A3

FILE NAME: F–093–Rev–R0.DWG

TCE FORM NO. 093 R0

ANNEXURE-IV

CROSS SECTION OF RESERVOIRS

TITLE: NEERUKONDA RESERVOIR – LOCATION MAP & UTM CO-ORDINATES

DWG NO: TCE.10244A-CV-3025-SK-30056

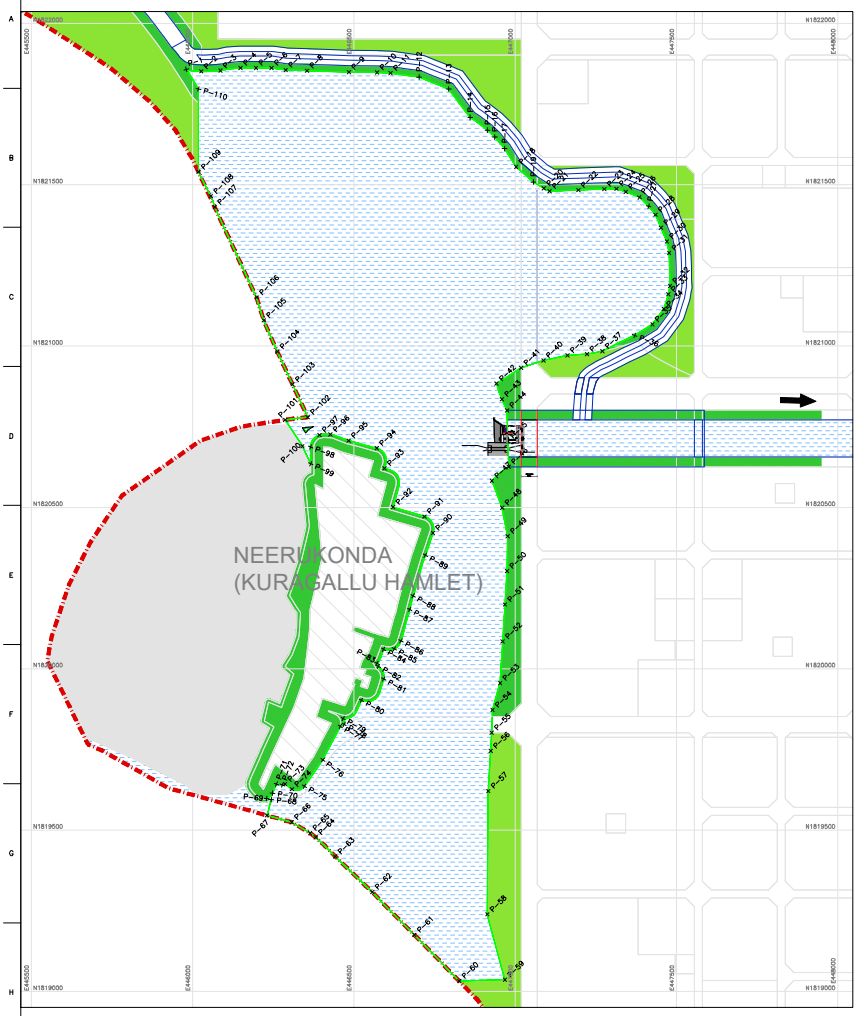
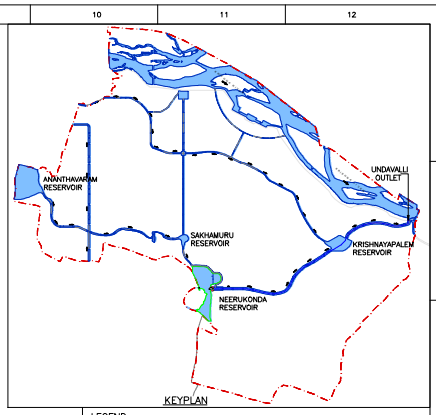


TABLE 1: DETAILS OF UTM COORDINATES

POINT LOCATION	EASTING	NORTHING
P-1	445980.82	1821857.48
P-2	446027.04	1821851.05
P-3	446086.24	1821853.60
P-4	446148.74	1821861.89
P-5	446198.83	1821861.89
P-6	446244.91	1821861.89
P-7	446289.04	1821855.58
P-8	446354.69	1821853.43
P-9	446484.41	1821849.15
P-10	446572.09	1821848.09
P-11	446614.22	1821846.04
P-12	446701.90	1821833.80
P-13	446793.93	1821796.60
P-14	446860.16	1821708.30
P-15	446914.14	1821669.08
P-16	446938.55	1821647.89
P-17	446967.04	1821612.28
P-18	447002.86	1821555.31
P-19	447038.34	1821508.59
P-20	447088.82	1821488.73
P-21	447106.18	1821480.03
P-22	447158.92	1821483.44
P-23	447276.57	1821498.50
P-24	447313.99	1821487.52
P-25	447342.19	1821478.12
P-26	447380.44	1821461.30
P-27	447413.51	1821433.23
P-28	447434.88	1821407.11
P-29	447452.11	1821366.50
P-30	447470.00	1821324.32
P-31	447477.20	1821288.33
P-32	447479.75	1821186.28
P-33	447475.05	1821160.44
P-34	447460.58	1821114.63
P-35	447425.20	1821067.44
P-36	447370.36	1821033.41
P-37	447270.50	1820984.07
P-38	447222.38	1820974.75
P-39	447161.93	1820971.15
P-40	447087.32	1820955.27
P-41	447018.22	1820932.52
P-42	446942.18	1820883.42
P-43	446938.40	1820835.11
P-44	446974.02	1820800.96
P-45	446977.27	1820705.75
P-46	446979.48	1820625.96
P-47	446927.77	1820582.21
P-48	446939.52	1820498.88
P-49	446976.41	1820410.37
P-50	446974.67	1820302.75
P-51	446968.25	1820196.01
P-52	446961.16	1820084.50
P-53	446953.19	1819955.62
P-54	446929.36	1819871.97
P-55	446923.63	1819801.82
P-56	446923.73	1819745.18
P-57	446918.66	1819620.85
P-58	446913.63	1819238.59
P-59	446967.99	1819035.95
P-60	446836.39	1819031.86
P-61	446687.70	1819174.49
P-62	446557.16	1819307.83
P-63	446442.43	1819418.00
P-64	446381.53	1819477.55
P-65	446364.15	1819490.76
P-66	446307.20	1819524.19
P-67	446230.58	1819545.37
P-68	446244.08	1819594.19
P-69	446229.05	1819597.45
P-70	446247.50	1819614.01
P-71	446259.88	1819642.23
P-72	446278.46	1819639.58
P-73	446286.91	1819642.56
P-74	446308.04	1819626.70
P-75	446346.80	1819635.84
P-76	446403.99	1819717.54
P-77	446457.74	1819821.00
P-78	446449.32	1819827.33
P-79	446498.07	1819845.53
P-80	446523.76	1819902.18
P-81	446592.54	1819968.21
P-82	446576.03	1820007.18
P-83	446571.64	1820016.94
P-84	446592.01	1820060.19
P-85	446625.64	1820061.71
P-86	446646.04	1820098.50
P-87	446673.06	1820183.89
P-88	446683.44	1820225.83
P-89	446721.56	1820351.52
P-90	446745.25	1820420.62
P-91	4467 18.71	1820471.96
P-92	446821.61	1820500.55
P-93	446595.17	1820620.93
P-94	446570.98	1820683.10
P-95	446483.87	1820706.84
P-96	446427.14	1820725.80
P-97	446393.45	1820724.44
P-98	446365.80	1820687.04
P-99	446366.03	1820635.28

TABLE 1 : DETAILS OF UTM COORINATE

POINT LOCATION	EASTING	NORTHING
P-100	446340.59	1820689.19
P-101	446287.25	1820771.33
P-102	446358.96	1820779.63
P-103	446309.79	1820881.12
P-104	446262.62	1820982.62
P-105	446220.38	1821079.60
P-106	446198.56	1821150.72
P-107	446068.67	1821430.64
P-108	446056.74	1821464.32
P-109	446018.23	1821539.66
P-110	446018.23	1821797.04



KEYPLAN

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

L – LENGTH
FRL – FULL RESERVOIR LEVEL
RL – REDUCED LEVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. LOCATION OF RESERVOIRS AND CANAL ALIGNMENT SHOWN IN THE DRAWING ARE AS PER THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.														
	INITIALS														
	REVISIONS														
	SIGN.														
	INITIALS														
	REVISIONS														
P0	SIGN.														
	INITIALS	GK		VS		VS							AKM		27-06-2017
ISSUE		DRN		DSN		CHD		CV	EL	IC	ME		PE/PM	APPD	DATE
										CLEARED					

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

NEERUKONDA RESERVOIR – LOCATION MAP & UTM CO-ORDINATES

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

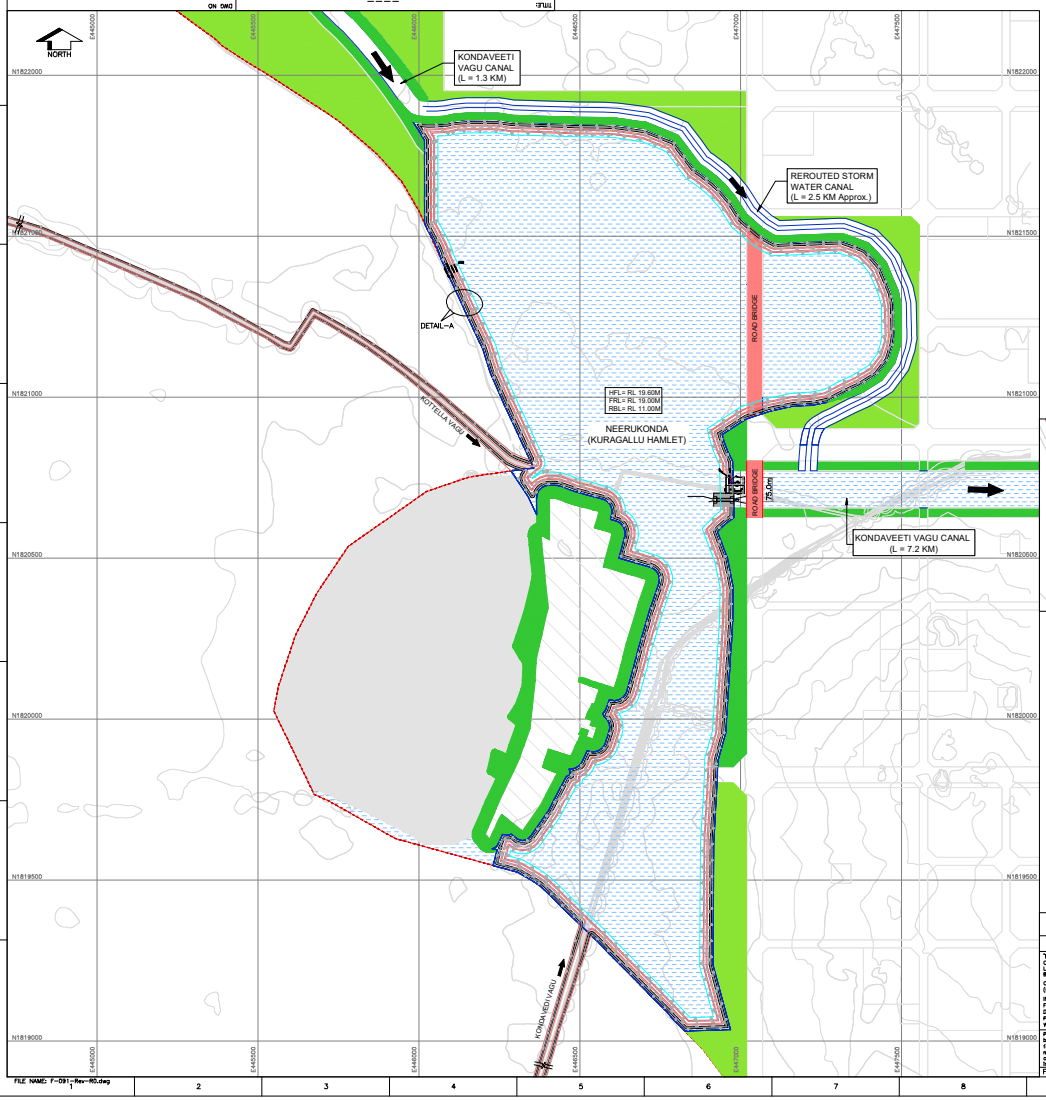
INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

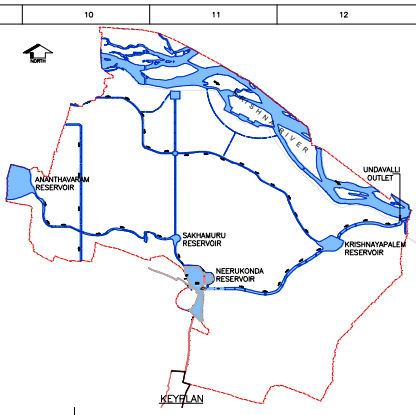
FILE NAME : 10244A-CV-30056-Rev-P0

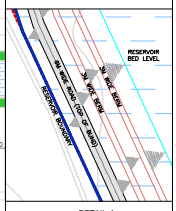
SCALE	DWG NO.	ISSUE
1:6000	TCE.10244A-CV-3025-SK-30056	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg







LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

L – LENGTH
RL – REDUCED LEVEL
HFL – HIGH FLOOD LEVEL
RBL – RESERVOIR BED LEVEL
FRL – FULL RESERVOIR LVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. DESIGN AND CONSTRUCTION OF SHIP LOCK IS EXCLUDED FROM THIS PACKAGE

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A–CV–MP–30003
2. NEERUKONDA RESERVOIR – LOCATION MAP & UTM COORDINATES DWG NO. TCE.10244A–CV–3025–SK–30056

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.														
	INITIALS														
	REVISIONS														
	SIGN.														
	INITIALS														
	REVISIONS														
PO	SIGN.														
	INITIALS	GK	VS	VS								AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME				PE/PM	APPD	DATE	
							CLEARED								

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
(CCDMC) VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of release of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

FILE NAME : 10244A–CV–30057–Rev–P0

NEERUKONDA RESERVOIR – PLAN

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
1:8000	TCE.10244A–CV–3025–SK–30057	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0 SIZE-A1

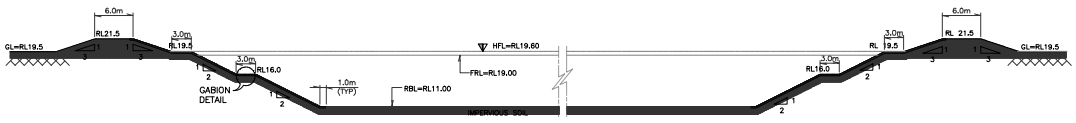
FILE NAME: F-091-Rev-R0.dwg

DWG NO TCE.10244A–CV–3025–SK–30057

TITLE NEERUKONDA RESERVOIR – PLAN

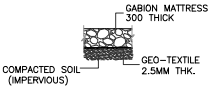
TITLE: NEERUKONDA RESERVOIR – TYPICAL SECTIONS IN CUTTING & EMBANKMENT

DWG NO: TCE.10244A-CV-3025-SK-30058



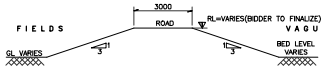
NEERUKONDA RESERVOIR – TYPICAL CROSS SECTION IN CUTTING & EMBANKMENT

(SCALE 1:300)



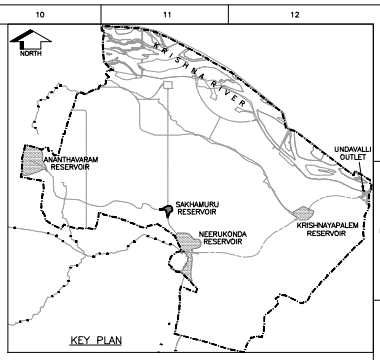
GABION DETAIL

(SCALE 1:20)



TYPICAL CS OF EMBANKMENT FOR VAGU UPSTREAM OF NEERUKONDA RESERVOIR

(SCALE 1:100)



KEY PLAN

LEGEND :

– · – · – CAPITAL CITY BOUNDARY

ABBREVIATIONS :

GL – GROUND LEVEL
HFL – HIGH FLOOD LEVEL
FRL – FULL RESERVOIR LEVEL
RBL – RESERVOIR BOTTOM LEVEL
RL – REDUCED LEVEL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. RESERVOIR BOUNDARY SHOWN IS AS PER THE LOCATION INDICATED IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER KEY PLAN.
4. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED. TO BE FINALIZED DURING DETAILED ENGG.
5. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
6. IF SANDY SOIL IS ENCOUNTERED, AN IMPERVIOUS SOIL LAYER OF 1.0M THICK(MIN.) SHALL BE PROVIDED.

ENGINEERING REFERENCE DRAWINGS :

1. NEERUKONDA RESERVOIR – LOCATION MAP & UTM COORDINATES, DWG NO. TCE.10244A-CV-3025-SK-30056.
2. NEERUKONDA RESERVOIR – PLAN, DWG NO. TCE.10244A-CV-3025-SK-30057.

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	VS	PB							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30058-Rev-P0

NEERUKONDA RESERVOIR – TYPICAL SECTIONS IN CUTTING & EMBANKMENT

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

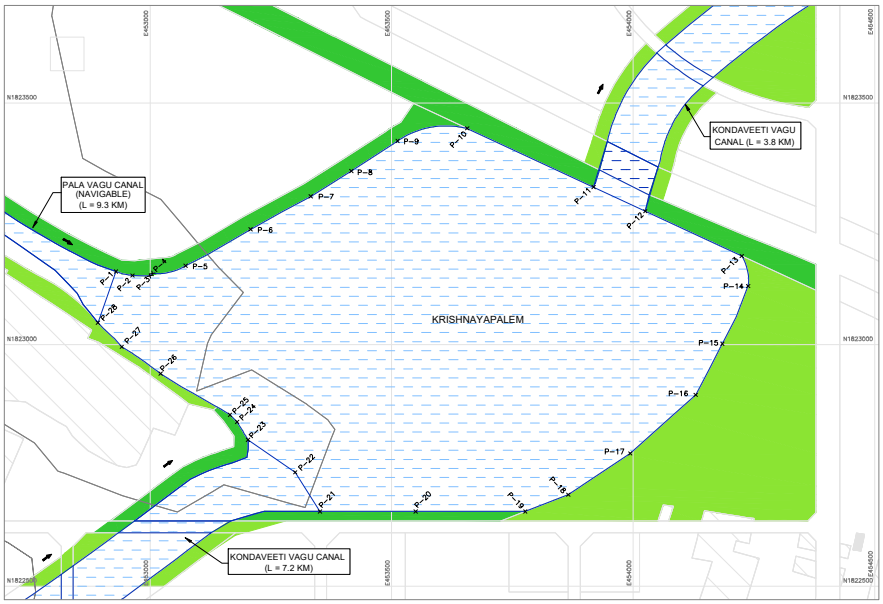
SCALE	DC & DSC: BLR & CV	DWG NO.	ISSUE
AS SHOWN		TCE.10244A-CV-3025-SK-30058	P0

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

TITLE: KRISHNAYAPALEM RESERVOIR – LOCATION MAP & UTM CO-ORDINATES

DWG NO: TCE.10244A-CV-3025-SK-30062



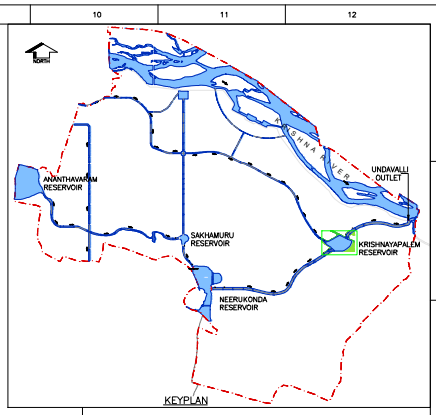


TABLE 1: DETAILS OF UTM COORINATES

POINT LOCATION	EASTING	NORTHING
P-1	452929.284	1823151.449
P-2	452963.826	1823143.206
P-3	452999.324	1823142.147
P-4	453005.221	1823147.576
P-5	453073.500	1823163.180
P-6	453208.225	1823238.621
P-7	453332.520	1823306.893
P-8	453416.694	1823359.472
P-9	453512.358	1823421.951
P-10	453656.515	1823447.631
P-11	453818.008	1823326.158
P-12	454025.219	1823276.333
P-13	454225.184	1823183.401
P-14	454236.344	1823121.175
P-15	454194.827	1823001.817
P-16	454129.758	1822896.138
P-17	453994.073	1822774.911
P-18	453865.799	1822680.242
P-19	453776.708	1822654.747
P-20	453550.117	1822654.747
P-21	453351.731	1822654.747
P-22	453300.573	1822735.685
P-23	453202.899	1822802.678
P-24	453180.145	1822839.720
P-25	453165.328	1822854.537
P-26	453021.650	1822939.772
P-27	452941.308	1822995.531
P-28	452892.076	1823045.492

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

L – LENGTH
FRL – FULL RESERVOIR LEVEL
RL – REDUCED LEVEL
KM – KILO METER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. LOCATION OF RESERVOIRS AND CANAL ALIGNMENT SHOWN IN THE DRAWING ARE AS PER THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	VS	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

FILE NAME : 10244A-CV-30062-Rev-P0

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

KRISHNAYAPALEM RESERVOIR – LOCATION MAP & UTM CO-ORDINATES

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

SCALE	DWG NO.	ISSUE
1:4000	TCE.10244A-CV-3025-SK-30062	P0

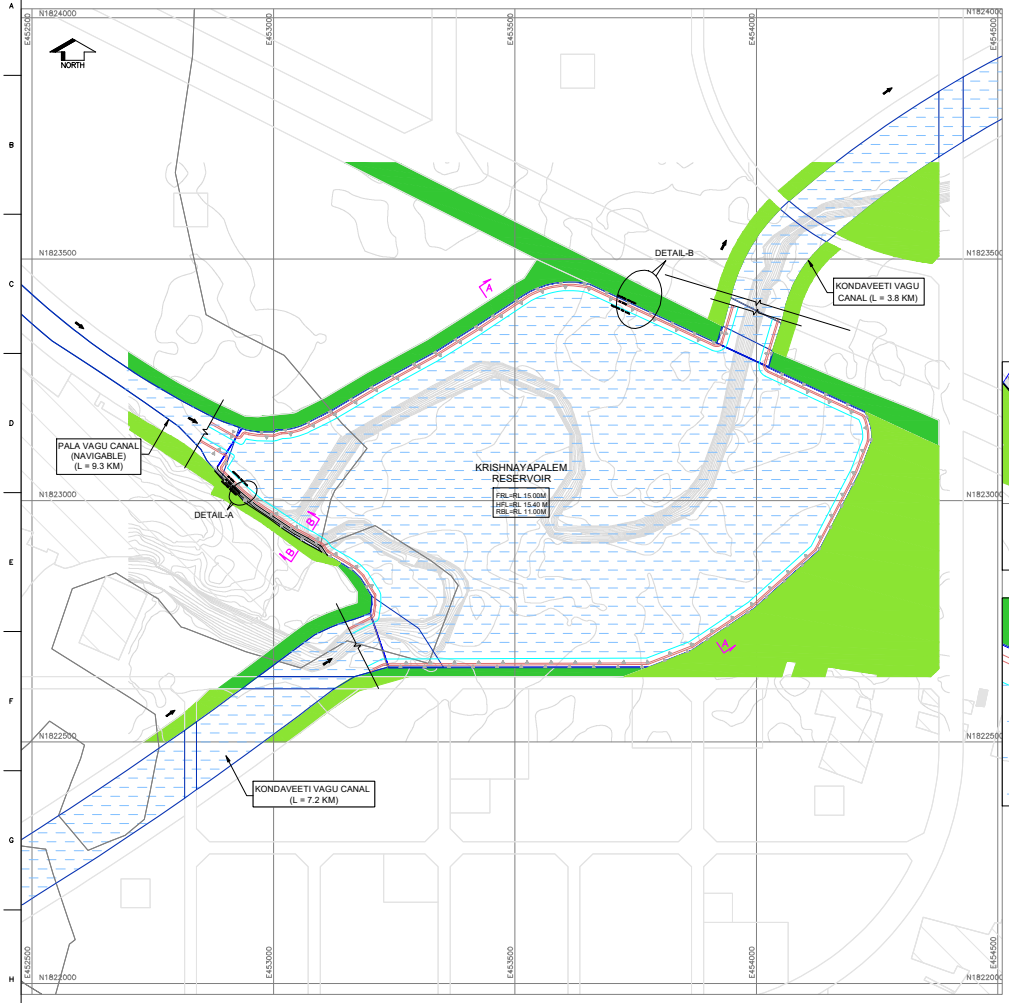
DC & DSC: BLR & CV

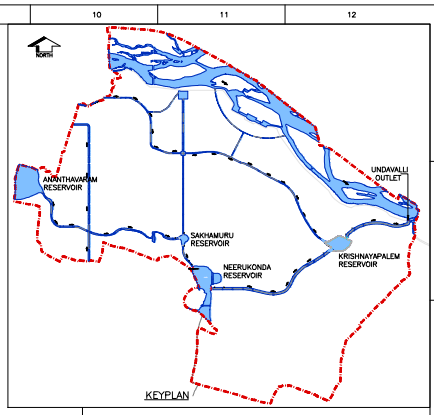
TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

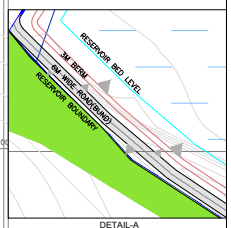
TITLE: KRISHNAYAPALEM RESERVOIR – PLAN

DWG NO: TCE.10244A-CV-3025-SK-30063

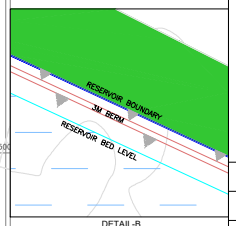




KEYPLAN



DETAIL-A



DETAIL-B

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

L – LENGTH
FRL – FULL RESERVOIR LEVEL
RL – REDUCED LEVEL
HFL – HIGH FLOOD LEVEL
RBL – RESERVOIR BED LEVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A-CV-MP-30003.
2. KRISHNAYAPALEM RESERVOIR – LOCATION MAP & UTM COORDINATES DWG NO. TCE.10244A-CV-3025-SK-30062.

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	VS	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
					CLEARED								

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30063-Rev-P0

KRISHNAYAPALEM RESERVOIR – PLAN

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

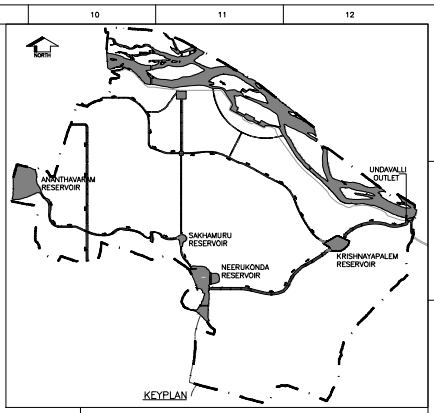
SCALE	DWG NO.	ISSUE
1:4000	TCE.10244A-CV-3025-SK-30063	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

FILE NAME: Y:\091\Rev-R0.dwg

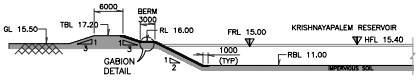
TITLE: KRISHNAYAPALEM RESERVOIR – TYPICAL SECTIONS IN CUTTING AND EMBANKMENT

DWG NO: TCE.10244A-CV-3025-SK-30064

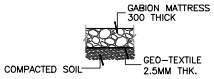


KEYPLAN

KRISHNAYAPALEM RESERVOIR
TYPICAL SECTION – CUTTING
SECTION A–A
(SCALE 1:400)



KRISHNAYAPALEM RESERVOIR
TYPICAL SECTION – EMBANKMENT
SECTION B–B
(SCALE 1:400)



GABION DETAIL
(SCALE 1:20)

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

GL – GROUND LEVEL
HFL – HIGH FLOOD LEVEL
FRL – FULL RESERVOIR LEVEL
RBL – RESERVOIR BOTTOM LEVEL
RL – REDUCED LEVEL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. RESERVOIR BOUNDARY SHOWN IS AS PER THE LOCATION INDICATED IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER KEY PLAN.
4. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED. TO BE FINALIZED DURING DETAILED ENGG.
5. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
6. IF SANDY SOIL IS ENCOUNTERED, AN IMPERVOUS SOIL LAYER OF 1.0M THICK(MIN.) SHALL BE PROVIDED.

ENGINEERING REFERENCE DRAWINGS :

1. KRISHNAYAPALEM RESERVOIR – LOCATION MAP & UTM COORDINATES, DWG NO. TCE.10244A–CV–3025–SK–30062
2. KRISHNAYAPALEM RESERVOIR – PLAN, DWG NO. TCE.10244A–CV–3025–SK–30063.

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	VS	VS						AKM			27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED	PE/PM	APPD	DATE	

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

KRISHNAYAPALEM RESERVOIR – TYPICAL SECTIONS IN CUTTING AND EMBANKMENT

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A–CV–30064–Rev–P0

SCALE : AS SHOWN
DC & DSC: BLR & CV

DWG NO. TCE.10244A–CV–3025–SK–30064

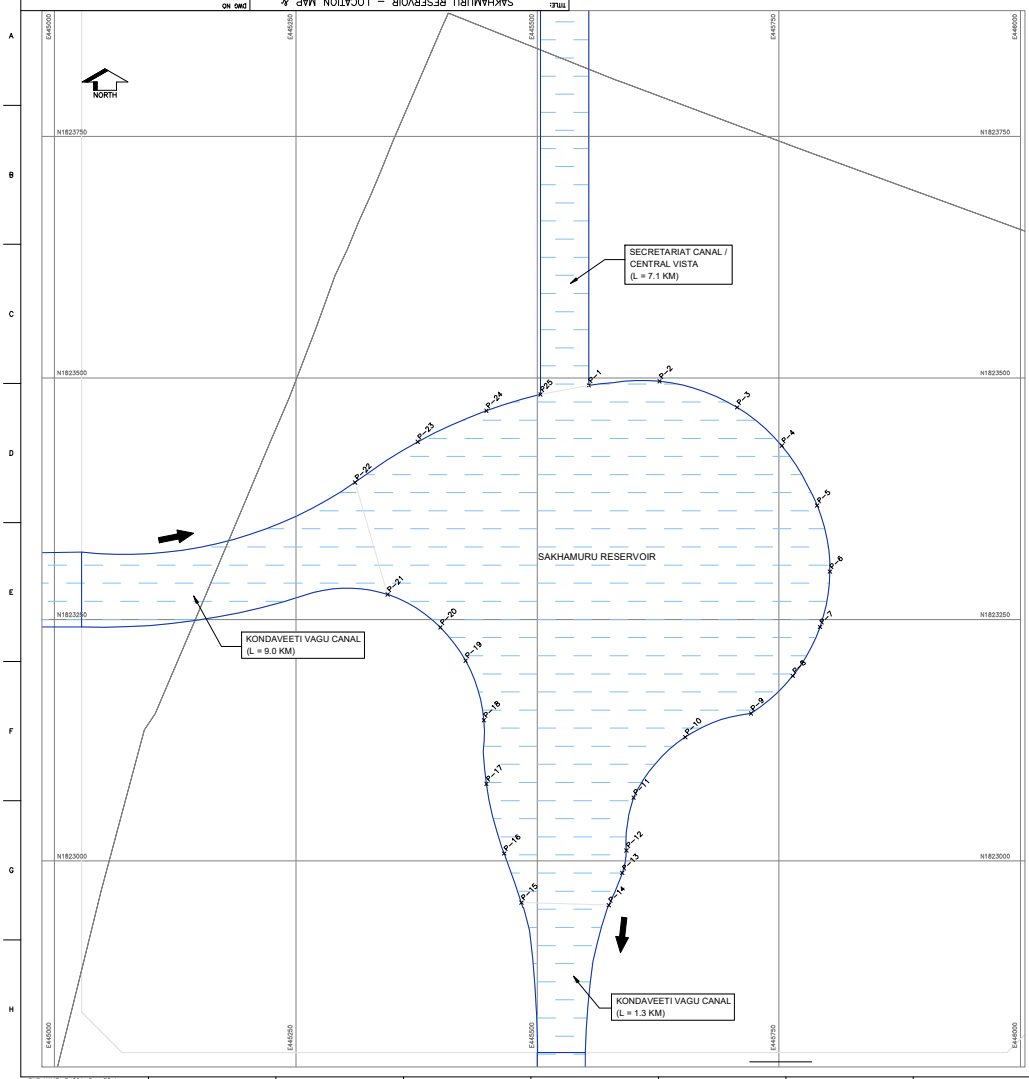
ISSUE P0

TCE FORM NO. 091 R0

FILE NAME: F–091–Rev–R0.dwg

DWG NO TCE.10244A-CV-3025-SK-30065

TITLE SAKHAMURU RESERVOIR – LOCATION MAP & UTM CO-ORDINATES



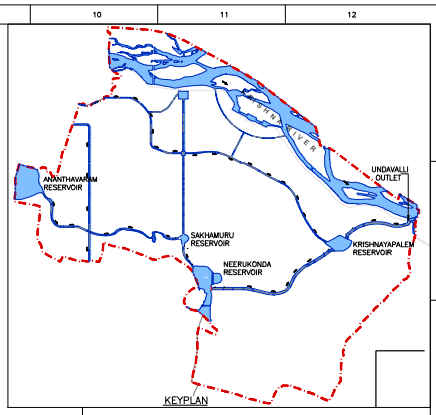


TABLE 1: DETAILS OF UTM COORDINATES

POINT LOCATION	EASTING	NORTHING
P-1	445553.22	1823492.42
P-2	445626.38	1823496.54
P-3	445706.80	1823469.49
P-4	445753.01	1823429.87
P-5	445789.71	1823367.94
P-6	445802.76	1823299.59
P-7	445792.59	1823242.39
P-8	445764.36	1823191.60
P-9	445721.14	1823152.77
P-10	445653.12	1823128.27
P-11	445599.63	1823065.62
P-12	445592.12	1823011.02
P-13	445588.01	1822987.62
P-14	445574.01	1822954.29
P-15	445483.38	1822956.96
P-16	445465.62	1823007.83
P-17	445447.21	1823079.70
P-18	445444.55	1823145.75
P-19	445425.66	1823207.41
P-20	445399.60	1823241.81
P-21	445344.89	1823275.87
P-22	445311.34	1823391.88
P-23	445376.08	1823433.84
P-24	445447.15	1823486.10
P25	445503.22	1823483.00

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

L – LENGTH
FRL – FULL RESERVOIR LEVEL
RL – REDUCED LEVEL
KM – KILO METER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. LOCATION OF RESERVOIRS AND CANAL ALIGNMENT SHOWN IN THE DRAWING ARE AS PER THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	VS	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
					CLEARED								

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

SAKHAMURU RESERVOIR – LOCATION MAP & UTM CO-ORDINATES

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

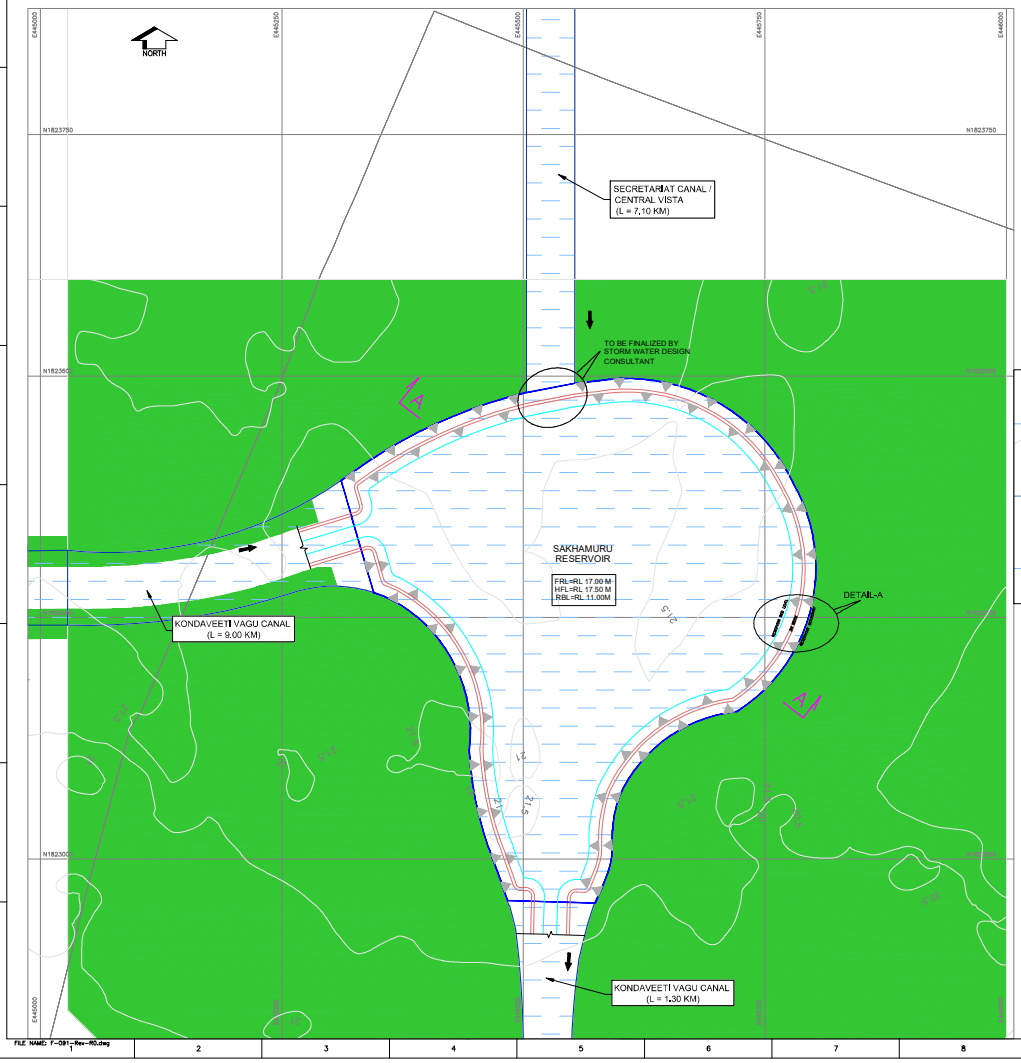
SCALE	1:2000	DWG NO.	TCE.10244A-CV-3025-SK-30065	ISSUE	P0
FILE NAME : 10244A-CV-30065-Rev-P0		DC & DSC: BLR & CV			

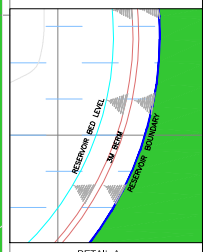
TCE FORM NO. 091 R0 SIZE-A1

FILE NAME: F-091-Rev-R0.dwg

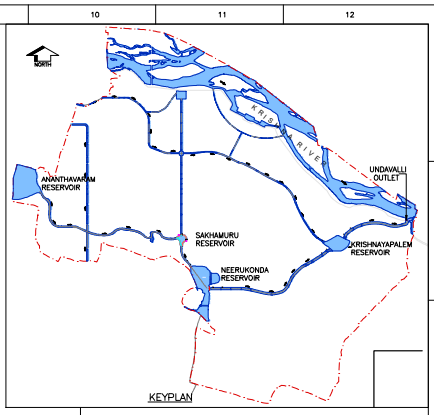
DWG NO TCE.10244A-CV-3025-SK-30066

TITLE SAKHAMURU RESERVOIR – PLAN





DETAIL-A



KEYPLAN

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

L – LENGTH
FRL – FULL RESERVOIR LEVEL
RL – REDUCED LEVEL
HFL – HIGH FLOOD LEVEL
RBL – RESERVOIR BED LEVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A-CV-MP-30003.
2. SAKHAMURU RESERVOIR – LOCATION MAP & UTM COORDINATES DWG NO. TCE.10244A-CV-3025-SK-30065

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	VS	VS								AKM	27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED			PE/PM	APPD	DATE

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

FILE NAME : 10244A-CV-30066-Rev-P0

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

SAKHAMURU RESERVOIR – PLAN

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

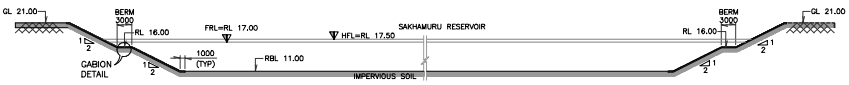
SCALE	DWG NO.	ISSUE
1:2000	TCE.10244A-CV-3025-SK-30066	P0
DC & DSC: BLR & CV		

TCE FORM NO. 091 R0

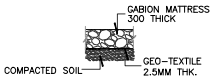
FILE NAME: F-091-Rev-R0.dwg

TITLE: SAKHAMURU RESERVOIR – TYPICAL SECTION IN CUTTING

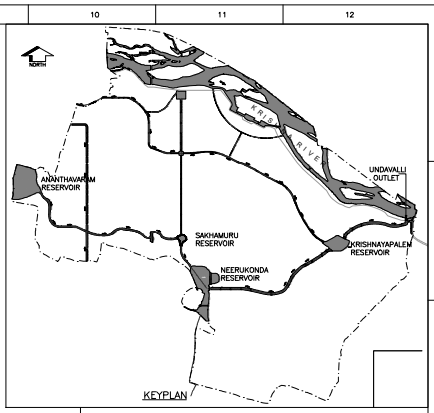
DWG NO: TCE.10244A-CV-3025-SK-30067



SAKHAMURU RESERVOIR
TYPICAL SECTION – CUTTING
SECTION A–A
(SCALE 1:400)



GABION DETAIL
(SCALE 1:20)



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

GL – GROUND LEVEL
HFL – HIGH FLOOD LEVEL
FRL – FULL RESERVOIR LEVEL
RBL – RESERVOIR BED LEVEL
RL – REDUCED LEVEL

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGE, COORDINATES AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. RESERVOIR BOUNDARY SHOWN IS AS PER THE LOCATION INDICATED IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. LAYOUT AND OTHER DETAILS REFER KEY PLAN.
4. THE DIMENSIONS AND SIDE SLOPE INDICATED IN THE DRAWING ARE THE MINIMUM VALUES THAT HAVE TO BE PROVIDED. TO BE FINALIZED DURING DETAILED ENGG.
5. FOR THE EXCAVATED CONDITION SIDE SLOPE PROTECTION TO BE PROVIDED, IF REQUIRED.
6. IF SANDY SOIL IS ENCOUNTERED, AN IMPERVIOUS SOIL LAYER OF 1.0M THICK(MIN.) SHALL BE PROVIDED.

ENGINEERING REFERENCE DRAWINGS :

1. SAKHAMURU RESERVOIR – LOCATION MAP & UTM COORDINATES, DWG NO. TCE.10244A–CV–3025–SK–30065.
2. SAKHAMURU RESERVOIR – PLAN, DWG NO. TCE.10244A–CV–3025–SK–30066.

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK		VS		VS						AKM	27-06-2017
ISSUE		DRN		DSN		CHD	CV	EL	IC	ME		PE/PM	APPD	DATE
		CLEARED												

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

SAKHAMURU RESERVOIR – TYPICAL SECTION IN CUTTING

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A–CV–30067–Rev–P0

SCALE	AS SHOWN	DWG NO.	ISSUE
DC & DSC: BLR & CV		TCE.10244A–CV–3025–SK–30067	P0

TCE FORM NO. 091 R0

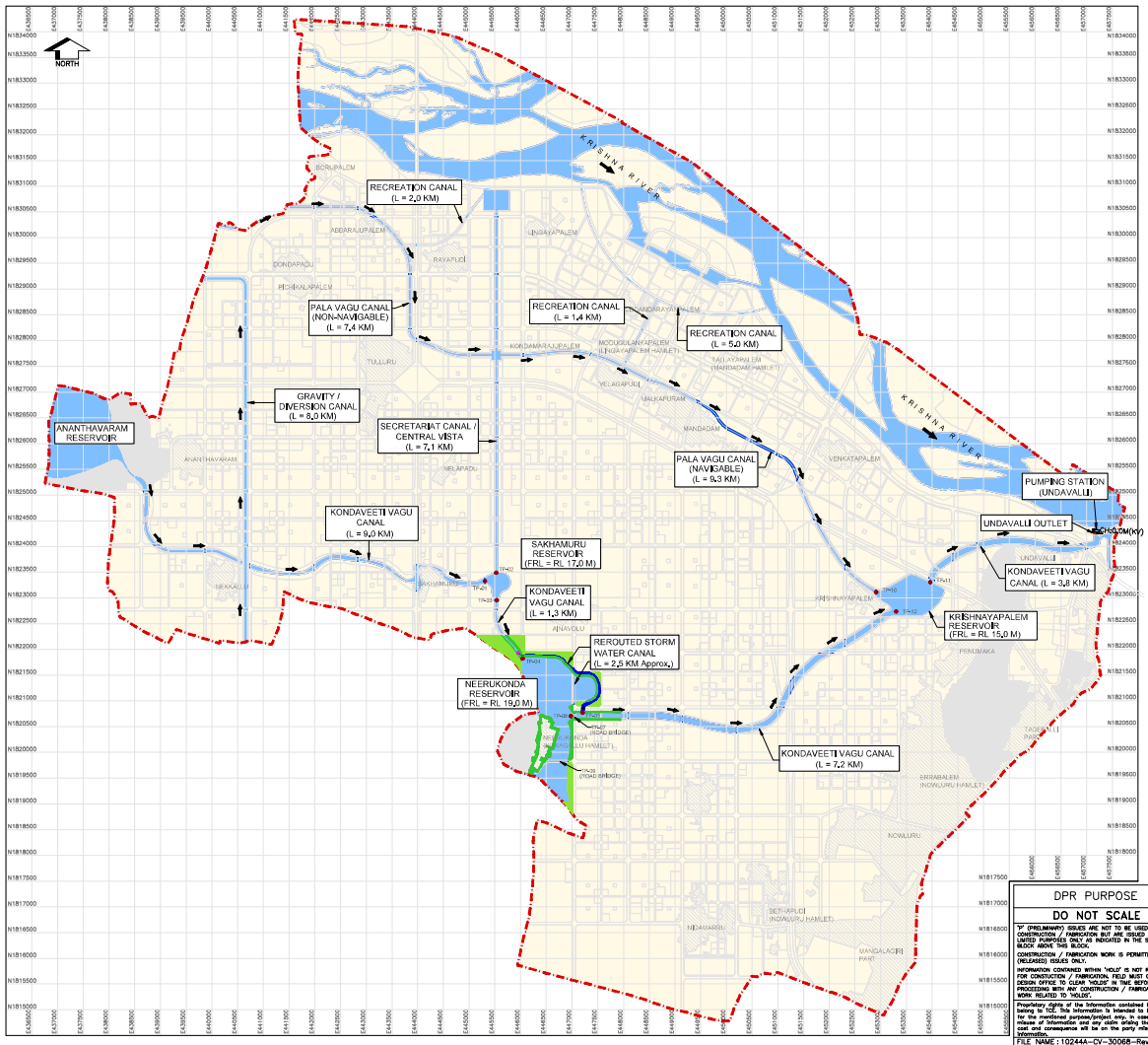
FILE NAME: F-091-Rev-R0.dwg

ANNEXURE-V

CROSS SECTIONS OF PUMPING STATIONS

TITLE: TERMINAL POINTS AND EXCLUSIONS

DWG NO: TCE.10244A-CV-3025-SK-30068



LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

– TERMINAL POINTS

ABBREVIATIONS :

FRL – FULL RESERVOIR LEVEL
L – LENGTH
RL – REDUCED LEVEL
KM – KILOMETER
TP – TERMINAL POINT

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
3. TERMINAL POINTS SHOWN IN THE DRAWING INVOLVE INTERFACING OF WORKS WITH OTHER CONTRACTORS(CANAL WORKS, ROAD BRIDGES).

EXCLUSIONS :

1. DESIGN AND CONSTRUCTION OF SHIP LOCK AT NEERUKONDA RESERVOIR.
2. DESIGN AND CONSTRUCTION OF ROAD BRIDGES.

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG No.TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												27-06-2017
	INITIALS	GK		VS		VS						AKM	
ISSUE		DRN		DSN		CHD		CV	EL	IC	ME	PE/PM	APPD	DATE
								CLEARED					

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

TERMINAL POINTS AND EXCLUSIONS

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural & built assets

SCALE	DWG NO.	ISSUE
1:37000	TCE.10244A-CV-3025-SK-30068	P0
DC & DSC: BLR & CV		

FILE NAME : 10244A-CV-30068-Rev-P0

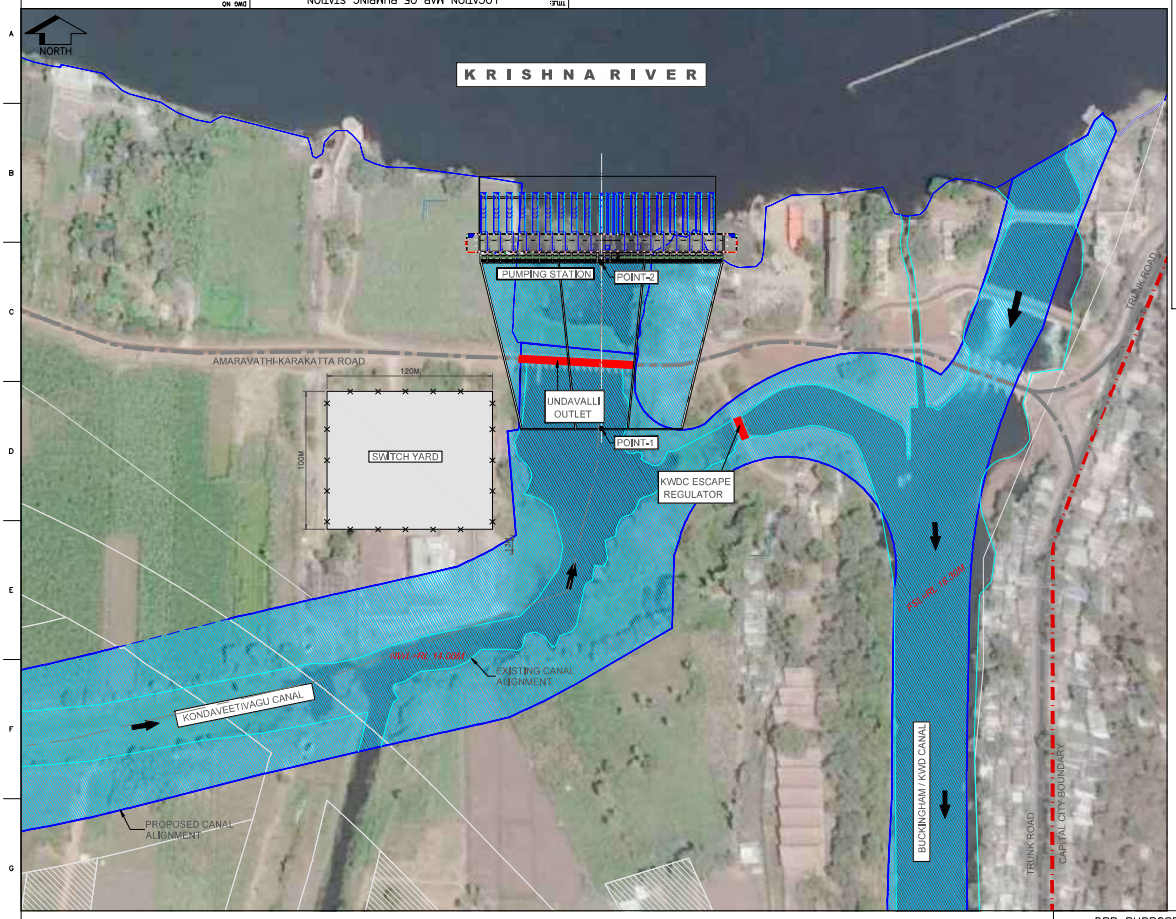
FILE NAME: F-091-Rev-R0.dwg

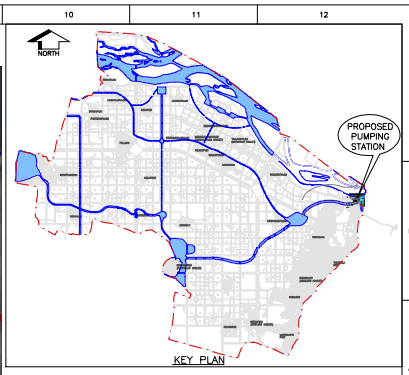
TCE FORM NO. 091 R0

SIZE-A1

DWG NO

TITLE: LOCATION MAP OF PUMPING STATION AT UNDAVALLI





NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. NUMBER OF PUMPS AND DIMENSIONS/ELEVATION OF PUMPING STATION SHOWN IN THE DRAWING ARE TENTATIVE BASED ON PRELIMINARY DESIGN, DIMENSIONS/ELEVATIONS WILL BE FINALIZED AFTER DETAILED DESIGN BASED ON PUMP VENDOR.
2. LOCATION OF PUMPING STATION AND SWITCH YARD SHOWN IN THE DRAWING IS TENTATIVE. TO BE FINALIZED DURING DETAILED ENGINEERING STAGE, BASED ON LAND AVAILABILITY.

UTM COORDINATES :

POINT-1	E-457201.5401	N-1824196.8427
POINT-2	E-457201.5368	N-1824316.8427

ENGINEERING REFERENCE DRAWINGS :

1. BLUE MASTER PLAN FOR THE CAPITAL CITY, DWG NO. TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

– NIL –

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	ND	RR	VSK							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LOCATION MAP OF PUMPING STATION AT UNDAVALLI

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

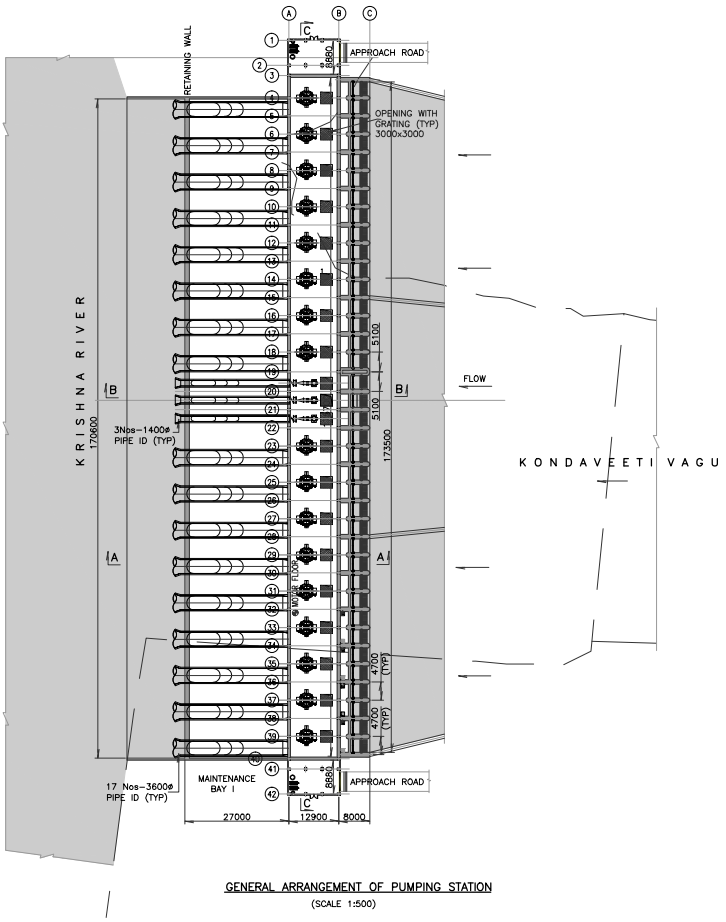
SCALE	1:1400	DWG NO.	TCE.10244A-CV-SK-30069
FILE NAME : 10244A-CV-30069-Rev-P0		DC & DSC : BLR & CV	ISSUE P0

TCE FORM NO. 091 R0

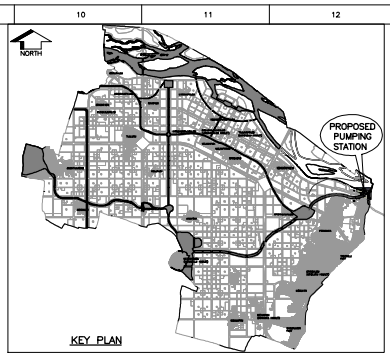
FILE NAME: F-091-Rev-R0.dwg

TITLE: GENERAL ARRANGEMENT DRAWING – PLAN

DWG NO: TCE.10244A-ME-6173-GA-30070



GENERAL ARRANGEMENT OF PUMPING STATION
(SCALE 1:500)



KEY PLAN

NOTES :

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. NUMBER OF PUMPS AND DIMENSIONS/ELEVATION OF PUMPING STATION SHOWN IN THE DRAWING ARE TENTATIVE BASED ON PRELIMINARY DESIGN, DIMENSIONS/ELEVATIONS WILL BE FINALIZED AFTER DETAILED DESIGN BASED ON PUMP VENDOR.

ENGINEERING REFERENCE DRAWINGS :

1. TCE.10244A-CV-SK-30069 LOCATION MAP OF PUMPING STATION AT UNDAVALLI

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	ND	AJ	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

GENERAL ARRANGEMENT DRAWING – PLAN

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

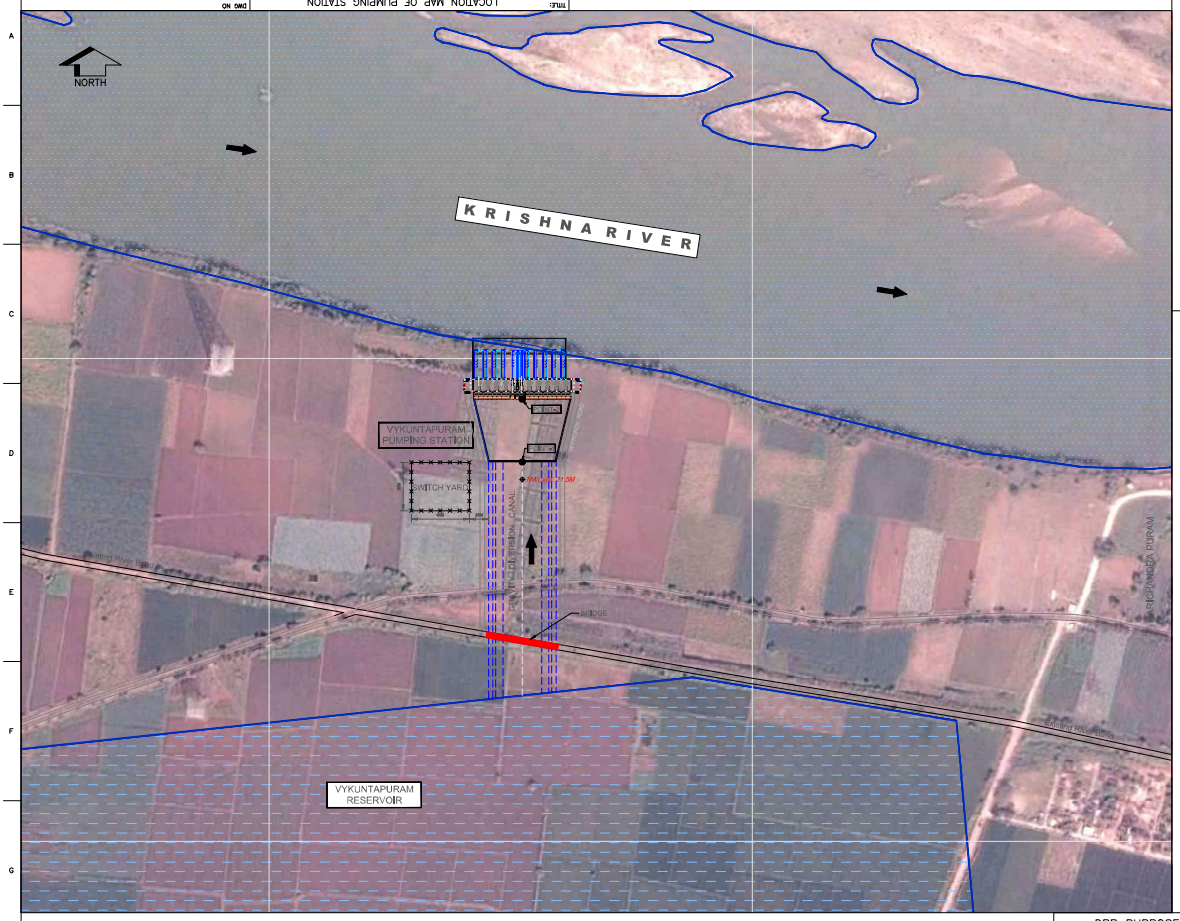
INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

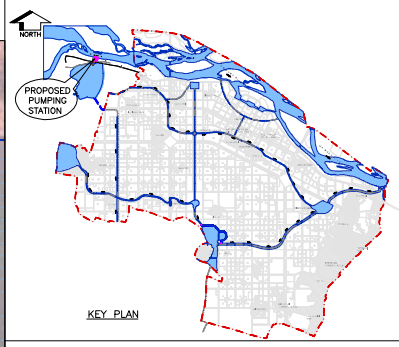
SCALE	DWG NO.	ISSUE
1:500	TCE.10244A-ME-6173-GA-30070	P0

FILE NAME: 10244A-ME-30070-Rev-P0
DC & DSC: BLR & CV
FILE NAME: F-091-Rev-R0.dwg
TCE FORM NO. 091 R0

DWG NO TCE.10244A-CV-SK-30077

TITLE LOCATION MAP OF PUMPING STATION AT VYKUNTAPURAM





NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. NUMBER OF PUMPS AND DIMENSIONS/ELEVATION OF PUMPING STATION SHOWN IN THE DRAWING ARE TENTATIVE BASED ON PRELIMINARY DESIGN, DIMENSIONS/ELEVATIONS WILL BE FINALIZED AFTER DETAILED DESIGN BASED ON PUMP VENDOR.
2. LOCATION OF PUMPING STATION, RESERVOIR AND SWITCH YARD SHOWN IN THE DRAWING IS TENTATIVE. TO BE FINALIZED DURING DETAILED ENGINEERING STAGE, BASED ON LAND AVAILABILITY.

UTM COORDINATES :

POINT-1	E-439262.000	N-1832393.000
POINT-2	E-439262.000	N-1832458.000

ENGINEERING REFERENCE DRAWINGS :
– NIL –

CONSTRUCTION REFERENCE DRAWINGS :
– NIL –

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	VS	VS							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

LOCATION MAP OF PUMPING STATION AT VYKUNTAPURAM

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural & built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30077-Rev-P0

SCALE 1:2000 | DWG NO. TCE.10244A-CV-SK-30077 | ISSUE P0

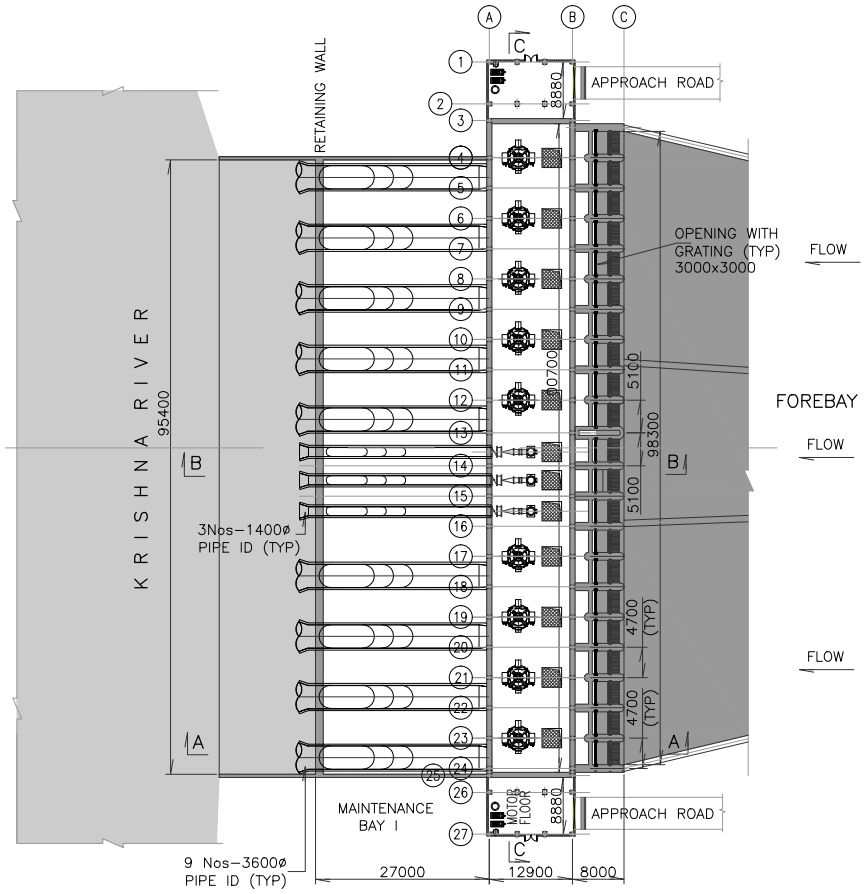
DC & DSC: BLR & CV

TCE FORM NO. D91 R0

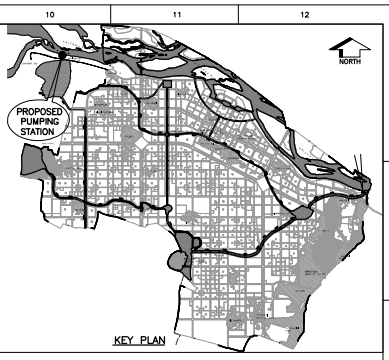
FILE NAME: F-D91_Rev-R0.dwg

TITLE: GENERAL ARRANGEMENT DRAWING – PLAN

DWG NO: ----



GENERAL ARRANGEMENT OF PUMPING STATION
(SCALE 1:500)



NOTES :

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. NUMBER OF PUMPS AND DIMENSIONS/ELEVATION OF PUMPING STATION SHOWN IN THE DRAWING ARE TENTATIVE BASED ON PRELIMINARY DESIGN, DIMENSIONS/ELEVATIONS WILL BE FINALIZED AFTER DETAILED DESIGN BASED ON PUMP VENDOR.

ABBREVIATION

Min WL	MINIMUM WATER LEVEL
NWL	NORMAL WATER LEVEL
MWL	MAXIMUM WATER LEVEL

ENGINEERING REFERENCE DRAWINGS :

1. TCE.10244A–CV–SK–30077 LOCATION MAP OF PUMPING STATION AT VYKUNTAPURAM

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	VS	AJ							AKM		27-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
		CLEARED											

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

Proprietary rights of the information contained herein belong to TCE. This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

GENERAL ARRANGEMENT DRAWING – PLAN

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS

SCALE	DWG NO.	ISSUE
AS SHOWN	TCE.10244A–ME–6173–GA–30078	P0

FILE NAME : 10244A–ME–3007B–Rev–P0 | DC & DSC : BLR & CV | TCE FORM NO. 091 R0

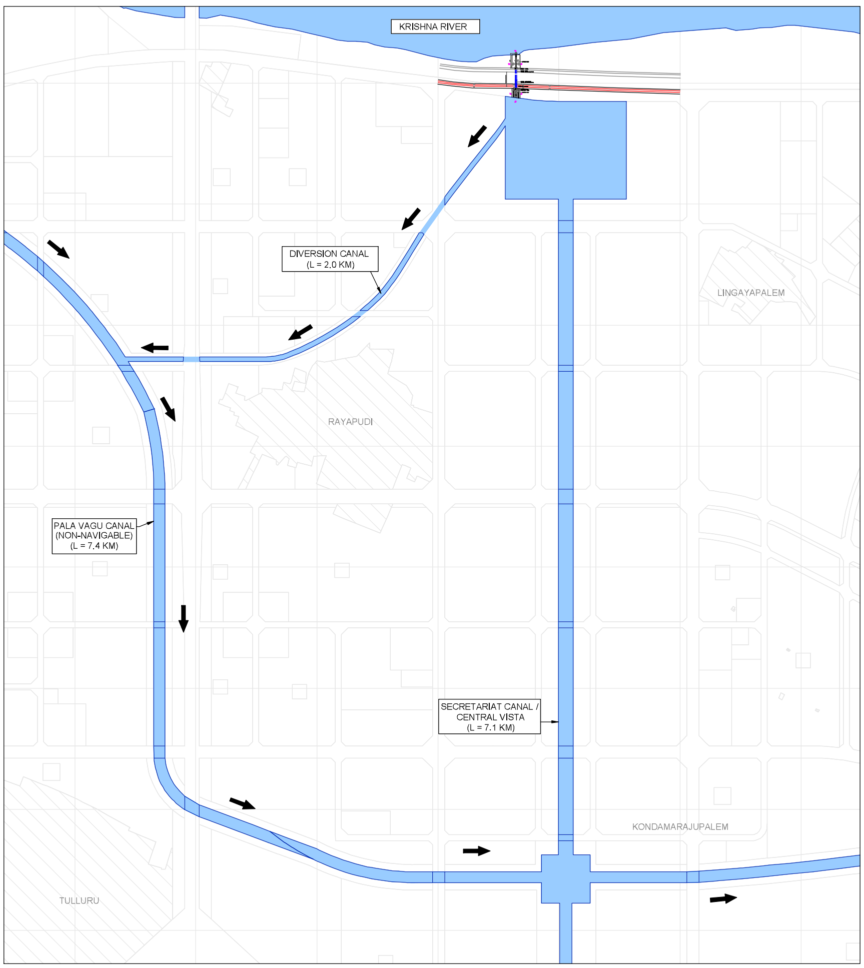
FILE NAME: F-091-Rev-R0.dwg

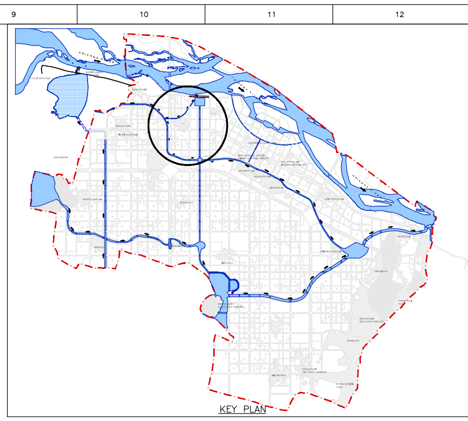
ANNEXURE-VI

GRAVITY INLET ARRANGEMENT FOR DRAWING WATER FROM KRISHNA RIVER TO CANALS


Diversion Canal
Length = 2000 m
Rayapudi
MS Pipes (2 nos.)
Approach
Canal
Google earth

TITLE: GRAVITY INLET ARRANGEMENT
SHEET 1 OF 3
DWG NO: TCE.10244A-CV-3028-SK-30017





KEY PLAN

LEGEND :

- CAPITAL CITY BOUNDARY
- CANAL / WATER BODIES

ABBREVIATIONS :

FRL – FULL RESERVOIR LEVEL
L – LENGTH
RL – REDUCED LEVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. MASTER PLAN (V4) OF AMARAVATI CAPITAL CITY
   DWG NO. TCE.10244A-CV-MP-30003

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.										
	INITIALS										
	REVISIONS										
	SIGN.										
	INITIALS										
	REVISIONS										
P0	SIGN.										12-06-2017
	INITIALS	ND	VS	VS					AKM		
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	PE/PM	APPD	DATE
					CLEARED						

DPR PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME : 10244A-CV-30017-Rev-P0

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

GRAVITY INLET ARRANGEMENT
SHEET 1 OF 3

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

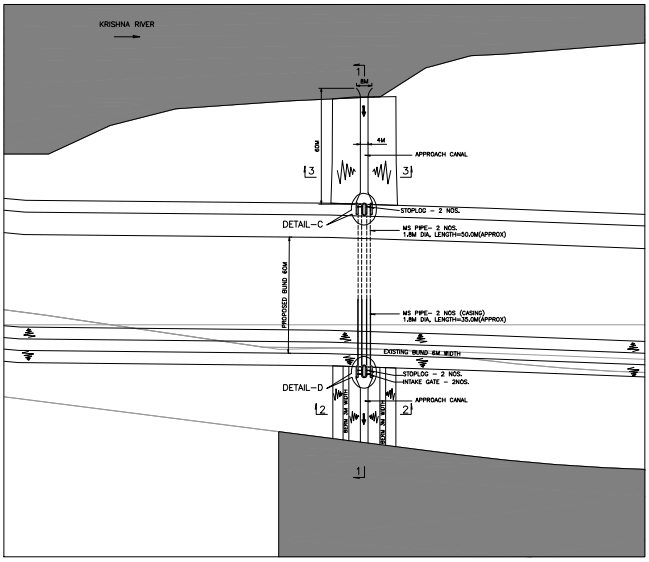
SCALE : 1:8000
DC & DISC: BLR & CV
DWG NO. TCE.10244A-CV-3028-SK-30017
ISSUE P0
SIZE-A1
TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

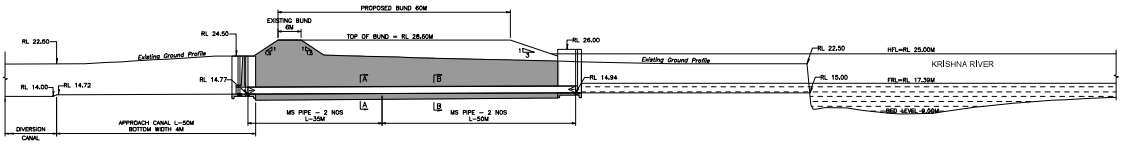
DWG NO TCE.10244A-CV-3028-SK-30018

TITLE GRAVITY INLET ARRANGEMENT SHEET 2 OF 3

NORTH



PLAN



SECTION 1–1
(SECAL 1:500)

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

FRL – FULL RESERVOIR LEVEL
L – LENGTH
RL – REDUCED LEVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. MASTER PLAN (V4) OF AMARAVATI CAPITAL CITY DWG NO. TCE.10244A–CV–MP–30003
2. GRAVITY INLET ARRANGEMENT SHEET 01 OF 03 DWG NO. TCE.10244A–CV–3028–SK–30017

CONSTRUCTION REFERENCE DRAWINGS :

–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	ND	VS	VS								AKM	12–06–2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

GRAVITY INLET ARRANGEMENT
SHEET 2 OF 3

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A–CV–30018–Rev–P0

SCALE : 1:37000 | DWG NO. TCE.10244A–CV–3028–SK–30018 | ISSUE P0

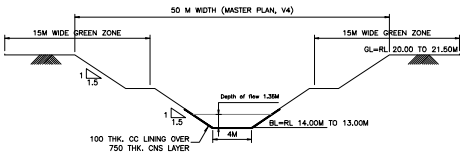
DC & DSC: BLR & CV

TCE FORM NO. 091 R0

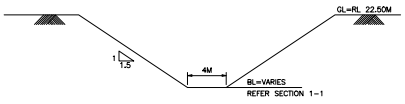
FILE NAME: F-091-Rev-R0.dwg

TITLE: GRAVITY INLET ARRANGEMENT
SHEET 3 OF 3

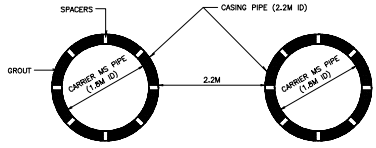
DWG NO: TCE.10244A-CV-3028-SK-30019



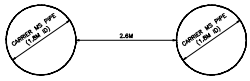
SECTION 2–2
(SECAL 1:200)



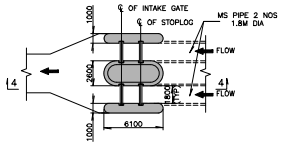
SECTION 3–3
(SECAL 1:200)



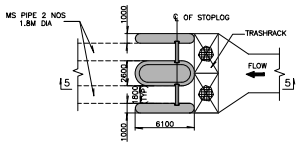
SECTION A–A
(SECAL 1:50)



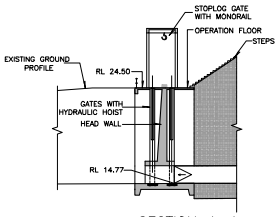
SECTION B–B
(SECAL 1:50)



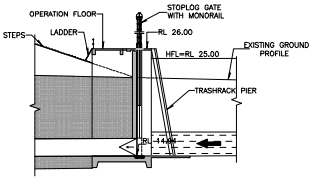
DETAIL – C



DETAIL – D



SECTION 4–4



SECTION 5–5

LEGEND :

– CAPITAL CITY BOUNDARY

– CANAL / WATER BODIES

ABBREVIATIONS :

FRL – FULL RESERVOIR LEVEL
L – LENGTH
RL – REDUCED LEVEL
KM – KILOMETER

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS. LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.

ENGINEERING REFERENCE DRAWINGS :

1. MASTER PLAN (V4) OF AMARAVATI CAPITAL CITY
   DWG NO. TCE.10244A-CV-MP-30003
2. GRAVITY INLET ARRANGEMENT SHEET 01 OF 03
   DWG NO. TCE.10244A-CV-3028-SK-30017

CONSTRUCTION REFERENCE DRAWINGS :

-NIL-

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	ND	VS	VS							AKM		12-06-2017
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME	CLEARED		PE/PM	APPD	DATE

AMARAVATI DEVELOPMENT CORPORATION LIMITED (ADCL)
VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS,
RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

GRAVITY INLET ARRANGEMENT
SHEET 3 OF 3

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

ARCADIS Design & Consultancy for natural and built assets

DPR PURPOSE

DO NOT SCALE

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR "HOLDS" IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO "HOLDS".

FILE NAME : 10244A-CV-30019-Rev-P0

SCALE : 1:37000 | DWG NO. TCE.10244A-CV-3028-SK-30019 | ISSUE P0

DC & DSC: BLR & CV

TCE FORM NO. 091 R0

FILE NAME: F-091-Rev-R0.dwg

ANNEXURE-VII

AMBIENT AIR QUALITY ANALYSIS REPORT

Annexure - VII
Summary of Ambient Air Quality Monitoring Results

S.No	Station Name	PM2.5				PM10				SO_2				NO_2			
		Min	Max	Avg	CPCB & WB-EHS Standards	Min	Max	Avg	CPCB & WB-EHS Standards	Min	Max	Avg	CPCB & WB-EHS Standards	Min	Max	Avg	CPCB & WB-EHS Standards
1	**Thulluru**	27	43	34.5	60 & 25	51	60	55.87	100 & 50	15	23	18.62	80 & 20	26	42	32.37	80 & 40
2	**Lingayapalem**	18	31	25.5	60 & 25	43	49	46.37	100 & 50	12	16	14	80 & 20	21	28	25.25	80 & 40
3	**Mandadam**	19	28	24.5	60 & 25	42	56	51	100 & 50	12	16	14.5	80 & 20	24	28	25.87	80 & 40
4	**Kuragallu**	20	29	25	60 & 25	38	49	42.62	100 & 50	12	16	14.12	80 & 20	23	29	26.12	80 & 40
5	**Nekkallu**	17	26	22.62	60 & 25	42	52	48	100 & 50	11	16	13.87	80 & 20	20	27	24	80 & 40
6	**Sakhamuru**	20	29	24.75	60 & 25	40	48	45.25	100 & 50	12	18	14.25	80 & 20	23	29	25.75	80 & 40
7	**Abbirajupalem**	18	27	22.62	60 & 25	39	46	42.25	100 & 50	10	15	12.37	80 & 20	20	26	23.5	80 & 40
8	**Vykuntapuram**	15	27	21	60 & 25	35	48	42.12	100 & 50	10	16	13.25	80 & 20	22	27	25.12	80 & 40
9	**Ventakapalem**	20	29	24.5	60 & 25	40	53	46.37	100 & 50	12	17	14.75	80 & 20	22	28	25.62	80 & 40
10	**Mangalgiri**	32	47	38.87	60 & 25	59	66	63.25	100 & 50	18	24	21.12	80 & 20	27	37	32.25	80 & 40

Note: All values in µg/m^3.

ANNEXURE-VIII

SURFACE AND GROUND WATER SAMPLE ANALYSIS REPORT

Surface Water Analysis Results

S NO	TEST PARAMETERS	UNITS	Thullur	Lake near Mandadam	Kuragallu Lake	Inavolu pond	Sakamuru pond
1	pH	--	7.8	7.9	8.2	8.2	8.1
2	Color	Hazen	1	1	1	1	1
3	Odour	--					
4	Temperature	^{0}C	38.6	38.6	39.2	39	39.2
5	Electrical Conductivity	µs/cm	2504	5150	1460	1082	1010
6	Turbidity	NTU	2.6	3.8	2.3	1	1
7	Total Dissolved Solids	mg/l	1464	3031	854	629	574
8	Total Hardness as $CaCO_3$	mg/l	710	1440	260	230	210
9	Total Alkalinity as $CaCO_3$	mg/l	700	1450	420	390	380
10	Chlorides as Cl	mg/l	300	578	175	120	110
11	Sodium as Na	mg/l	210	431	185	136	134
12	Potassium as K	mg/l	19	21	8	8	6
13	Sulphates as SO_4	mg/l	129	296	56	41	38
14	Nitrates as NO_3	mg/l	22	86	17	12	10
15	Iron as Fe	mg/l	0.07	0.1	0.04	0.02	0.03
16	Fluoride as F	mg/l	0.9	1	0.8	0.8	0.9
17	Lead as Pb	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
18	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
19	Phenolic Compounds as C_6H_5OH	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
20	Cadmium as Cd	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
21	Zinc as Zn	mg/l	0.04	0.03	0.03	0.02	0.04
22	Total Chromium	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

S NO	TEST PARAMETERS	UNITS	Thullur	Lake near Mandadam	Kuragallu Lake	Inavolu pond	Sakamuru pond
23	Boron as B	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
24	Total carbon	mg/l	296	539	152	122	124
25	Total Nitrogen	mg/l	42	102	29	16	19
26	Free Ammonia	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
27	Total Phosphorous	mg/l	0.01	0.01	0.01	0.01	0.01
28	Sodium Absorption Ratio	mg/l	3.46	4.94	4.94	3.9	4.02
29	Oil & Grease	mg/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
30	Total Suspended Solids	mg/l	20	29	18	16	16
31	Dissolved Oxygen	mg/l	5.6	5.6	4.1	3.6	3.4
32	Chemical Oxygen Demand	mg/l	< 5	10	< 5	< 5	< 5
33	Bio Chemical Oxygen Demand	mg/l	< 3	< 3	< 3	< 3	< 3
34	Total Coli forms	MPN/ 100ml	11	19	11	8	10
35	Faecal Coliforms	--	Absent	Absent	Absent	Absent	Absent

Ground Water Analysis Results

S NO	TEST PARAMETERS	UNITS	Lingayapalem	Mandadam	Nekkallu	Abbarajupalem	Ananathavaram	Venkatapalem	Unguturu
1	pH	--	7.6	6.6	7.6	7.9	7.1	7.4	7.3
2	Color	Hazen	1	1	1	1	1	1	1
3	Odour	--							
4	Temperature	^{0}C	39.5	38.9	39.4	39.4	39.2	38.9	39.3
5	Electrical Conductivity	µs/cm	2227	1574	3755	859	4386	1616	1982
6	Turbidity	NTU	1	1	1	1	1.2	1	1
7	Total Dissolved Solids	mg/l	1382	983	2304	552	2692	985	1228
8	Total Hardness as $CaCO_3$	mg/l	730	500	570	230	920	420	470
9	Total Alkalinity as $CaCO_3$	mg/l	690	470	1150	260	1100	490	600
10	Chlorides as Cl	mg/l	230	160	350	80	580	150	190
11	Sodium as Na	mg/l	210	152	678	92	680	210	270
12	Potassium as K	mg/l	14	10	28	8	36	16	28
13	Sulphates as SO_4	mg/l	104	91	227	56	258	110	124
14	Nitrates as NO_3	mg/l	15	12	29	14	30	12	16
15	Iron as Fe	mg/l	0.1	0.02	0.06	0.02	0.05	0.03	0.03
16	Fluoride as F	mg/l	0.7	0.6	0.8	0.4	0.9	0.7	0.8
17	Lead as Pb	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
18	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
19	Phenolic Compounds as C_6H_5OH	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
20	Cadmium as Cd	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
21	Zinc as Zn	mg/l	0.03	0.01	0.02	0.01	0.02	0.01	0.01
22	Total Chromium	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
23	Boron as B	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01
24	Total carbon	mg/l	142	116	248	58	320	116	158
25	Total Nitrogen	mg/l	21	18	39	19	51	23	30
26	Free Ammonia	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
27	Total Phosphorous	mg/l	0.01	< 0.01	0.02	< 0.01	0.01	0.01	0.01

S NO	TEST PARAMETERS	UNITS	Lingayapalem	Mandadam	Nekkallu	Abbarajupalem	Ananathavaram	Venkatapalem	Unguturu
28	Sodium Absorption Ratio	mg/l	3.4	2.9	12.3	2.6	9.7	4.5	8.4
29	Oil & Grease	mg/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
30	Total Suspended Solids	mg/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
31	Dissolved Oxygen	mg/l	3.7	3.8	3.8	3.9	4	3.8	4
32	Chemical Oxygen Demand	mg/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
33	Bio Chemical Oxygen Demand	mg/l	< 3	< 3	< 3	< 3	< 3	< 3	< 3
34	Total Coli forms	MPN/ 100ml	Absent	Absent	Absent	Absent	5	Absent	4
35	Faecal Coliforms	--	Absent	Absent	Absent	Absent	Absent	Absent	Absent

ANNEXURE-IX

SOIL QUALITY ANALYSIS REPORT

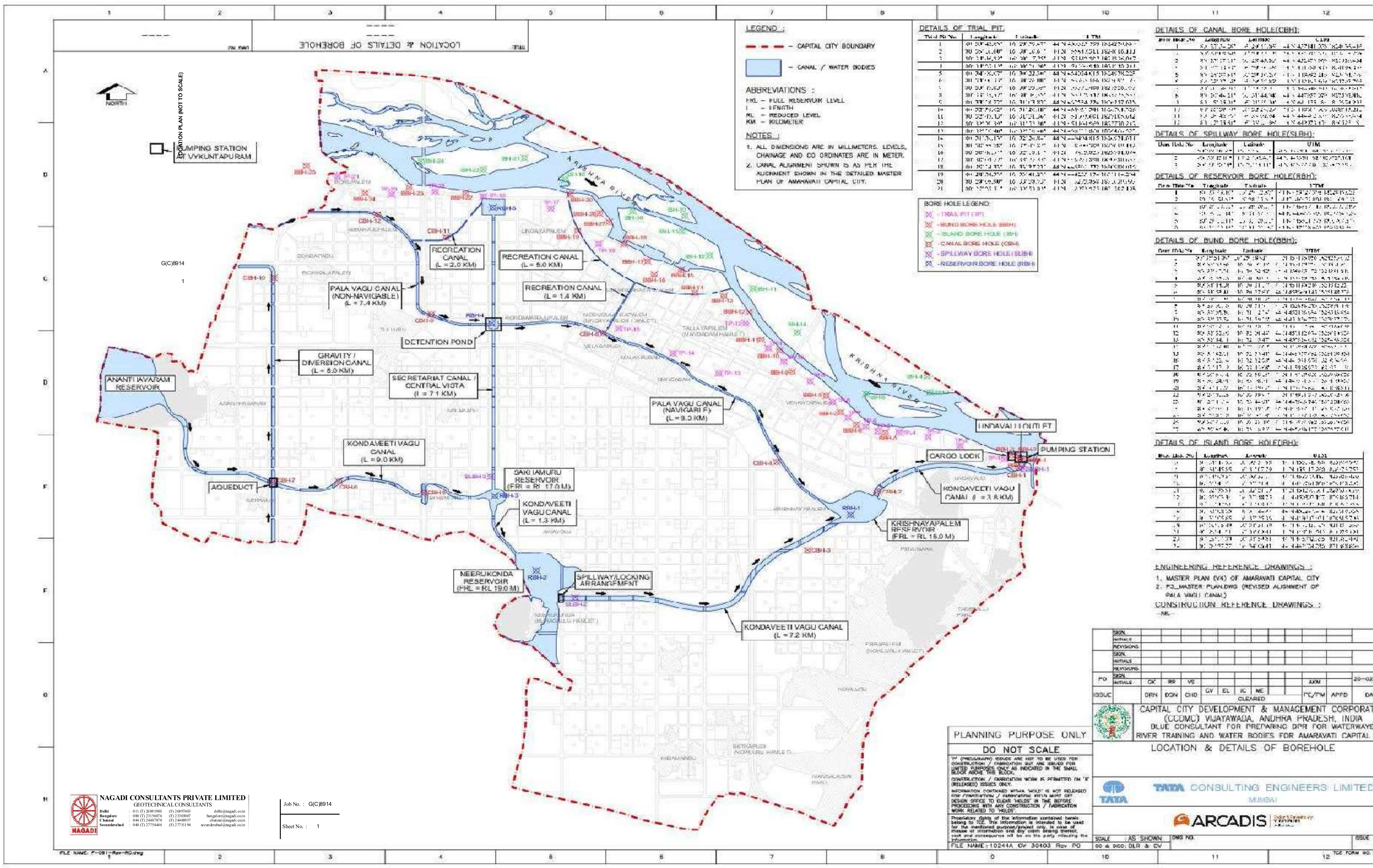
Summary of Soil Analysis of Reports

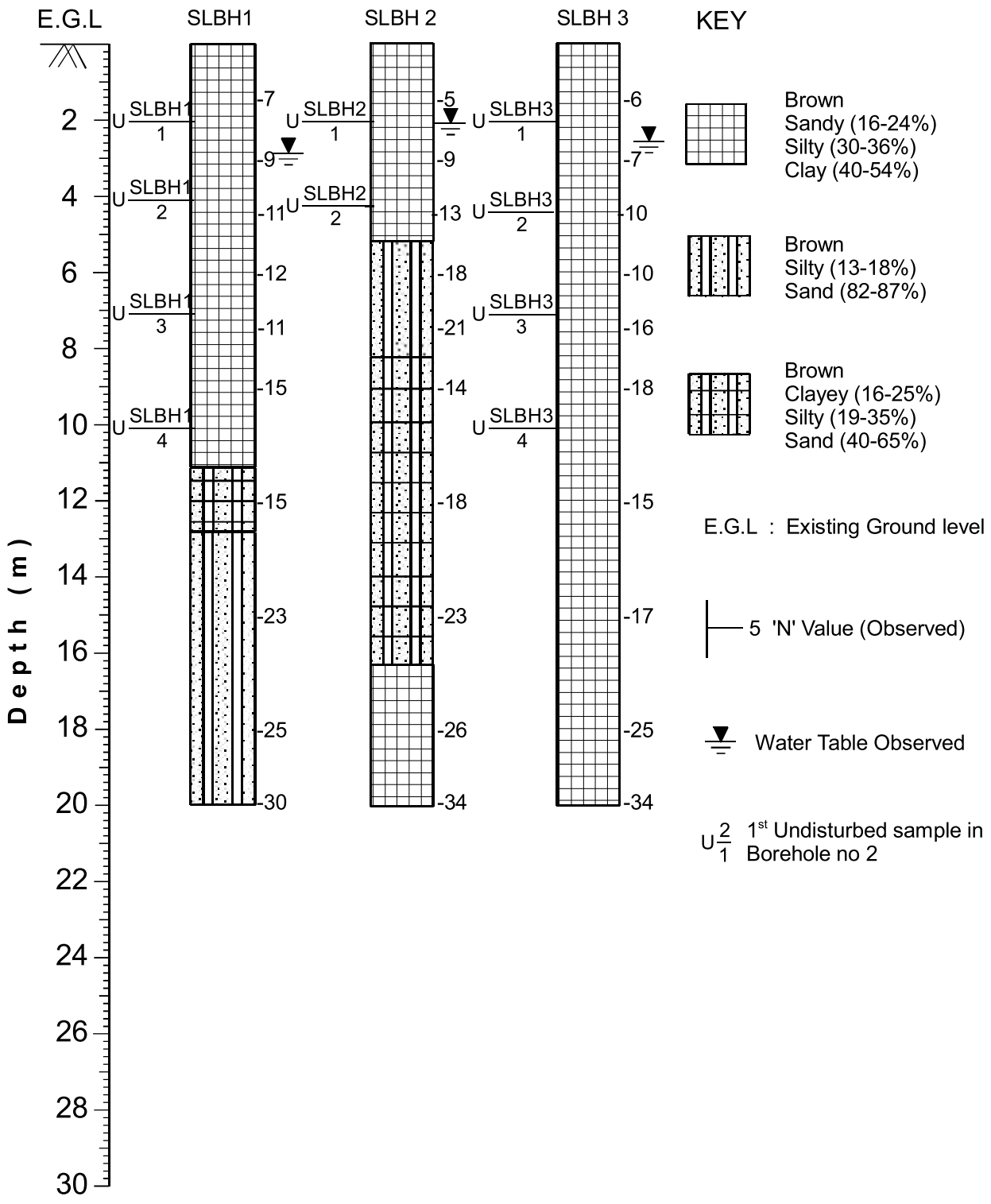
S.No	TEST PARAMETERS	UNITS	THULLUR	LINGAYAPALEM	AINAVOLU	KURAGALLU	NEKKALLU	SAKHAMURU	ABBIRAJUPALEM	VYKUNTAPURAM	ANANTHAVARAM	VENKATAPALEM
	Particulate Size											
1	**Sand**	%	56	62	58	49	52	53	48	49	42	43
	Silt	%	14	16	10	16	12	18	16	18	21	24
	Clay	%	30	22	32	35	36	29	36	33	37	33
2	**Texture**	--	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
3	**Electrical Conductivity (20%)**	µs/cm	683	1009	251	358	205	582	856	617	272	401
4	**pH (20%)**	--	7.7	6.3	8.2	7.4	7.6	7.7	5.4	7.7	7.6	7.9
5	**Porocity**	(%)	22.4	26.5	18.4	23.9	17.8	25.6	26.1	21	19.3	20.2
6	**Sodium as Na**	mg/kg	448	786	144	227	120	396	502	418	184	376
7	**Potassium as K**	Kg/h	156	256	67	86	52	137	188	152	49	117
8	**Sodium Absorption Ratio (SAR)**	--	0.2	3.5	0.1	0.1	0.1	0.3	0.4	0.2	0.1	0.2
9	**Cation Exchange Capacity**	Meq/100gm	17.6	21.2	10.8	11.5	10.5	21.2	22.4	17.6	11.8	15.2

S.No	TEST PARAMETERS	UNITS	THULLUR	LINGAYAPALEM	AINAVOLU	KURAGALLU	NEKKALLU	SAKHAMURU	ABBIRAJUPALEM	VYKUNTAPURAM	ANANTHAVARAM	VENKATAPALEM
10	Water Holding Capacity	(%)	38.8	41.3	25.1	35.2	29.6	35.6	36.6	35.6	29.4	31.8
11	Moisture Content	(%)	18.6	52.4	6.3	6.3	5.3	6.7	3.9	4.8	48.5	4.8
12	Permeability	cm/hr	6.8	7.3	5.2	5.5	5.6	7.2	6.6	5.9	5.7	6.3
13	Copper as Cu	mg/kg	14	9.6	4.6	7.3	6.4	21	24	12	4	17
14	Iron as Fe	%	0.4	0.02	0.1	0.2	0.1	0.4	0.5	0.3	0.1	0.3
15	Zinc as Zn	mg/kg	78	24	26	40	28	83	89	68	22	67
16	Nickel as Ni	mg/kg	19	8.3	6.1	9.2	5.8	20	31	17	5.6	15
17	Lead as Pb	mg/kg	5.2	5.5	1.9	2.6	1.6	5.6	6.2	4.9	1.8	4.3
18	Cadmium as Cd	mg/kg	2.9	2	1	2.1	0.5	3.2	3.3	2.6	0.8	2
19	Chromium as cr	mg/kg	42	31	14	25	11	48	56	39	10.5	35
20	Nitrogen as N	Kg/h	180	164	68	92	60	204	204	175	67	177
21	Phosphorous as P	Kg/h	136	118	39	66	42	140	158	118	34	126
22	Total organic Carbon	%	3.8	2.1	1.6	2	2.2	3.9	4.2	3.2	2	1.1
23	Chlorides as Cl	mg/kg	118	192	59	73	54	135	210	125	68	70
24	Alkalinity	mg/kg	370	418	102	190	100	380	290	300	120	150

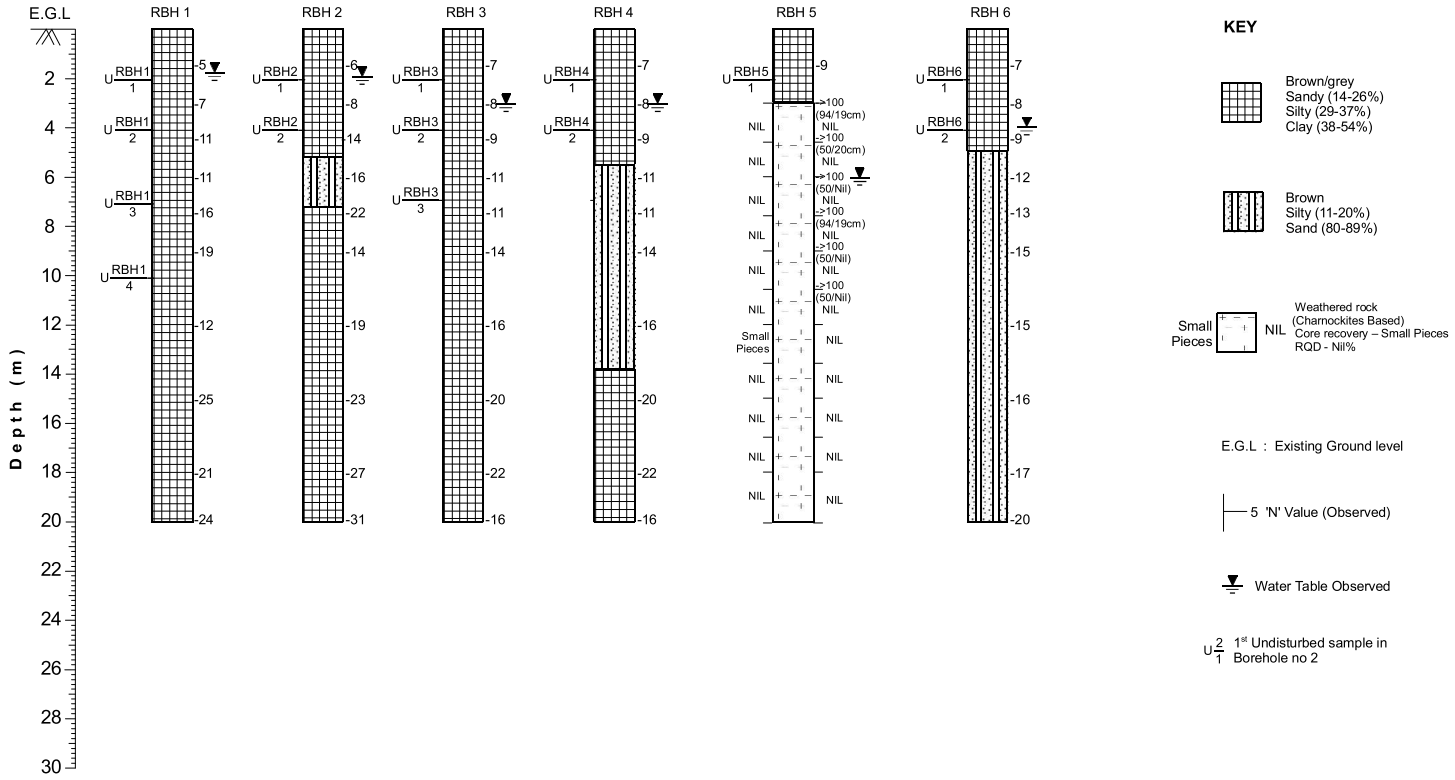
ANNEXURE-X

BORE LOGS AND SOIL QUALITY DETAILS IN THE PROJECT AREA


LOCATION & DETAILS OF BOREHOLE
NORTH
PUMPING STATION AT VYKUNTAPURAM
LEGEND :
— CAPITAL CITY BOUNDARY
— CANAL / WATER BODIES
ABBREVIATIONS :
FRL – FULL RESERVOIR LEVEL
L – LENGTH
RL – REDUCED LEVEL
KM – KILOMETER
NOTES :
1. ALL DIMENSIONS ARE IN MILLIMETERS, LEVELS, CHAINAGE AND CO ORDINATES ARE IN METER.
2. CANAL ALIGNMENT SHOWN IS AS PER THE ALIGNMENT SHOWN IN THE DETAILED MASTER PLAN OF AMARAVATI CAPITAL CITY.
DETAILS OF TRIAL PIT
DETAILS OF CANAL BORE HOLE(CBH)
DETAILS OF SPILLWAY BORE HOLE(SLBH)
DETAILS OF RESERVOIR BORE HOLE(RBH)
DETAILS OF BUND BORE HOLE(BBH)
DETAILS OF ISLAND BORE HOLE(IBH)
BORE HOLE LEGEND
TRIAL PIT (TP)
BUND BORE HOLE (BBH)
ISLAND BORE HOLE (IBH)
CANAL BORE HOLE (CBH)
SPILLWAY BORE HOLE (SLBH)
RESERVOIR BORE HOLE (RBH)
KRISHNA RIVER
RECREATION CANAL (L = 2.0 KM)
RECREATION CANAL (L = 6.0 KM)
RECREATION CANAL (L = 1.4 KM)
PALA VAGU CANAL (NON-NAVIGABLE) (L = 7.4 KM)
DETENTION POND
GRAVITY / DIVERSION CANAL (L = 6.0 KM)
SECRETARIAT CANAL / CENTRAL VISTA (L = 7.1 KM)
ANANTHAVARAM RESERVOIR
PALA VAGU CANAL (NAVIGABLE) (L = 9.0 KM)
UNDAVALLI OUTLET
CARGO LOCK
PUMPING STATION
KONDAVEETI VAGU CANAL (L = 9.0 KM)
AQUEDUCT
SAKHAMURU RESERVOIR (FRL = RL 17.0 M)
KONDAVEETI VAGU CANAL (L = 1.3 KM)
KONDAVEETI VAGU CANAL (L = 3.6 KM)
KRISHNAYAPALEM RESERVOIR (FRL = RL 15.0 M)
NEERUKONDA RESERVOIR (FRL = RL 19.0 M)
SPILLWAY/LOCKING ARRANGEMENT
KONDAVEETI VAGU CANAL (L = 7.2 KM)
G(C)6914
ENGINEERING REFERENCE DRAWINGS :
1. MASTER PLAN (V4) OF AMARAVATI CAPITAL CITY
2. P3_MASTER PLAN.DWG (REVISED ALIGNMENT OF PALA VAGU CANAL)
CONSTRUCTION REFERENCE DRAWINGS :
--NIL--
PLANNING PURPOSE ONLY
DO NOT SCALE
CAPITAL CITY DEVELOPMENT & MANAGEMENT CORPORATION (CCDMC) VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY
LOCATION & DETAILS OF BOREHOLE
TATA CONSULTING ENGINEERS LIMITED
MUMBAI
ARCADIS
NAGADI CONSULTANTS PRIVATE LIMITED
GEOTECHNICAL CONSULTANTS
Job No. : G(C)6914
Sheet No. : 1
SCALE AS SHOWN
ISSUE P0
20-02-2017


E.G.L
SLBH1
SLBH 2
SLBH 3
KEY
Depth (m)
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
U SLBH1 1
U SLBH1 2
U SLBH1 3
U SLBH1 4
U SLBH2 1
U SLBH2 2
U SLBH3 1
U SLBH3 2
U SLBH3 3
U SLBH3 4
-7
-9
-11
-12
-11
-15
-15
-23
-25
-30
-5
-9
-13
-18
-21
-14
-18
-23
-26
-34
-6
-7
-10
-10
-16
-18
-15
-17
-25
-34
Brown
Sandy (16-24%)
Silty (30-36%)
Clay (40-54%)
Brown
Silty (13-18%)
Sand (82-87%)
Brown
Clayey (16-25%)
Silty (19-35%)
Sand (40-65%)
E.G.L : Existing Ground level
5 'N' Value (Observed)
Water Table Observed
U 2/1 1st Undisturbed sample in Borehole no 2

G(C)8914



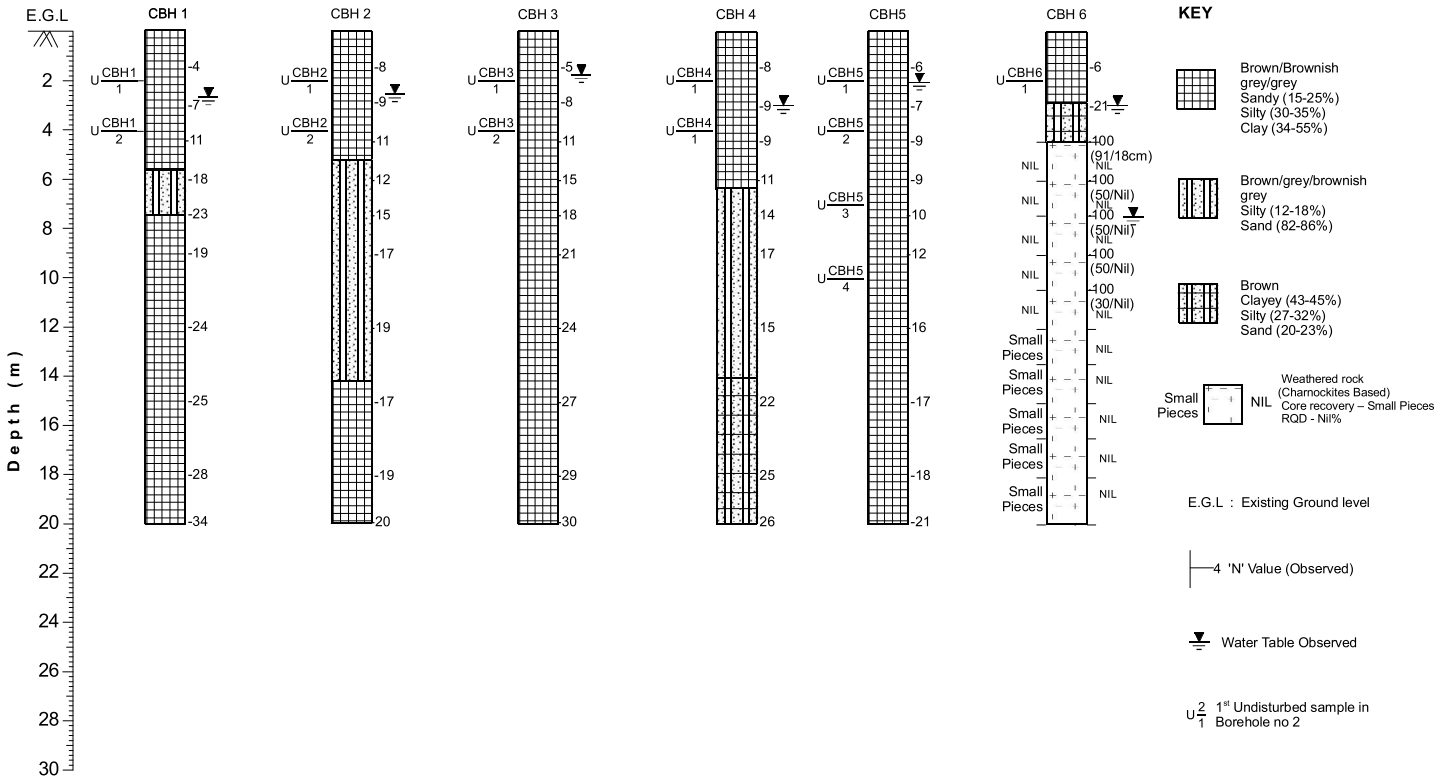
NAGADI CONSULTANTS PRIVATE LIMITED
GEOTECHNICAL CONSULTANTS

Delhi	: 011 (T) 26891980	(F) 26897403	delhi@nagadi.co.in
Bangalore	: 080 (T) 23156076	(F) 23303007	bangalore@nagadi.co.in
Chennai	: 044 (T) 24487870	(F) 24488957	chennai@nagadi.co.in
Secunderabad	: 040 (T) 27754446	(F) 27751194	secunderabad@nagadi.co.in

SOIL INVESTIGATION FOR FLOOD MANAGEMENT WORKS AT MANGALAGIRI, AMARAVATHI, TADEPALLI AND TADIKONDA MANDALS

Job No. : G(C)8914

Sheet No. : 2A



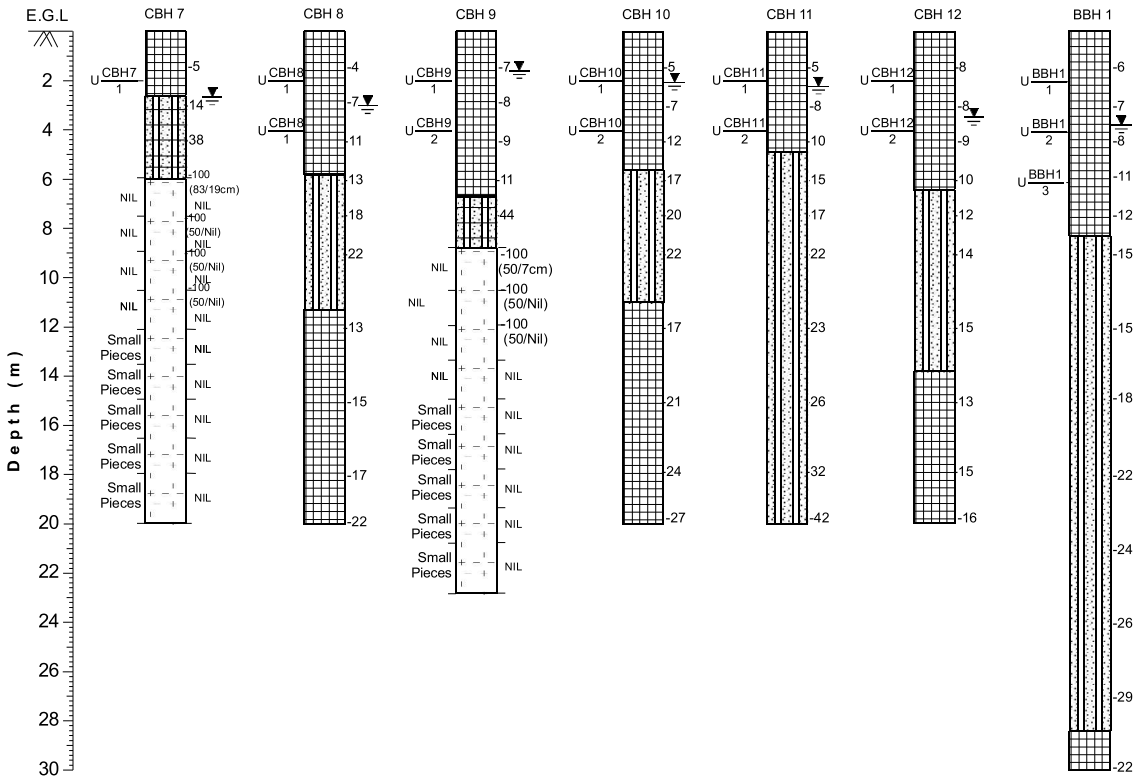
NAGADI CONSULTANTS PRIVATE LIMITED
GEOTECHNICAL CONSULTANTS

Delhi	: 011 (T) 26891980	(F) 26897403	delhi@nagadi.co.in
Bangalore	: 080 (T) 23156076	(F) 23303007	bangalore@nagadi.co.in
Chennai	: 044 (T) 24487870	(F) 24488957	chennai@nagadi.co.in
Secunderabad	: 040 (T) 27754446	(F) 27751194	secunderabad@nagadi.co.in

SOIL INVESTIGATION FOR FLOOD MANAGEMENT WORKS AT MANGALAGIRI, AMARAVATHI, TADEPALLI AND TADIKONDA MANDALS

Job No. : G(C)8914

Sheet No. : 2B



NAGADI CONSULTANTS PRIVATE LIMITED
GEOTECHNICAL CONSULTANTS

Delhi	:	011 (T) 26891980	(F) 26897403	delhi@nagadi.co.in
Bangalore	:	080 (T) 23156076	(F) 23303007	bangalore@nagadi.co.in
Chennai	:	044 (T) 24487870	(F) 24488957	chennai@nagadi.co.in
Secunderabad	:	040 (T) 27754446	(F) 27751194	secunderabad@nagadi.co.in

SOIL INVESTIGATION FOR FLOOD MANAGEMENT WORKS AT MANGALAGIRI, AMARAVATHI, TADEPALLI AND TADIKONDA MANDALS

Job No. : G(C)8914

Sheet No. : 2C

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.8m | Term. Depth : 20.0m | B.H.No. : SLBH 1

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
7	1.5	Brown sandy silty clay	0	18	32	50	42	25					
	2.0	Brown sandy silty clay							1.82	16.27	CD	0.28	14
9	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.91	24.16	CD	0.27	15
11	4.5	Brown sandy silty clay	0	20	34	46	37	23					
12	6.0	Brown sandy silty clay											
	7.0	Brown sandy silty clay							1.93	22.37	CD	0.27	15
11	7.5	Brown sandy silty clay	0	21	35	44	36	22					
15	9.0	Brown sandy silty clay											
	10.0	Brown sandy silty clay							1.95	22.61	CD	0.25	16
	11.1	Change of strata											
15	12.0	Brown clayey silty sand	0	65	19	16	20	14					
	12.8	Change of strata											
23	15.0	Brown silty sand	0	83	17	0	-	NP					
25	18.0	Brown silty sand											
30	20.0	Brown silty sand	0	87	13	0	-	NP					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.0m | Term. Depth : 20.0m | B.H.No. : SLBH 2

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
5	1.5	Brown sandy silty clay	0	16	32	52	45	26					
	2.0	Brown sandy silty clay							1.81	25.91	CD	0.30	13
9	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.89	23.52	CD	0.28	15
13	4.5	Brown sandy silty clay	0	20	35	45	37	22					
	5.2	Change of strata											
18	6.0	Brown silty sand	0	82	18	0	-	NP					
21	7.5	Brown silty sand											
	8.2	Change of strata											
14	9.0	Brown clayey silty sand	0	47	30	23	29	16					
18	12.0	Brown clayey silty sand											
23	15.0	Brown clayey silty sand	0	40	35	25	31	17					
	16.3	Change of strata											
26	18.0	Brown sandy silty clay	0	22	36	42	35	21					
34	20.0	Brown sandy silty clay											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.5m | Term. Depth : 20.0m | B.H.No. : SLBH 3

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
6	1.5	Brown sandy silty clay	0	16	30	54	45	27					
	2.0	Brown sandy silty clay							1.79	17.35	CD	0.30	13
7	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.88	25.46	CD	0.29	14
10	4.5	Brown sandy silty clay	0	18	32	50	43	25					
10	6.0	Brown sandy silty clay											
	7.0	Brown sandy silty clay							1.91	24.09	CD	0.27	15
16	7.5	Brown sandy silty clay	0	20	34	46	37	23					
18	9.0	Brown sandy silty clay											
	10.0	Brown sandy silty clay							1.93	23.77	CD	0.25	16
15	12.0	Brown sandy silty clay	0	21	35	44	35	22					
17	15.0	Brown sandy silty clay											
25	18.0	Brown sandy silty clay	0	24	36	40	33	20					
34	20.0	Brown sandy silty clay											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 1.8m | Term. Depth : 20.0m | B.H.No. : RBH 1

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	Φ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
5	1.5	Brown sandy silty clay	0	14	29	57	49	28					
	2.0	Brown sandy silty clay							1.86	27.91	CD	0.31	13
7	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.89	25.22	CD	0.30	13
11	4.5	Brown sandy silty clay	0	17	32	51	43	25					
11	6.0	Brown sandy silty clay											
	7.0	Brown sandy silty clay							1.92	24.76	CD	0.28	14
16	7.5	Brown sandy silty clay	0	20	33	47	39	23					
19	9.0	Brown sandy silty clay											
	10.0	Brown sandy silty clay							1.95	22.33	CD	0.26	16
19	12.0	Grey sandy silty clay	0	22	35	43	35	21					
25	15.0	Grey sandy silty clay											
21	18.0	Grey sandy silty clay	0	25	37	38	31	20					
24	20.0	Grey sandy silty clay											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 1.9m | Term. Depth : 20.0m | B.H.No. : RBH 2

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
6	1.5	Brown sandy silty clay	0	16	30	54	46	27					
	2.0	Brown sandy silty clay							1.88	27.61	CD	0.29	13
8	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.91	25.72	CD	0.28	14
14	4.5	Brown sandy silty clay											
	5.2	Change of strata	0	20	34	46	38	24					
16	6.0	Brown silty sand	0	83	17	0	-	NP					
	7.2	Change of strata											
22	7.5	Brown sandy silty clay	0	21	33	46	38	23					
14	9.0	Brown sandy silty clay											
19	12.0	Brown sandy silty clay											
23	15.0	Brown sandy silty clay	0	23	34	43	35	21					
27	18.0	Brown sandy silty clay											
31	20.0	Brown sandy silty clay	0	26	36	38	32	20					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE		Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals												
		B.H. Location:	Water Table: 3.0m				Term. Depth : 20.0m				B.H.No. : RBH 3			
N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test			
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)	
	0.0	Ground level												
	0.5	Brown sandy silty clay												
7	1.5	Brown sandy silty clay	0	17	32	51	43	25						
	2.0	Brown sandy silty clay							1.82	18.71	CD	0.29	14	
8	3.0	Brown sandy silty clay												
	4.0	Brown sandy silty clay							1.89	25.16	CD	0.28	14	
9	4.5	Brown sandy silty clay	0	18	33	49	41	25						
11	6.0	Brown sandy silty clay												
	7.0	Brown sandy silty clay							1.91	23.87	CD	0.27	15	
11	7.5	Brown sandy silty clay	0	20	35	45	37	22						
14	9.0	Brown sandy silty clay												
16	12.0	Brown sandy silty clay	0	23	35	42	35	21						
20	15.0	Brown sandy silty clay												
22	18.0	Brown sandy silty clay	0	26	36	38	32	19						
16	20.0	Brown sandy silty clay												
		*-Natural Bulk Density # -N Values (Observed)												

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 3.0m | Term. Depth : 20.0m | B.H.No. : RBH 4

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
7	1.5	Brown sandy silty clay	0	17	33	50	42	25					
	2.0	Brown sandy silty clay							1.80	14.96	CD	0.29	14
8	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.88	25.26	CD	0.27	15
8	4.5	Brown sandy silty clay	0	18	34	48	40	25					
	5.5	change of strata											
10	6.0	Brown silty sand	0	80	20	0	-	NP					
12	7.5	Brown silty sand											
16	9.0	Brown silty sand											
16	12.0	Brown silty sand	0	86	14	0	-	NP					
	13.8	Change of strata											
15	15.0	Brown sandy silty clay	0	20	34	46	38	23					
14	18.0	Brown sandy silty clay											
16	20.0	Brown sandy silty clay	0	24	35	41	40	20					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 6.0m | Term. Depth : 20.0m | B.H.No. : RBH 5

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
9	1.5	Brown sandy silty clay	0	17	34	49	42	25					
	2.0	Brown sandy silty clay							1.79	14.22	CD	0.29	14
>100 (94/19cm)	3.0	Change of strata											
>100 (50/20cm)	4.5	Weathered Rock (Granite Gniess Based)									D	-	39
>100 (50/Nil)	6.0	Weathered Rock (Granite Gniess Based)									D	-	40
>100 (50/Nil)	7.5	Weathered Rock (Granite Gniess Based)											

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 6.0m | Term. Depth : 20.0m | B.H.No. : RBH 5

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
>100 (50/Nil)	9.0	Weathered Rock (Granite Gniess Based)											
>100 (50/Nil)	10.5	Weathered Rock (Granite Gniess Based)											
	12.0	Weathered Rock (Small pieces)	Crushing strength 443kg/cm^2 water absorption 0.11%										
	13.5	Weathered Rock (Small pieces)	Crushing strength 484kg/cm^2 water absorption 0.10%										
	15.0	Weathered Rock (Small pieces)	Crushing strength 564kg/cm^2 water absorption 0.08%										
	16.5	Weathered Rock (Small pieces)	Crushing strength 524kg/cm^2 water absorption 0.09%										
	18.0	Weathered Rock (Small pieces)	Crushing strength 564kg/cm^2 water absorption 0.08%										
	20.0	Weathered Rock (Small pieces)	Crushing strength 564kg/cm^2 water absorption 0.08%										
		*-Natural Bulk Density # -N Values (Observed)											

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 4.0m | Term. Depth : 20.0m | B.H.No. : RBH 6

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
7	1.5	Brown sandy silty clay	0	17	34	49	42	25					
	2.0	Brown sandy silty clay							1.80	13.79	CD	0.29	13
8	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.89	24.91	CD	0.28	14
9	4.5	Brown sandy silty clay	0	18	35	47	40	23					
	4.9	Change of strata											
12	6.0	Brown silty sand	0	82	18	0	-	NP					
13	7.5	Brown silty sand											
15	9.0	Brown silty sand											
15	12.0	Brown silty sand	0	85	15	0	-	NP					
16	15.0	Brown silty sand											
17	18.0	Brown silty sand	0	89	11	0	-	NP					
20	20.0	Brown silty sand											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.6m | Term. Depth : 20.0m | B.H.No. : CBH 1

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
4	1.5	Brown sandy silty clay	0	15	30	55	48	28					
	2.0	Brown sandy silty clay							1.84	18.13	CD	0.28	13
7	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.90	24.22	CD	0.29	13
11	4.5	Brown sandy silty clay	0	19	34	47	40	23					
	5.6	Change of strata											
18	6.0	Brown silty sand	0	82	18	0	-	NP					
23	7.5	Brown silty sand											
19	9.0	Grey Sandy silty clay	0	17	33	50	42	25					
24	12.0	Grey Sandy silty clay											
25	15.0	Grey Sandy silty clay											
28	18.0	Grey Sandy silty clay	0	21	35	44	35	22					
34	20.0	Grey Sandy silty clay											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.5m | Term. Depth : 20.0m | B.H.No. : CBH 2

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
8	1.5	Brown sandy silty clay	0	18	33	49	42	25					
	2.0	Brown sandy silty clay							1.81	16.27	CD	0.29	14
9	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.90	23.36	CD	0.28	15
11	4.5	Brown sandy silty clay	0	20	35	45	49	22					
	5.2	Change of strata											
12	6.0	Brown silty sand	0	82	18	0	-	NP					
15	7.5	Brown silty sand											
17	9.0	Brown silty sand											
19	12.0	Brown silty sand	0	86	14	0	-	NP					
	14.2	Change of strata											
17	15.0	Brown sandy silty clay	0	22	33	45	37	22					
19	18.0	Brown sandy silty clay											
20	20.0	Brown sandy silty clay	0	25	36	39	32	20					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 1.8m | Term. Depth : 20.0m | B.H.No. : CBH 3

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	Φ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
5	1.5	Brown sandy silty clay	0	15	30	55	48	28					
	2.0	Brown sandy silty clay							1.86	28.12	CD	0.30	12
8	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.90	25.22	CD	0.27	14
11	4.5	Brown sandy silty clay	0	18	33	49	42	25					
15	6.0	Change of strata											
18	7.5	Brown silty sand											
21	9.0	Brown silty sand	0	23	34	43	35	22					
24	12.0	Brown silty sand											
27	15.0	Brown silty sand	0	27	35	38	32	20					
29	18.0	Change of strata											
30	20.0	Brown sandy silty clay	0	30	35	35	30	18					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.9m | Term. Depth : 20.0m | B.H.No. : CBH4

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
8	1.5	Brown sandy silty clay	0	18	34	48	41	24					
	2.0	Brown sandy silty clay							1.83	16.91	CD	0.30	14
9	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.91	22.35	CD	0.29	15
9	4.5	Brown sandy silty clay	0	20	35	45	38	22					
11	6.0	Brown sandy silty clay											
	6.4	Change of strata											
14	7.5	Brown silty sand	0	84	16	0	-	NP					
17	9.0	Brown silty sand											
15	12.0	Brown silty sand	0	88	12	0	-	NP					
	14.1	Change of strata											
22	15.0	Brown clayey silty sand	0	45	32	23	25	16					
25	18.0	Brown clayey silty sand											
26	20.0	Brown clayey silty sand	0	53	27	20	23	15					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.0m | Term. Depth : 20.0m | B.H.No. : CBH5

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	Φ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
6	1.5	Brown sandy silty clay	0	16	32	52	45	26					
	2.0	Brown sandy silty clay							1.87	26.02	CD	0.29	13
7	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.89	25.23	CD	0.28	14
9	4.5	Brown sandy silty clay	0	18	34	48	41	24					
9	6.0	Brown sandy silty clay											
	7.0	Brown sandy silty clay							1.91	24.00	CD	0.26	15
10	7.5	Brown sandy silty clay	0	19	35	46	38	23					
12	9.0	Brown sandy silty clay											
	10.0	Brown sandy silty clay							1.93	22.83	CD	0.25	18
16	12.0	Brown sandy silty clay	0	22	35	43	35	22					
17	15.0	Brown sandy silty clay											
18	18.0	Brown sandy silty clay	0	25	36	39	32	19					
21	20.0	Brown sandy silty clay											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 3.0m | Term. Depth : 20.0m | B.H.No. : CBH6

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
6	1.5	Brown sandy silty clay	0	16	32	52	45	26					
	2.0	Brown sandy silty clay							1.83	16.17	CD	0.30	13
	2.9	Change of strata											
21	3.0	Brown clayey silty sand	0	44	33	23	29	16					
<100 (91/18cm)	4.5	Change of strata									D	-	39
		Weathered Rock											
<100 (50/Nil)	6.0	Weathered Rock									D	-	41
<100 (50/Nil)	7.5	Weathered Rock											
<100 (50/Nil)	9.0	Weathered Rock											

SOIL PROFILE	Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals												
	B.H. Location:	Water Table: 3.0m				Term. Depth : 20.0m				B.H.No. : CBH6			
N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
<100 (30/Nil)	10.5	Weathered Rock											
	12.0	Weathered Rock (Small pieces)	Crushing strength 403kg/cm^2 water absorption 0.12%										
	13.5	Weathered Rock (Small pieces)	Crushing strength 484kg/cm^2 water absorption 0.11%										
	15.0	Weathered Rock (Small pieces)	Crushing strength 524kg/cm^2 water absorption 0.09%										
	16.5	Weathered Rock (Small pieces)	Crushing strength 443kg/cm^2 water absorption 0.11%										
	18.0	Weathered Rock (Small pieces)	Crushing strength 484kg/cm^2 water absorption 0.10%										
	20.0	Weathered Rock (Small pieces)	Crushing strength 564kg/cm^2 water absorption 0.08%										
		*-Natural Bulk Density # -N Values (Observed)											

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 4.5m | Term. Depth : 20.0m | B.H.No. : CBH7

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
5	1.5	Brown sandy silty clay	0	15	30	55	47	27					
	2.0	Brown sandy silty clay							1.79	15.01	CD	0.31	12
	2.7	Change of strata											
14	3.0	Brown clayey silty sand	0	46	30	24	29	17					
38	4.5	Brown clayey silty sand											
<100 (83/19cm)	6.0	Change of strata											
		Weathered Rock									D	-	40
<100 (50/Nil)	7.5	Weathered Rock									D	-	42
<100 (50/Nil)	9.0	Weathered Rock											

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 4.5m | Term. Depth : 20.0m | B.H.No. : CBH7

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
<100 (30/Nil)	10.5	Weathered Rock											
	12.0	Weathered Rock (Small pieces)			Crushing strength 282kg/cm^2			water absorption 0.14%					
	13.5	Weathered Rock (Small pieces)			Crushing strength 363kg/cm^2			water absorption 0.12%					
	15.0	Weathered Rock (Small pieces)			Crushing strength 323kg/cm^2			water absorption 0.11%					
	16.5	Weathered Rock (Small pieces)			Crushing strength 443kg/cm^2			water absorption 0.09%					
	18.0	Weathered Rock (Small pieces)			Crushing strength 524kg/cm^2			water absorption 0.10%					
	20.0	Weathered Rock (Small pieces)			Crushing strength 524kg/cm^2			water absorption 0.08%					
		*-Natural Bulk Density # -N Values (Observed)											

SOIL PROFILE		Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals												
		B.H. Location:	Water Table: 3.0m				Term. Depth : 20.0m				B.H.No. : CBH 8			
N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test			
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)	
	0.0	Ground level												
	0.5	Brown sandy silty clay												
4	1.5	Brown sandy silty clay	0	14	30	56	48	28						
	2.0	Brown sandy silty clay							1.76	13.79	CD	0.30	12	
7	3.0	Brown sandy silty clay												
	4.0	Brown sandy silty clay							1.87	25.91	CD	0.29	14	
11	4.5	Brown sandy silty clay	0	17	33	50	42	25						
13	4.9	Change of strata												
18	6.0	Brown silty sand	0	83	17	0	-	NP						
22	7.5	Brown silty sand												
	9.0	Brown silty sand	0	86	14	0	-	NP						
	11.3	Change of strata												
13	12.0	Brown sandy silty clay	0	19	34	47	40	23						
15	15.0	Brown sandy silty clay												
17	18.0	Brown sandy silty clay	0	24	36	40	33	20						
22	20.0	Brown sandy silty clay												
		*-Natural Bulk Density # -N Values (Observed)												

SOIL PROFILE		Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals												
		B.H. Location:	Water Table: 1.5m				Term. Depth : 20.0m				B.H.No. : CBH9			
N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test			
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)	
	0.0	Ground level												
	0.5	Brown sandy silty clay												
7	1.5	Brown sandy silty clay	0	17	33	50	42	25						
	2.0	Brown sandy silty clay							1.88	24.67	CD	0.29	14	
8	3.0	Brown sandy silty clay												
	4.0	Brown sandy silty clay							1.91	23.52	CD	0.28	14	
9	4.5	Brown sandy silty clay	0	18	35	47	40	22						
11	6.0	Brown sandy silty clay												
	6.7	Change of strata												
44	7.5	Brown clayey silty sand	0	43	33	24	29	16						
	8.8	Change of strata												
<100 (50/7cm)	9.0	Weathered Rock												

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 1.5m | Term. Depth : 20.0m | B.H.No. : CBH9

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
<100 (50/Nil)	10.5	Weathered Rock											
<100 (50/Nil)	12.0	Weathered Rock											
	13.5	Weathered Rock (Small pieces)	Crushing strength 363kg/cm^2 water absorption 0.12%										
	15.0	Weathered Rock (Small pieces)	Crushing strength 443kg/cm^2 water absorption 0.11%										
	16.5	Weathered Rock (Small pieces)	Crushing strength 484kg/cm^2 water absorption 0.09%										
	18.0	Weathered Rock (Small pieces)	Crushing strength 564kg/cm^2 water absorption 0.10%										
	20.0	Weathered Rock (Small pieces)	Crushing strength 524kg/cm^2 water absorption 0.09%										

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.0m | Term. Depth : 20.0m | B.H.No. : CBH 10

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
	1.5	Brown sandy silty clay	0	15	30	55	48	27					
5	2.0	Brown sandy silty clay							1.89	26.92	CD	0.31	12
	3.0	Brown sandy silty clay											
7	4.0	Brown sandy silty clay							191	24.76	CD	0.29	14
	4.5	Brown sandy silty clay	0	18	35	47	40	23					
12	5.6	Change of strata											
	6.0	Brown silty sand	0	80	20	0	-	NP					
17	7.5	Brown silty sand											
20	9.0	Brown silty sand	0	84	16	0	-	NP					
22	11.0	Change of strata											
17	12.0	Brown sandy silty clay	0	20	34	46	39	23					
21	15.0	Brown sandy silty clay											
24	18.0	Brown sandy silty clay	0	24	36	40	32	19					
27	20.0	Brown sandy silty clay											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 2.2m | Term. Depth : 20.0m | B.H.No. : CBH 11

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
5	1.5	Brown sandy silty clay	0	16	30	54	47	27					
	2.0	Brown sandy silty clay							1.85	23.76	CD	0.30	13
8	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.90	24.69	CD	0.29	14
10	4.5	Brown sandy silty clay	0	18	34	48	41	24					
	4.9	Change of strata											
15	6.0	Brown silty sand	0	83	17	0	-	NP					
17	7.5	Brown silty sand											
22	9.0	Brown silty sand											
23	12.0	Brown silty sand	0	86	14	0	-	NP					
26	15.0	Brown silty sand											
32	18.0	Brown silty sand	0	89	11	0	-	NP					
42	20.0	Brown silty sand											

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

B.H. Location: | Water Table: 3.5m | Term. Depth : 20.0m | B.H.No. : CBH 12

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
	1.5	Brown sandy silty clay	0	17	33	50	42	25					
8	2.0	Brown sandy silty clay							1.81	17.29	CD	0.30	13
8	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.90	24.26	CD	0.29	14
9	4.5	Brown sandy silty clay	0	18	35	47	40	23					
10	6.0	Brown sandy silty clay											
	6.4	Change of strata											
12	7.5	Grey silty sand	0	81	19	0	-	NP					
14	9.0	Grey silty sand											
15	12.0	Grey silty sand	0	86	14	0	-	NP					
	13.8	Change of strata											
13	15.0	Brown sandy silty clay	0	20	34	46	38	23					
15	18.0	Brown sandy silty clay											
16	20.0	Brown sandy silty clay	0	25	36	39	32	19					

*-Natural Bulk Density # -N Values (Observed)

SOIL PROFILE

Project: Proposed Flood Management Works at Mangalagiri, Amaravathi, Tadepalli and Tadikonda Mandals

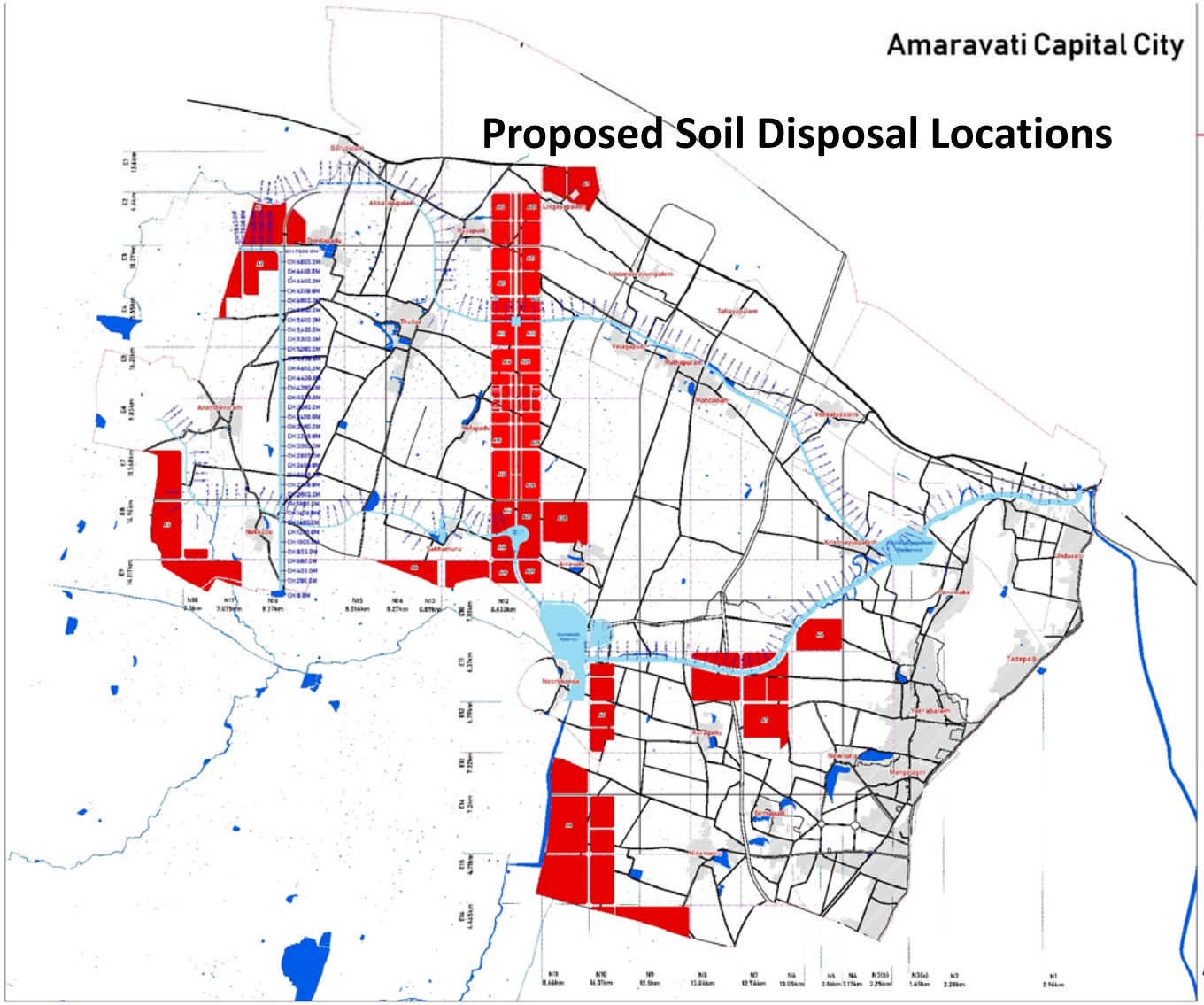
B.H. Location: | Water Table: 3.8m | Term. Depth : 30.0m | B.H.No. : BBH 1

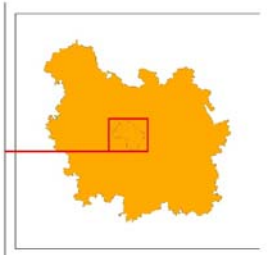
N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density * (g/cm^3)	Water Cont (%)	Type	c (kg/cm^2)	ϕ (°)
	0.0	Ground level											
	0.5	Brown sandy silty clay											
6	1.5	Brown sandy silty clay	0	15	29	56	47	23					
	2.0	Brown sandy silty clay							1.81	11.72	CD	0.26	13
7	3.0	Brown sandy silty clay											
	4.0	Brown sandy silty clay							1.89	25.13	CD	0.27	14
8	4.5	Brown sandy silty clay	0	17	33	50	41	25					
11	6.0	Brown sandy silty clay											
	7.0	Brown sandy silty clay							1.92	23.64	CD	0.25	16
12	7.5	Brown sandy silty clay	0	21	35	44	35	22					
	8.3	Change of strata											
15	9.0	Brown silty sand	0	82	18	0	-	NP					

*-Natural Bulk Density # -N Values (Observed)

Amaravati Capital City

Proposed Soil Disposal Locations





Legend

- Capital City Planning Boundary
- Water Bodies

Trunk Roads

Phase

- Other Trunk Roads
- Phase - I Roads

Master Plan - Mosaic of 22 LPS layouts

Disposal Land

- Zones
- Existing Roads

1:25,000

0 0.75 1.5 3 km

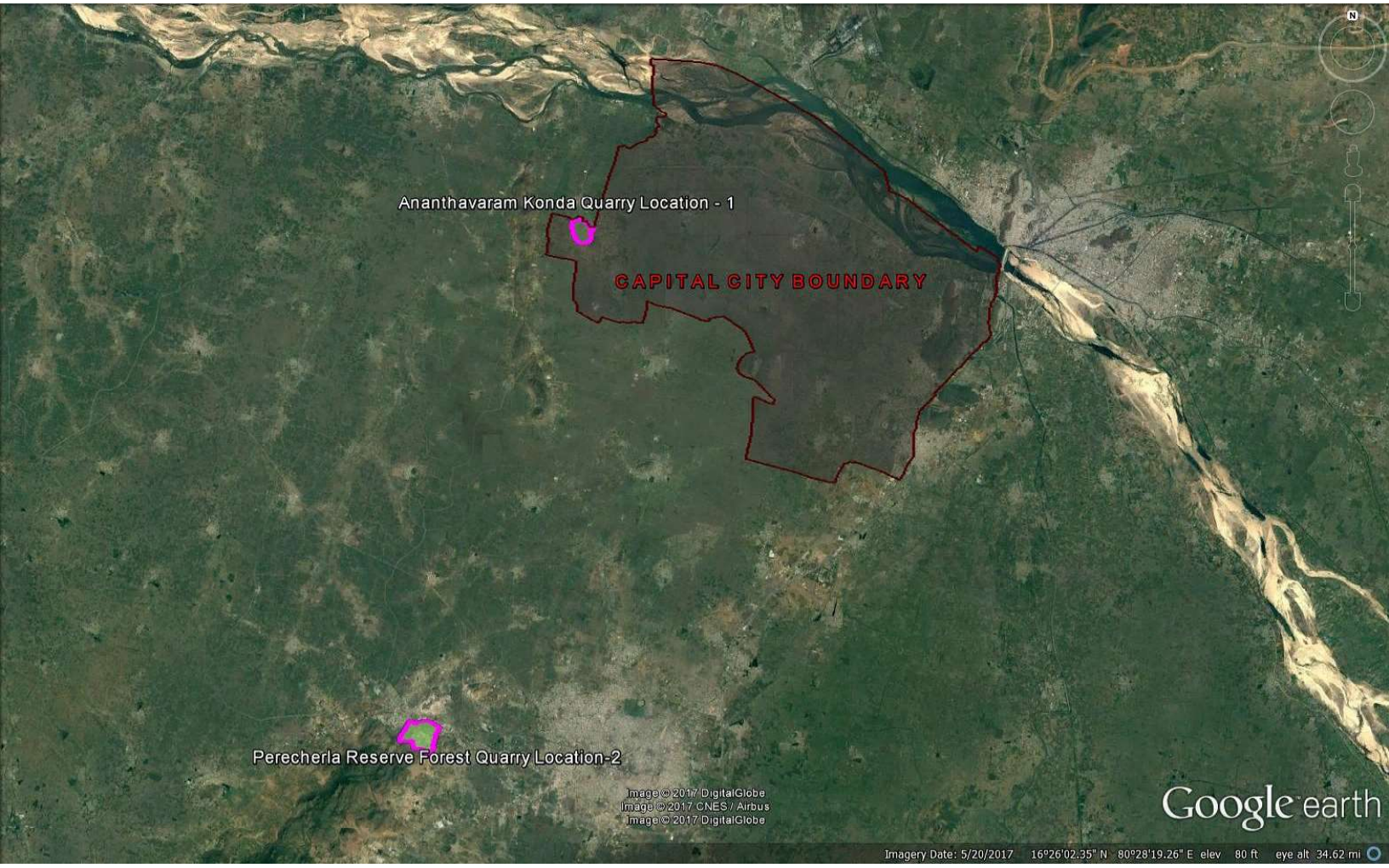
Map Extent: A 0 size

Amaravati Development Corporation Limited

Amaravati Flood Works - Excavated Soil Disposal Locations Details				
S. No	**Description**	**Locationwise Area Details**		**Spoil fill Quantity**
		Sqm	**Acres**	**Cum**
1	Government Sector	4050000	1000.74	9922500
2	Startup Area	1703395	420.90	2895772
3	Near Dondapadu	1681804	415.57	2774977
4	Near Ananthavaram	1106434	273.40	1825616
5	Near Shakamuru	3084110	762.07	5397193
6	Between Neerukonda & Krishnayapalem	7582886	1873.71	13649195
7	Filling in Ananthavaram Quarry	2023500	500.00	4047000
		21232129	**5246.39**	**40512252**
In the above sites a total of app 40.51 mil cu mec can be accommodated which is in line with the overall requirment i.e. 40.50 Mil cu m				

ANNEXURE-XI

QUARRY LOCATIONS

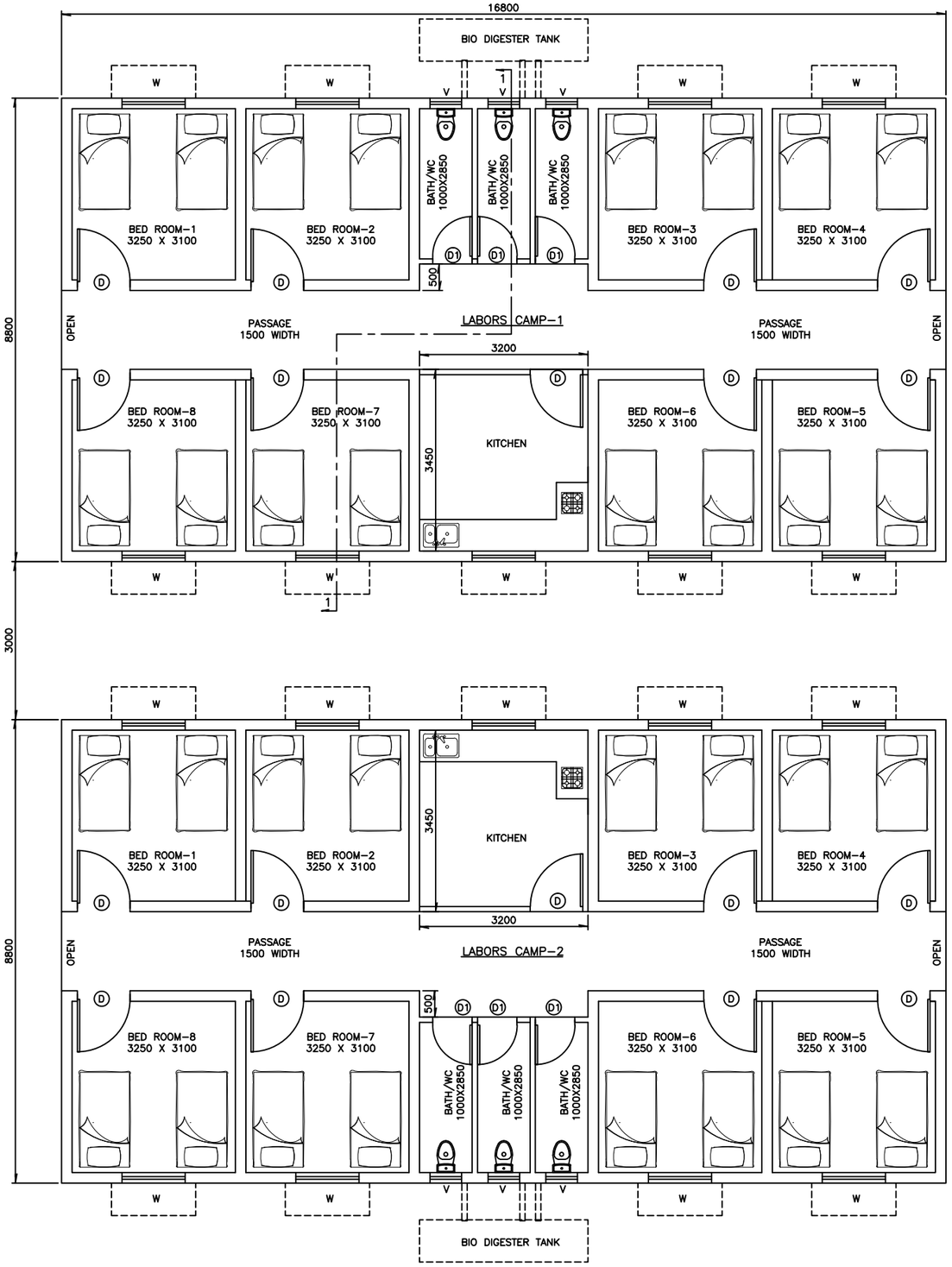

Ananthavaram Konda Quarry Location - 1
CAPITAL CITY BOUNDARY
Perecherla Reserve Forest Quarry Location-2
Image © 2017 DigitalGlobe
Image © 2017 CNES / Airbus
Image © 2017 DigitalGlobe
Google earth
Imagery Date: 5/20/2017 16°26'02.35" N 80°28'19.26" E elev 80 ft eye alt 34.62 mi

Annexure – XII

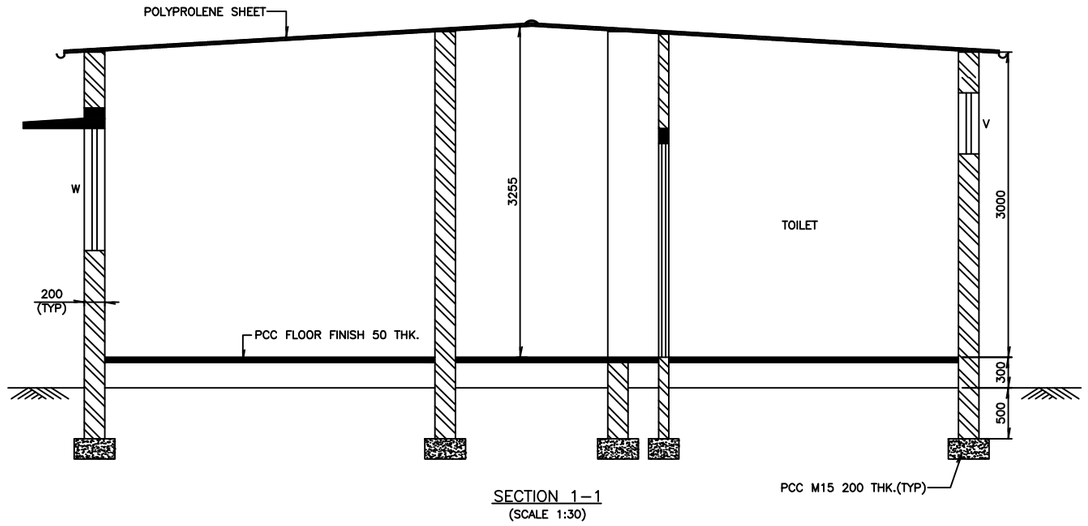
Plan Section of Labor camp

TITLE: ANNEXURE-XII
PLAN AND SECTION OF LABOR CAMP

DWG NO ----



PLAN OF LABORS CAMP
(SCALE 1:50)



SECTION 1-1
(SCALE 1:30)

OPENING DETAILS		
	L	B
DOOR -D	1000	2100
DOOR -D1	750	2100
WINDOW -W	1200	1200
VENTILATOR -V	600	600

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. NUMBER OF BLOCKS MAY VARY DEPENDING ON NUMBER OF LABORS.

LEGEND :

FFL – FINISHED FLOOR LEVEL
FGL – FINISHED GROUND LEVEL
TYP – TYPICAL
PCC – PLAIN CEMENT CONCRETE

– REINFORCEMENT CEMENT CONCRETE
– PCC
– BLOCK WALL

ENGINEERING REFERENCE DRAWINGS :

–NIL–

	SIGN.											
	INITIALS											
	REVISIONS											
	SIGN.											
	INITIALS											
	REVISIONS											
PO	SIGN.											
	INITIALS	GK	RR	VS						AKM		–
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE
					CLEARED							

CAPITAL CITY DEVELOPMENT & MANAGEMENT CORPORATION (CCDMC) VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

ANNEXURE-XII
PLAN AND SECTION OF LABOR CAMP

TATA CONSULTING ENGINEERS LIMITED

ARCADIS Design & Consultancy for natural and built assets

FOR REFERENCE PURPOSE
DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME :

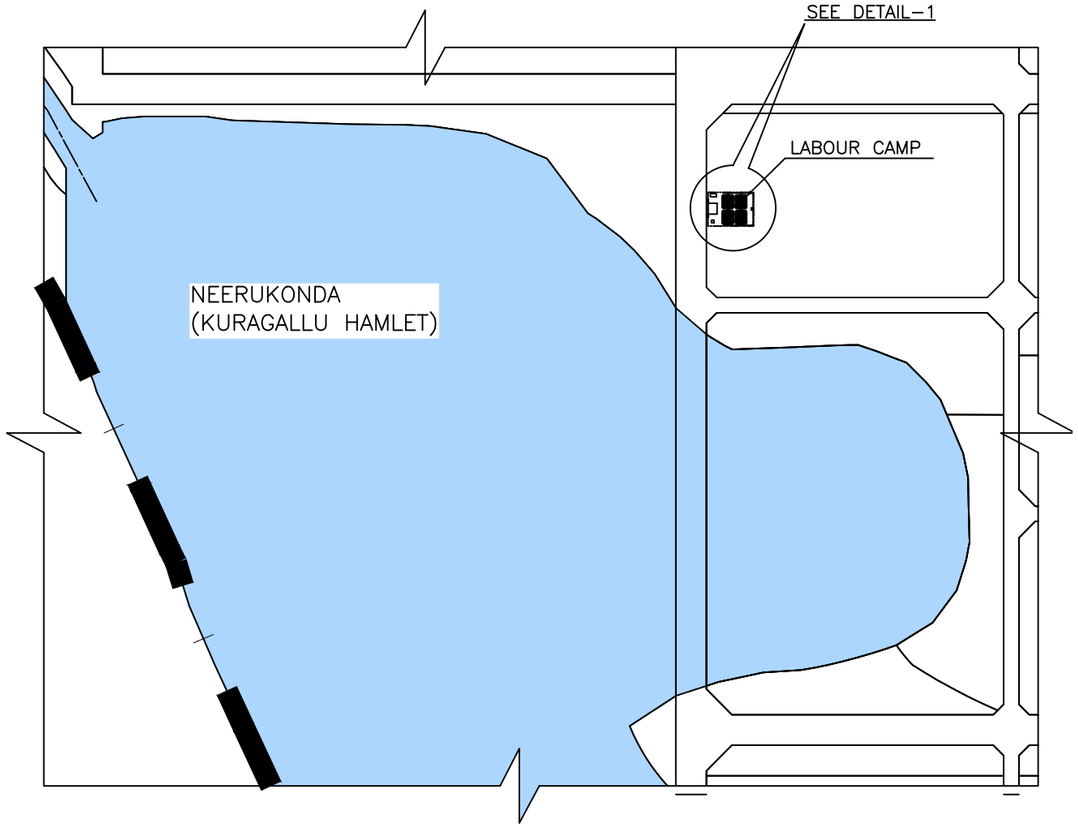
SCALE : AS SHOWN
DC & DISC: BLR & CV
DWG NO.
ISSUE P0
SIZE-A1

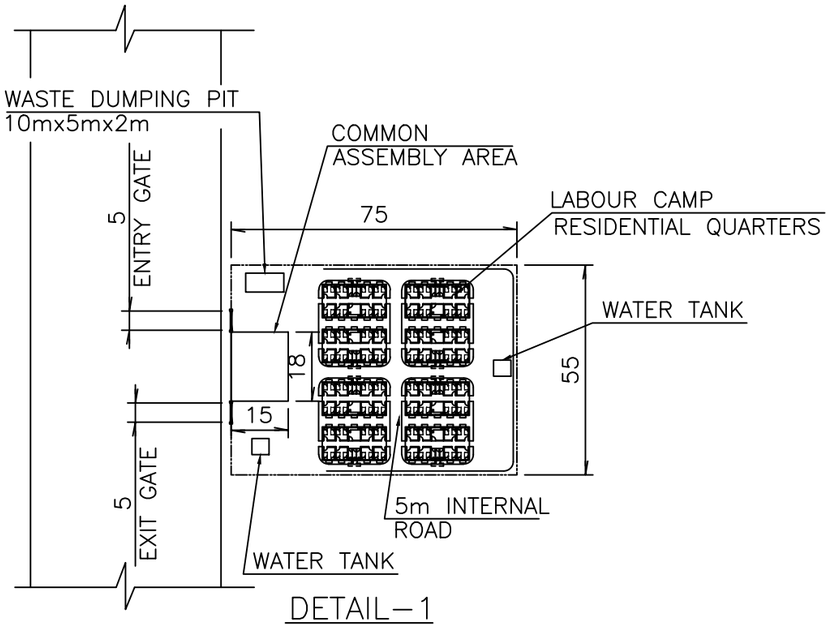
FILE NAME: F-091-Rev-R0.dwg
TCE FORM NO. 091 R0

Annexure – XIIa

Layout Map of Labor camp

TITLE:	DWG NO
ANNEXURE–X11A KEY PLAN OF LABOR CAMP ----	----





DETAIL–1
(SCALE NTS)

NOTE: REFER ANEXXURE–XII FOR DETAILS OF LABOUR CAMP

NOTES :
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

ENGINEERING REFERENCE DRAWINGS :
–NIL–

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
PO	SIGN.												
	INITIALS	GK	RR	VS						AKM			–
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME		PE/PM	APPD	DATE	
					CLEARED								

CAPITAL CITY DEVELOPMENT & MANAGEMENT CORPORATION (CCDMC) VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

FOR REFERENCE PURPOSE

DO NOT SCALE

ANNEXURE–X11A
LAYOUT MAP OF LABOUR CAMP (NEERUKONDA)

TATA CONSULTING ENGINEERS LIMITED

ARCADIS Design & Consultancy for natural and built assets

SCALE : AS SHOWN	DWG NO.	ISSUE P0
DC & DISC: BLR & CV		
FILE NAME :		

SIZE–A1

FILE NAME: F–091–Rev–R0.dwg

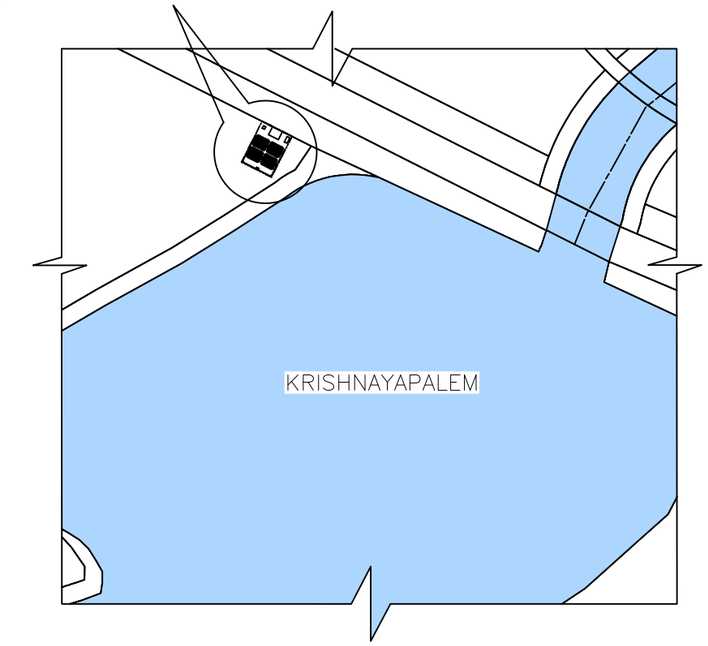
TCE FORM NO. 091 R0

Annexure – XIIb

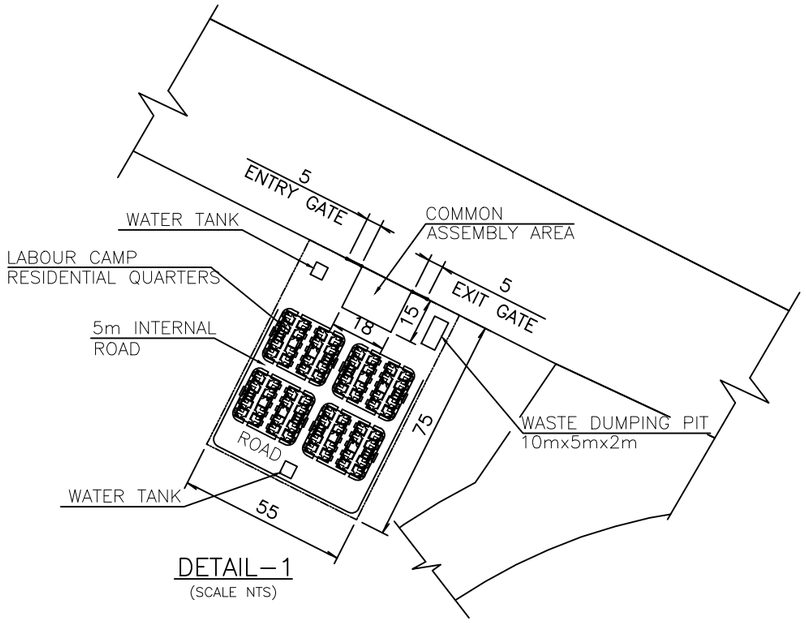
Layout Map of Labor camp

TITLE: ANNEXURE-XIIB KEY PLAN OF LABOR CAMP

DWG NO ----



KEYPLAN OF LABOURS CAMP
(SCALE NTS)



DETAIL-1
(SCALE NTS)

NOTE: REFER ANEXXURE-XII FOR DETAILS OF LABOUR CAMP

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

ENGINEERING REFERENCE DRAWINGS :

-NIL-

	SIGN.												
	INITIALS												
	REVISIONS												
	SIGN.												
	INITIALS												
	REVISIONS												
P0	SIGN.												
	INITIALS	GK	RR	VS							AKM		-
ISSUE		DRN	DSN	CHD	CV	EL	IC	ME			PE/PM	APPD	DATE
					CLEARED								

FOR REFERENCE PURPOSE

DO NOT SCALE

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK.

CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

FILE NAME :

CAPITAL CITY DEVELOPMENT & MANAGEMENT CORPORATION (CCDMC) VIJAYAWADA, ANDHRA PRADESH, INDIA
BLUE CONSULTANT FOR PREPARING DPR FOR WATERWAYS, RIVER TRAINING AND WATER BODIES FOR AMARAVATI CAPITAL CITY

ANNEXURE-XIIB
LAYOUT MAP OF LABOUR CAMP (KRISHNAYAPALEM)

TATA CONSULTING ENGINEERS LIMITED

ARCADIS Design & Consultancy for natural and built assets

SCALE : NTS
DC & DISC: BLR & CV
DWG NO.
ISSUE P0
SIZE-A1

FILE NAME: F-091-Rev-R0.dwg

TCE FORM NO. 091 R0

ANNEXURE-XIII

ANCIENT MONUMENTS AND ARCHAELOGICAL SITES AND REMAINS RULES 1959

THE GAZETTE OF INDIA
EXTRAORDINARY
PART II-SECTION 3 – SUB-SECTION (ii)
PUBLISHED BY AUTHORITY
****
NEW DELHI, THURSDAY, OCTOBER 15, 1959/ASVINA 23, 1881
****

MINISTRY OF SCIENTIFIC RESEARCH AND CULTURAL AFFAIRS

NOTIFICATIONS
NEW DELHI, THE 15TH OCTOBER, 1959

S.O. 2306.- In exercise of the powers conferred by section 38 of the Ancient Monuments and Archaeological Sires and Remains Act, 1958 (24 of 1958), the Central Government hereby makes the following rules, the same having been previously published in the Gazette of India, Part II-Section 3-Sub-Section (ii), dated the 8th August, 1959, as required by sub-section (1) of the said section.

ANCIENT MONUMENTS AND ARCHAEOLOGICAL SITES AND REMAINS RULES 1959

CHAPTER I
PRELIMINARY

1. Short title, date and commencement: (1) These rules may be called the Ancient Monuments and Archaeological Sites and Remains Rules, 1959.

(2) They extend to the whole of India, but rules 24, 25, 27, 28, 29 and 30 shall not apply to the State of Jammu and Kashmir.

(3) They shall come into force on the 15th day of October, 1959.[1]

1. **Definitions.—**In these rules, unless the context otherwise requires.—

(a) ***"construction"*** means the construction of any structure and includes additions to or alterations of an existing building;

(b) ***"copying",*** together with its grammatical variations and cognate expressions, means the preparation of copies by drawing or by photography or by mould or by squeezing and includes the preparation of a cinematographic film [2][and video film] with the aid of a hand-camera which is capable of taking films of not more than eight millimeters and which does not require the use of a stand or involve any special previous arrangement;

---

[1] *Vide* S.O. 2307, dated 15.10.1959
[2] *Vide* GSR 90, dated 30.01.1991

(c) ***"filming",*** together with its grammatical variations and cognate expressions, means the preparation of a cinematographic film [1][including video film] with the aid of a camera which is capable of taking films of more than eight millimeters and which requires the use of a stand or involves other special previous arrangements;

(d) ***"form"*** means a form set out in the Third Schedule;

(e) ***"mining operation"*** means any operation for the purpose of searching for or obtaining minerals and includes quarrying, excavating, blasting and any operation of a like nature;

(f) ***"prohibited area"*** or ***"regulated area"*** means an area near or adjoining a protected monument which the Central Government has, by notification in the Official Gazette, declared to be a prohibited area, or, as the case may be, a regulated area, for purposes of mining operation or construction or both;

(g) ***"Schedule"*** means a Schedule to these rules; and

(h) ***"section"*** means a section of the Ancient Monuments and Archaeological Sites and Remains Act, 1958 (24 of 1958).

CHAPTER II
ACCESS TO PROTECTED MONUMENTS

3. Monuments governed by agreement.—(1) Access to protected monuments in respect of which an agreement has been entered into between the owner and the Central Government under section 6, or in respect of which an order has been made by that Government under section 9, shall be governed by the provisions of the agreement or, as the case may be, the order; and nothing in rules 4, 5, 6 or 7 shall be construed as affecting any such agreement or order.

(2) A copy of the relevant provisions of every such agreement or order shall be exhibited in a conspicuous part of the monument concerned.

4. Parts of monuments not open.—The Director-General may, by order, direct that [2][any protected monument or any specified part thereof] shall not be open, permanently or for a specified period, to any person other than an archaeological officer, his agents, subordinates and workmen and any other Government servant on duty at such part.

5. Monuments when kept open.--(1) The protected monument specified in the First Schedule shall remain open during the hours specified against them in that schedule; protected monuments which are not so specified and to which neither rule 3 nor rule 4 applied shall remain open from sunrise to sunset:

[3][Provided that an archaeological officer, or any officer of the Archaeological Survey of India authorised by him in this behalf may, by notice to be exhibited in a conspicuous part of a protected monument, direct that a protected monument or part thereof shall.—

(i) Be kept open beyond the said period; or

---

[1] *Vide* GSR 90, dated 30.01.1991
[2] *Vide* GSR 800 (E), dated 17.10.2000 with effect from 28.10.2000
[3] *Vide* S.O. 5002, dated 13.12.1969

(ii) Be closed temporarily for such period as may be specified by the notice].

(2) Nothing in this rule or in rule 6 shall apply to an archaeological officer, his agents, subordinates and workmen or to any other Government servant on duty at a protected monument.

6. Entrance fee.—

[1][No person above the age of fifteen years shall enter any protected monument or part thereof.—

(a) Specified as category A monuments in Part I of the Second Schedule,

[2][except on payment as follows:

(i) Citizens of India – Rs. 10/- per head;

(ii) Others - [3][[US $ 5 or Indian Rs. 250/-]] per head.]

(b) Specified as category B monuments in Part II of the Second Schedule,

[2][except on payment as follows;

(i) Citizens of India – Rs. 5/- per head;

(ii) Others - [3][[US $ 2 or Indian Rs. 100/-]] per head.]

[4][* * *]

[5][Provided further that an archaeological officer, or any officer of the Archaeological Survey of India authorised by him in this behalf may exempt, members of delegations sponsored by the Central Government or a State Government, State Guest and persons accompanying such delegations or guest, from the payment of such fee.]

[6][Provided also that the Director-General may, by order, direct that, on such occasions and for such periods as may be specified in the order, no fee shall be charged for entry into a protected monument or part thereof.]

7. Holding of meetings, etc., in monuments.—(1) No protected monument shall be used for the purpose of holding any meeting, reception, party, conference or entertainment except under and in accordance with a permission in writing granted by the Central Government.

(2) Nothing in sub-rule (1) shall apply to any meeting, reception, party, conference or entertainment, which is held in pursuance of a recognized religious usage or custom.

8. Prohibition of certain acts within monuments.—No person shall, within a protected monument,--

---

[1] *Vide* GSR 688(E), dated 24.09.2001, w.e.f. 1.10.2001.
[2] *Vide* GSR 800(E), dated 17.10.2000, w.e.f. 28.10.2000.
[3] *Vide* GSR 688(E), dated 24.09.2001, w.e.f. 1.10.2001.
[4] Word "Provided that on every Friday, no such fee shall be charged". Omitted by GSR 848(E) dated 3.11.2000. w.e.f. 3.11.2000.
[5] *Vide* S.O. 3520, dated 20.11.1966.
[6] *Vide* S.O. 5002, dated 13.12.1969.

(a) do any act which causes or is likely to cause damage or injury to any part of the monument; or

(b) discharge any fire-arms; or

(c) cook or consume food except in areas, if any, permitted to be used for that purpose; or

(d) [1][hawk or sell any goods or wares or canvas any custom for such goods or wares or display any advertisement in any form or show a visitor round or take his photograph for monetary consideration, except under the authority of, or under, and in accordance with the conditions of, a licence granted by an archaeological officer;]

(e) beg for alms; or

(f) violate any practice, usage or custom applicable to or observed in the monument; or

(g) bring, for any purpose other than the maintenance of the monument,

(i) any animal, or

(ii) any vehicle except in areas reserved for the parking thereof.

9. Penalty.—Whoever—

(i) unlawfully enters any protected monument or part thereof at a time when, under these rules, it is not to be kept open, or

(ii) unlawfully enters any protected monument in respect of which an order has been made under rule 5, or

(iii) contravenes of any of the provisions of rule 6 or rule 7 or rule 8,

shall be punishable with fine which may be extended to five hundred rupees.

CHAPTER III
CONSTRUCTION AND OTHER OPERATIONS IN PROTECTED AREAS

10. Permission required for construction, etc.—(1) No person shall undertake any construction or mining operation within a protected area except under and in accordance with a permission granted in this behalf by the Central Government.

(2) Every application for permission under sub-rule (1) shall be made to the Central Government in Form-I at least three months before the date of commencement of the construction or operation.

11. Licence required for excavation.—No person other than an archaeological officer or an officer authorised by him in this behalf shall undertake any excavation for archaeological purposes in any protected area except under and in accordance with the terms and conditions of a licence granted under rule 13.

[1] Vide S.O. 935, dated 16.02.1971.

12. **Application for licence.—**Every application for a licence shall be in Form-II and be made to the Director-General at least three months before the proposed date of the commencement of the excavation operations.

13. **Grant or refusal of licence.—**(1) On receipt of an application under rule 12, the Director-General may grant a licence in Form-III if he is satisfied that, having regard to the status of the applicant, the competence of the director of excavation operations, the adequacy of the staff to be employed and other relevant factors, the licence may be granted to the applicant:

    Provided that no licence shall be granted unless the applicant has furnished security of such amount not exceeding rupees ten thousand as the Director-General may, having regard to the circumstances of each case, require.

    (2) The Director-General, by order, may, for reasons to be recorded in writing, refuse to grant a licence in any particular case.

14. **Period of licence,--**Every licence shall be in force for such period not exceeding three years as may be specified in the licence:

    Provided that the Director-General may, on application made to him at least one month before the expiry of a licence, extend its period by one year at a time so that the aggregate period does not exceed five years.

15. **Cancellation of licence,--**The Director-General may, by order, cancel a licence granted under rule 13 if he is satisfied that the conduct of the excavation operations has not been satisfactory or in accordance with the conditions of the licence, or if any further security demanded under rule 18 has not been deposited within the specified time:

    Provided that no licence shall be cancelled unless the licensee has been given an opportunity to make his objections.

16. **Conditions of licence,--**Every licence shall be subject to the following conditions, namely:

    (a) the licence shall not be transferable;

    (b) the licensee shall give to the Director-General, the Collector and the owner of the land to be excavated at least fifteen days' notice in writing of the commencement of the excavation operations;

    (c) the licensee shall produce the licence before the District Magistrate or the District Superintendent of Police concerned or an archaeological officer, if so required;

    (d) the excavation operations shall be conducted under the supervision of the director named in the licence who shall be present at the excavation operations for at least three-fourths of the period of the operations;

    (e) the licensee shall not, without the permission of the Director-General, dismantle or disturb any structures found during the excavation operations and shall make adequate arrangements for the safety of such structures and of the excavated antiquities till they are taken charge of by the Director-General;

    (f) The licensee shall not subject any antiquities recovered during the excavation operations to any chemical or electrolytic process of cleaning without the written permission of the Director-General;

(g) An archaeological officer or his representative may inspect the excavation operations or any antiquities recovered during the operations and make notes on or copy or film the excavated structures and antiquities;

(h) The licensee shall not discontinue the excavation operations unless he has given at least fifteen days' notice in writing to the Director-General;

(i) At the conclusion of the excavation operations, the licensee shall give notice in writing to the owner of the land specifying the nature of the antiquities, if any, recovered during the operations;

(j) The licensee shall, within three months of the completion of the excavation operations, submit to the Director General a summary report of the results of the excavation, and where the operations are carried on for a period of more than three months such report shall be submitted every quarter, and it shall be open to the Director-General to publish the report in his reports or reviews; and

(k) The licensee shall as soon as practicable submit a report in Form IV to the Central Government through the Director General on the antiquities recovered during the excavation operations.

17. **Recovery from security.—**The Director-General may, by order, direct the deduction, from the security furnished by a licensee under rule 13, of—

(a) the value of any antiquities recovered during the excavation operations and lost or destroyed while in the custody of the licensee; and

(b) any compensation payable by the Central Government under section 27 to the owner or occupier of the land excavated by the licensee.

18. **Demand of further security.—**Where during the currency of a licence, any amount has been recovered under rule 17, the Director-General may require the licensee, within such time as he may specify, to deposit such further sum as security as is equivalent to the amount so recovered.

19. **Appeal.—**Any person aggrieved by an order of the Director-General under rule 13 or rule 15 or rule 17 may prefer an appeal to the Central Government; and the decision of that Government on such appeal shall be final.

20. **Return of security.—**On expiration or earlier cancellation of a licence, the security deposited by the licensee or the balance thereof remaining after deduction of any amount under rule 17 shall be returned to him.

21. **Publication of the result of excavation.—**Save as otherwise provided in rule 16, the Director-General shall not, without the consent of the licensee, publish the results of the excavation unless the licensee has failed to publish the results within the period specified by the Director-General in this behalf.

22. **Retention of antiquities by licensee.—**The Central Government may, by order, subject to such terms and conditions as may be specified, permit the licensee to retain such of the antiquities recovered during the excavation operations as may be specified therein:

Provided that human relics of historical importance and antiquities, which, in the opinion of the Central Government, are of national importance, shall not be permitted to be retained by the licensee.

23. Penalty.—Whoever—

(i) unlawfully undertakes any excavation for archaeological purposes in any protected area, or

(ii) contravenes any of the conditions of a licence,

shall be punishable with fine which may extend to five thousand rupees.

CHAPTER IV
EXCAVATION IN UNPROTECTED AREAS

24. Intimation to the Central Government.—Every State Government intending to undertake or authorize any person to undertake any archaeological excavation or other like operation in any area which is not a protected area shall intimate its intention to the Central Government at least three months prior to the proposed date of the commencement of the excavation or operation specifying the following details, namely,—

(i) name, location and other details of the site;

(ii) nature of antiquities previously found;

(iii) details of previous explorations, if any;

(iv) purpose of the excavation or operation;

(v) proposed extent of the excavation or operation (a plan of the site in triplicate showing in red outline the extent of the proposed excavation or operation should be attached);

(vi) proposed duration of the excavation or operation;

(vii) amount of the proposed expenditure on the excavation or operation; and

(viii) name and status of the director of the excavation or operation.

25. Approval by the Central Government.—After considering the proposal, the Central Government may either approve it or advise the State Government to modify it or to abandon it altogether.

26. Deputation of an archaeological officer.—The Central Government may depute an archaeological officer to inspect the excavation or operation while it is in progress and render such advise as he deems necessary.

CHAPTER V
REPORT ON EXCAVATED ANTIQUITIES BY AN ARCHAEOLOGICAL OFFICER

27. Form of report by an archaeological officer.—Where, as a result of an excavation made by an archaeological officer in any area under section 21 or 22 any antiquities are

discovered, the archaeological officer shall, as soon as practicable, submit a report in Form V to the Central Government through the Director-General on the antiquities recovered during the excavation.

CHAPTER VI
MOVING OF ANTIQUITIES FROM CERTAIN AREAS

28. **Application for moving antiquities.—**Every application for permission to move any antiquities or any class of antiquities in respect of which a notification has been issued under sub-section (1) of section 25 shall be made in Form-VI to the Director-General at least three months before the proposed date of the moving.

29. **Grant of refusal of permission.—**On receipt of an application under rule 28, the Director-General may, after making such enquiry as be may deem necessary, grant permission for the moving of all or any of the antiquities or, for reasons to be recorded, refuse such permission.

30. **Appeal.—**Any person aggrieved by an order of the Director General under rule 29 may prefer an appeal to the Central Government; and the decision of that Government on such appeal shall be final.

CHAPTER VII
MINING OPERATION AND CONSTRUCTION NEAR PROTECTED MONUMENTS

31. **Notice of intention to declare a prohibited or regulated area**.--(1) Before declaring an area near or adjoining a protected monument to be a prohibited area or a regulated area for purposes of mining operation or construction or both, the Central Government shall, by notification in the Official Gazette, give one month's notice of its intention to do so; and a copy of such notification shall be affixed in a conspicuous place near the area.

    (2) Every such notification shall specify the limits of the area which is to be so declared and shall also call for objections, if any, from interested persons.

32. **Declaration of prohibited or regulated area.—**After the expiry of one month from the date of the notification under rule 31 and after considering the objections, if any, received within the said period, the Central Government may declare, by notification in the Official Gazette, the area specified in the notification under rule 31, or any part of such area, to be a prohibited area, or, as the case maybe, a regulated area for purposes of mining operation or construction or both.

33. **Effect of declaration of prohibited or regulated area.—**No person other than an archaeological officer shall undertake any mining operation or any construction—

    (a) in a prohibited area, or

    (b) in a regulated area, except under and in accordance with the terms and conditions of a licence granted by the Director-General.

34. **Application for licence.—**Every person intending to undertake any mining operation or any construction in a regulated area shall apply to the Director-General in Form VII at least three months before the date of commencement of such operation or construction.

35. Grant or refusal of licence.—(1) On receipt of an application under rule 34, the Director General may grant a licence or, if he is satisfied that the licence asked for should not be granted, may, for reasons to be recorded, refuse to grant a licence.

(2) Every licence granted under sub-rule (1) shall be in Form VIII and be subject to the following conditions, namely:-

(a) the licence shall not be transferable;

(b) it shall be valid for the period specified therein; and

(c) any other condition relating to the manner of carrying out the mining operation or the construction which the Director-General may specify in the licence for ensuring the safety and appearance of, and the maintenance of the approach and access to, the protected monument.

36. Cancellation of licence.—The Director-General may, by order, cancel a licence granted under rule 35 if he is satisfied that any of its conditions has been violated:

Provided that no licence shall be cancelled unless the licensee has been given an opportunity to make his objections.

37. Appeal.—Any person aggrieved by an order of the Director-General made under rule 35 or rule 36 may prefer an appeal to the Central Government; and the decision of that Government on such appeal shall be final.

38. Removal of unauthorized buildings.—(1) The Central Government may, by order, direct the owner or occupier of an unauthorized building in a prohibited area or in a regulated area or of a building or part thereof which has been constructed in contravention of any of the conditions of a licence granted under rule 35 to remove such building or part thereof within a period specified in that order.

(2) If the owner or occupier refuses or fails to comply with an order made under sub-rule (1), the Central Government may direct the District Magistrate to cause the building or part thereof to be removed, and the owner or occupier shall be liable to pay the cost of such removal.

39. Penalty. —Whoever—

(i) unlawfully undertakes any mining operation or construction in a prohibited area or in a regulated area, or

(ii) contravenes any of the conditions of a licence, or

(iii) fails or refuses to comply with an order made under sub-rule (1) of rule 38,

shall be punishable with imprisonment, which may extend to three months or with fine which may extend to five thousand rupees or with both.

CHAPTER VIII
COPYING AND FILMING OF PROTECTED MONUMENTS

40. Permission required for copying certain monuments.—The Director General may, by order, direct that no person other than an archaeological officer or an officer authorized by an archaeological officer in this behalf shall copy any specified monument or part thereof except

under and in accordance with the terms and conditions of a permission in writing by an archaeological officer.

41. Conditions of copying other monuments.—(1) Any person may copy a protected monument in respect of which no order under rule 40 has been made.

(2) Nothing in sub-rule (1) shall be construed as authorizing any person other than an archaeological officer or an officer authorised by him in this behalf, while copying any such monument, to—

(a) bring into or use within the precincts of such monument a camera-stand, stool, chair, table, large drawing-board, easel or any such appliance, or

(b) erect any scaffolding within such precincts, or

(c) use within such precincts any artificial light other than a flash-light synchronised with the exposure of a camera, or

(d) apply any extraneous matter, such as water, oil, grease or any moulding material, on such monument or part thereof, or

(e) prepare a direct tracing or mould or squeeze of such monument or part thereof, except under and in accordance with the terms and conditions of a permission in writing granted by an archaeological officer.

42. Licence required for filming.—

[1][(1) No person other than an archaeological officer or an officer authorised by him in this behalf shall undertake any filming operation at a protected monument or part thereof except under and in accordance with the terms and conditions of a licence granted under rule 44.

[2][(2) Nothing in sub-rule (1) shall apply to any person undertaking video filming from exterior of a protected monument except those specified in the Second Schedule in respect of which video-filming shall be permitted on payment of Rs. 25/-;

Provided it is for non-commercial purpose and does not involve any cast and use of a stand or in anyway interfere with customary and religious practices and work and work of repairs.]

43. Application for licence.—Every person intending to undertake any filming operation at a protected monument shall apply to the Director-General in Form IX at least three months before the proposed date of the commencement of such operation.

44. Grant or refusal of licence.—(1) On receipt of an application under rule 43, the Director General may grant a licence [3][on payment of a fee of Rs. 5,000 (rupees five thousand) in case of professionals and other agencies] or, if he is satisfied that the licence asked for should not be granted, may, for reasons to be recorded, refuse to grant a licence:

Provided that the Director General shall not grant any licence to film the interior of any protected monument, that is to say such part of any protected monument as is covered

[1] Renumbered by GSR 90, dated 30.01.1991.
[2] *Vide* GSR 90, dated 30.01.1991.
[3] *Vide* GSR 90, dated 30.01.1991.

by a roof of any description, except when the film is for the purpose of education or of publicising the monument.

(2) Every licence granted under sub-rule (1) shall be in Form X and be subject to the following conditions, namely:-

(a) the licence shall not be transferable and shall be valid for the period specified therein;

(b) nothing shall be done by the licensee or any member of his party which has, or may have, the effect of exposing any part of the monument or attached lawn or garden to the risk of damage;

(c) the filming operation shall be restricted to that part of the monument in respect of which the licence has been granted;

(d) no extraneous matter, such as water, oil, grease or the like, shall be applied on any part of the monument;

(e) the generating plant for electric power, wherever required, shall be placed away from the monument or the attached lawn or garden;

(f) the filming operation shall not obstruct or hamper the movement of persons who may lawfully be within the precincts of the monuments and

(g) any other condition which the Director-General may specify in the licence.

45. Cancellation of licence.—The Director-General, by order, may, after giving notice to the licence, cancel a licence granted under rule 44 if he is satisfied that any of its conditions has been violated.

46. Appeal.—Any person aggrieved by an order of the Director-General made under rule 44 or rule 45 may prefer an appeal to the Central Government; and the decision of that Government on such appeal shall be final.

47. Certain rules not affected.—Nothing in rule 41 and no provision of a permission granted under rule 40 or of a licence granted under rule 44 shall affect the operation of rules 3, 4, 5, 6, 7, 8 and 9.

48. Penalty.—Whoever copies or films any protected monument or does any other act in contravention of any provision of this chapter or of any permission or licence granted thereunder shall be punishable with fine which may extend to five hundred rupees.

CHAPTER IX
MISCELLANEOUS

49. Manner of preferring an appeal.—

(1) Every appeal to the Central Government under the Ancient Monuments and Archaeological Sites and Remains Act, 1958, or under these rules shall be in writing and shall be preferred within one month of the date of receipt of the order appealed against.

(2) Every such appeal shall be accompanied by a copy of the order appealed against.

50. Service of orders and notices.—Every order or notice made or issued under the Ancient Monuments and Archaeological Sites and Remains Act, 1958, or these rules shall—

(a) in the case of any order or notice of a general nature or affecting a class of persons, be published in the Official Gazette; and

(b) in the case of any order or notice affecting a corporation or firm, be served in the manner provided for the service of summons in rule 2 of order XXIX or rule 3 of order XXX, as the case may be, in the First Schedule to the Code of Civil Procedure, 1908; and

(c) in the case of any order or notice affecting an individual person, be served on such person—

(i) by delivering or tendering it to the person concerned, or

(ii) if it cannot be so delivered or tendered, by delivering or tendering it to any adult male member of the family of such person or by affixing a copy thereof on the outer door or some conspicuous part of the premises in which that person is known to have last resided or carried on business or personally worked for gain, or

(iii) by sending it by registered post, acknowledgement due.

[1][SCHEDULES

Hours during which certain monuments or part thereof will remain open (vide rule 5)

Serial no.	State	District	Locality	Name of monument	Part of monumemnt which shall remain open during hours other than from sunrise to sunset	Hours of opening
1.	Andhra Pradesh	Hyderabad	Hyderabad City	Char Minar	(i) Second storey and upwards (ii) Remaining area	(i) From 9 AM to 5.30 PM or sunset whichever is earlier (ii) From sunrise to 10 PM
2.	Bihar	Patna	Kumrahar	Site of Mauryan Palace	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.
3.	Bihar	Patna	Nalanda (Bargaon)	All mounds, structures and buildings enclosed in the acquired area	Fenced area containing excavated remains.	From 9 AM to 5.30 PM or sunset whichever is earlier.
4.	Delhi	Delhi	Delhi Zail	Afsar Wala-ki-masjid	Garden	From Sunrise to 10 PM
5.	Delhi	Delhi	Delhi Zail	Gateways of Abadi Bagh Bu-Halima	Garden	From Sunrise to 10 PM
6.	Delhi	Delhi	Delhi Zail	Jantar Mantar	Whole	From Sunrise to 10 PM
7.	Delhi	Delhi	Delhi Zail	Kotla Firoz Shah	Garden	From Sunrise to 10 PM
8.	Delhi	Delhi	Delhi Zail	Tomb of Afsar Wala	Garden	From Sunrise to 10 PM
9.	Delhi	Delhi	Delhi Zail	Tomb of Khan Khanan	Garden	From Sunrise to 10 PM
10.	Delhi	Delhi	Mehrauli Zail	Group of buildings at Hauz Khas	Garden	From Sunrise to 10 PM
11.	Delhi	Delhi	Mehrauli Zail	Qutb archaeological area	Garden	From Sunrise to 10 PM
12.	Madras	South Arcot	Gingee	Fortress including monuments on Krishnagiri and Rajagiri hills	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.

[1] Vide S.O. 5002, dated 13.12.1969

13.	Maharashtra	Aurangabad	Ajanta	Ajanta Caves	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.
14.	Maharashtra	Aurangabad	Aurangabad	Tomb of Rabia Daurani (Bibi-ka-Maqbara)	Garden	From sunrise to 10 PM
15.	Maharashtra	Bombay (suburban)	Kanheri	Buddhist Caves	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.
16.	Maharashtra	Kolaba	Gharapuri	Elephanta Caves	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.
17.	Maharashtra	Poona	Karla	Cave Temples	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.
18.	Mysore	Bangalore	Bangalore	Tipu Sultan's Palace	Garden	From sunrise to 10 PM
19.	Mysore	Bijapur	Bijapur	Gol Gumbaz	Garden	From sunrise to 10 PM
20.	Mysore	Mandya	Seringapatnam	Daria Daulat Bagh	(i)Palace (ii)Garden	(i) From 9 AM to 5.30 PM or sunset whichever is earlier (ii) From sunrise to 10 PM
21.	Mysore	Mysore	Somanathpur	Kesava temple	Whole	From 9 AM to 5.30 PM or sunset whichever is earlier.
22.	Rajasthan	Ajmer	Ajmer	Marble pavilion and balustrade on the Anasagar Bund and the ruins of the marble Hamam behind the Anasagar Dam	Whole	From sunrise to 10 PM
23.	Uttar Pradesh	Agra	Agra	Taj Mahal	Whole	From sunrise to 10 PM. On full-moon days and four days preceding and following from sunrise to 12 PM (midnight)
24.	Uttar Pradesh	Lucknow	Lucknow	Residency buildings	(i) Model room (ii) Garden	(i) From 9 AM to 5.30 PM or sunset whichever is earlier (ii) From sunrise to 10 PM

[1]SECOND SCHEDULE
(see rule 6)
Protected monuments or parts thereof entry into which can be had only on payment of fee
Part – I
Category 'A' Monuments

Serial no.	State	District	Locality	Name of monument	Part of monument for which payment of fee is required
1.	Karnataka	Bellary	Hampi Kamalapuram Krishnapuram Venkatapuram	Group of monuments	Ancient enclosures, Kamalapuram; Royal enclosures Kamalapuram: Hazara Ram Temple, Kamalapuram Zanana enclosures, Kamalapuram Krishna Temple, Krishnapuram; Vithal Temple, Venkatapuram, Pattabhirama Temple, Kamalapuram Achutaraya Temple, Venkatapuram.
2.	Karnataka	Bijapur	Pattadakal	Group of temples	Whole, except Virupaksha Temple.
3.	Maharashtra	Aurangabad	Ajanta	Ajanta Caves	Whole
4.	Maharashtra	Aurangabad	Ellora	Ellora Caves	Group of caves
5.	Maharashtra	Bombay (Kolaba)	Gharapuri	Elephanta Caves	Cave nos. 1 to 5 and fenced area in front
6.	Madhya Pradesh	Chhattarpur	Khajuraho	Western group of temples	Whole, except Matangesvara temple
7.	Madhya Pradesh	Raisen	Sanchi	Buddhist Monuments	Whole
8.	National Capital Territory of Delhi	Delhi	Delhi Zail	Humayun's Tomb	Whole monument and gardens within the enclosure wall and gateway
9.	National Capital Territory of Delhi	Delhi	Mehrauli	Qutab, Archaeological area	Whole, except Qutab Minar from inside.
10.	Orissa	Puri	Konarak	Sun Temple	Ancient Monuments of the Black Pagoda and ruins of all ancient edifices, images, structures, basement, pillars, carvings, walls, gateways, etc., of the complex.
11.	Tamil Nadu	Chengai Anna	Mahabalipuram	Group of monuments at Mahabalipuram	Whole
12.	Uttar Pradesh	Agra	Agra	Agra Fort	Archaeological area
13.	Uttar Pradesh	Agra	Agra	Taj group of monuments	The Taj and its garden and grounds, including the Jawab on the east, the pavilions on east and west sides of the grounds as well as all the towers (except

[1] Vide GSR 306, dated 10.07.1996

					the two towers flanking the Masjid) and the Great Southern Entrance Gateway with the cloisters on its flanks, the old Mughal Acquaduct in the Taj with the Central Marble Tank, the well at the Taj Garden and the drinking fountain in the west enclosure wall of the Taj Garden.
14.	Uttar Pradesh	Agra	Fatehpur Sikri	Fatehpur Sikri group of monuments	The entire area bounded on the south by the compound wall to the south of Jodhabai Palace and further eastwards by the road leading to the southern entrance of Diwan-i-am quadrangle, on the east by the Diwan-i-am quadrangle; on the north by the walls enclosing the Diwan-i-Khas, Ankh Michauli Hospital, Zanana Garden and Birbal's daughter's palace and on the west by the wall enclosing the horse's stable

[1]SECOND SCHEDULE

Monuments or parts thereof entry into which can be had only on payment of fee (vide rule 6)

Serial no.	State	District	Locality	Name of monument	Part of monument for which payment of fee is required
1.	Andhra Pradesh	Chittor	Chandragiri	Raja and Rani Mahal	Whole
2.	Andhra Pradesh	Hyderabad	Golkonda	Golkonda Fort	Whole
3.	Assam	Sibsagar	Garhagaon	Ahom Raja's Palace	Whole
4.	Bihar	Nalanda	Nalanda (bargain)	All mounds, structures and buildings enclosed in the acquired area, Nalanda	Fenced area containing excavated remains.
5.	Bihar	Patna	Kumrahar	Site of Mauryan Palace	Whole
6.	Bihar	Rohtas	Sasaram	Shershah Suri Tomb	Whole
7.	Bihar	Vaishali	Chakramdas	Ancient ruins, Vaishali	The Stupa, Ashokan Pillar, mounds and excavated remains
8.	Gujarat	Ahmedabad	Lothal	Excavated remains at Lothal	Whole
9.	Gujarat	Mehsana	Modhera	Sun Temple	Sun temple, Sun tank, Kund and carved stones with images, temples and underground cell.

[1] Vide GSR 306, dated 10.07.1996

10.	Gujarat	Mehsana	Patan	Rani-ki-Vav	Whole
11.	Jammu & Kashmir	Udhampur	Kiramchi	Group of temples	Whole complex
12.	Jammu & Kashmir	Udhampur	Ramnagar	Ramnagar Palace	Palace attributed to Raja Suchet Singh.
13.	Karnakata	Bangalore	Bangalore	Tipu Sultan Palace	Whole
14.	Karnataka	Bijapur	Aihole	Durga Temple Complex	Whole
15.	Karnakaka	Bijapur	Badami	Jaina and Vishnu caves	Whole
16.	Karnakata	Bijapur	Bijapur	Gol Gumbaz	The Mausoleum and garden
17.	Karnataka	Bijapur	Bijapur	Ibrahim Rouza	Whole
18.	Karnakaka	Chitaldurg	Chitaldurg	Chitaldurg	Fortress and temples on the hill
19.	Karnataka	Mandya	Srirangapatna	Daria Daulat Bagh	Palace complex and garden
20.	Karnataka	Mysore	Somanathapura	Sri Kesava Temple	Whole
21.	Kerala	Kannur	Pallicherry	Bekal fort	Whole
22.	Maharashtra	Aurangabad	Aurangabad	Tomb of Rabia Daurani (Bibi-ki-Maqbara)	Tomb and the garden
23.	Maharashtra	Aurangabad	Daulatabad	Daulatabad Fort	Daulatabad Fort and monuments therein
24.	Maharashtra	Bombay suburban	Kanheri	Caves	Buddhist caves
25.	Maharashtra	Kolaba	Alibag	Hirakota Old Fort	Whole
26.	Maharashtra	Kolaba	Raigad	Raigad Fort	Whole
27.	Maharashtra	Nasik	Pathardi	Pandav Lena Caves	Whole
28.	Maharashtra	Pune	Junnar	Junnar Caves and inscriptions	Whole
29.	Maharashtra	Pune	Karla	Cave temples	Whole
30.	Maharashtra	Pune	Pune	Shaniwarwada	Old citadel known as Shaniwarwada
31.	Maharashtra	Sholapur	Sholapur	Old Fort	Whole
32.	Madhya Pradesh	Dhar	Mandu	Group of monuments	Royal enclosures (Jahaz Mahal, Hindola Mahal and other palatial remains)
33.	Madhya Pradesh	Gwalior	Gwalior	Gwalior Fort	Badal mahal, Mansingh's Palace, Sas bahu temples, Teli ka Mandir
34.	Madhya Pradesh	Nimar (East)	Burhanpur	Palace situated in the Fort (Shahi Quila)	Whole
35.	Madhya Pradesh	Raipur	Sirpur	Group of monuments (Laxman temple)	Whole
36.	National Capital Territory of Delhi	Delhi	Delhi Zail	Delhi Fort	Archaeological area

37.	National Capital Territory of Delhi	Delhi	Delhi Zail	Tomb of Safdarjung	Whole with all its enclosures, wall, gateway and gardens
38.	National Capital Territory of Delhi	Delhi	Purana Quila	Purana Quila	Gateways, bastions and gardens, Quila-i-Khaona Mosque and Sher Mandan (from outside).
39.	Orissa	Puri	Bhubaneswar	Raja Rani Temple	Whole
40.	Orissa	Puri	Jagmara	Udaygiri and Khandagiri	All ancient caves, structures and other monuments or remains situated on the Udaygiri and Khandagiri hills except the Temple of Parasnath on the top of the Khandagiri hill and also the temple in front of Harabhuji and the Trisula Caves.
41.	Rajasthan	Bharatpur	Deeg	Deeg Palace	Whole
42.	Rajasthan	Chittor	Chittorgarh	Fort	Victory tower and other buildings
43.	Rajasthan	Udaipur	Kumbhalgarh	Fort of Kumbhalgarh	Whole
44.	Tamil Nadu	Dindigul	Dindigul	Fort	Whole
45.	Tamil Nadu	Madras	Fort St. George	Fort St. George	Part of the Fort complex where objects are on display for public writing.
46.	Tamil Nadu	Pudukkottai	Tirumayam	Fort	Whole
47.	Tamil Nadu	South Arcot	Gingee	Rajagiri Fort and Krishnagiri Fort	Whole (Annual festival is held every year during the month of May and fee will remain suspended for 10 days at Rajagiri Fort, Gingee)
48.	Tamil Nadu	Tiruchirapalli	Kodumabur	Muvarkoil	Surrounding sub-shrines, stone enclosures, and stone well on the north-east corner.
49.	Uttar Pradesh	Agra	Agra	Group of monuments at Ram Bagh	Whole
50.	Uttar Pradesh	Agra	Agra	Itimad-ud-daula's Tomb	Whole
51.	Uttar Pradesh	Agra	Sikandara	Akbar's Tomb	Whole
52.	Uttar Pradesh	Agra	Sikandara	Mariam's Tomb	Whole
53.	Uttar Pradesh	Bahraich	Sahet-Mahet	Monuments of Sravasti	Excavated remains at Sahet within the fenced area.
54.	Uttar Pradesh	Jhansi	Jhansi	Rani Jhansi Mahal	Whole
55.	Uttar Pradesh	Jaunpur	Jaunpur	Fort (old)	Whole
56.	Uttar Pradesh	Lucknow	Lucknow	Residency Buildings	Model Room and the garden
57.	Uttar Pradesh	Varanasi	Sarnath	Excavated remains at Sarnath	Whole
58.	West Bengal	Murshidabad	Hazarduari	Hazarduari Palace	Parts of the palace complex where objects are also on display

Monuments or parts thereof entry into which can be had only on payment of fee[1] (vide rule 6)

Sl.	Name of the monument	Locality	State
1	Rani Jhansi Fort	Jhansi	Uttar Pradesh
2	Jantar Mantar	Delhi	Delhi
3	Rahim-Khane-Khanan Tomb	Delhi	Delhi
4	Karanghar Palace	Sibsagar	Assam
5	Rang-dhar Pavilion	Sibsagar	Assam
6	Avantiswami Temple	Avantipura	Jammu & Kashmir
7	Rock cut caves	Masrur	Himachal Pradesh
8	Kangra Fort	Kangra	Himachal Pradesh
9	Cooch Behar Palace	Cooch Behar	West Bengal
10	Bishnupur Temples	Bishnupur	West Bengal
11	Rani Roopmati Pavilion	Mandu	Madhya Pradesh
12	Hoshang Shah's Tomb	Mandu	Madhya Pradesh
13	Hoshang Shah's Palace	Mandu	Madhya Pradesh
14	Brihadeswara temple	Gangaikonda Cholapuram	Tamilnadu
15	Temples and sculpture gallery	Lakkundi	Karnataka
16	Bellary Fort	Bellary	Karnataka
17	Nanjangud	Nanjangud	Karnataka
18	Bagh Caves	Bagh	Madhya Pradesh
19	Aurangabad Caves	Aurangabad	Maharashtra
20	Raigarh hill monuments	Colaba	Maharashtra
21	Cave temple and inscriptions	Bhaja	Maharashtra
22	Ratnagiri monuments	Ratnagiri	Orissa
23	Lalitgiri monuments	Lalitgiri	Orissa
24	Lower Fort and structures	Chandragiri	Andhra Pradesh
25	Upper Fort	Chandragiri	Andhra Pradesh
26	Ruined Buddhist stupa and other remains	Amravati	Andhra Pradesh
27	Four storeyed rock-cut Hindu temple	Undavalli	Andhra Pradesh
28	Thousand Pillared temple	Hanamkonda	Andhra Pradesh
29	Warrangal fort	Warrangal	Andhra Pradesh
30	**Buddhist monuments:** 1. Rock-cut temple 2. Large Monastery 3. Small Monastery 4. Brick Chaitya 5. Ruined Mandapa 6. Stone build stupa and large group of stupas	Guntapalle	Andhra Pradesh
31	Ashokan rock edict	Junagadh	Gujarat
32	Buddhistic Cave	Junagadh	Gujarat
33	Baba Pyare Khapra Kodia Caves	Junagadh	Gujarat

[1] Vide GSR 799 (E), dated 17.10.2000.

34	Champaner monuments	Champaner	Gujarat
35	Suraj Kund monastery	Lakarpur	Haryana
36	Shiekh Chilli's Tomb	Thaneshwar	Haryana
37	Group of four maidans	Charaideo	Assam
38	Ahom Palace	Garhgaon	Assam
39	Bishnudol	Jaisagar	Assam
40	Devidol	Jaisagar	Assam
41	Excavated site	Vikramshila	Bihar
42	Bekal fort	Bekal	Kerala
43	Hill of Nagarjunakonda with the ancient remains	Pullareddigudem (Agraharam)	Andhra Pradesh
44	Rock-cut Jain temple	Sittannavasal	Tamilnadu
45	Natural cavern with stone bed and Brahmi and old Tamil inscriptions called Eladipattam	Sittannavasal	Tamilnadu
46	Leh Palace	Leh	Jammu & Kashmir
47	Sultangarhi	Delhi	Delhi
48	Tomb of Lord Cornwallis	Ghazipur	Uttar Pradesh
49	Observatory of Mansingh	Varanasi	Uttar Pradesh
50	Fort of Kalinjar, together with the parapet walls, with the gateways and the monuments inside it, viz., Sita Kunda, Sita Sez, Patalganga, Pandu Kund, Bhaironka jhirka, Siddh-ki-gumpha, Bhagwan-Sez, Pani-ka-aman, Mrigthara, Koththirth, Linga tempole of Nilakanthal, etc.	Kalinjar	Uttar Pradesh
51	Mehtab Bagh on the river bank facing Taj	Agra	Uttar Pradesh
52	Kotla Feroz Shah with remaining walls, bastions and gateways and gardens, the Old Mosque and well and other ruined buildings it contains	Delhi	Delhi
53	Tughlaqabad Fort (Palace area) and Tomb of Tughlaq Ghiasudin	Delhi	Delhi

THIRD SCHEDULE

FORM I

Application for permission for construction/mining
Operation within a protected area.
(See rule 10)

1. Name and address of applicant[1]

2. Name of the protected area within which construction/mining operation is proposed.

   Locality **District** **State**

3. Nature and details of the proposed construction/mining operation in respect of which permission is sought.

   (In the case of construction, a site-plan in triplicate showing in red outline the location of the building in relation to the protected area and the plan and elevation of the building should be attached; and the colour, external appearance and method of the screening of the building and the depth down to which the soil will be excavated for the appurtenances of the building should be specified.

   In the case of mining operation, a site-plan in triplicate showing in red outline the extent of the operation in relation to the protected area should be attached; and details, regarding the depth down to which the operation is to be carried out, the mode of the operation, the method of the muffling of sound, the kind and charge of blasting material and the depth and number of blast-holes to be fired at a time should be specified.)

4. Purpose of the proposed construction/mining operation.

5. Approximate duration and date of commencement of the proposed construction/mining operation.

   I declare that the above information is correct. I also undertake to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958, and rules made thereunder.

   Station

   Seal of the organization

   Date

   Signature of the applicant[2]

[1] If the application is on behalf of an organisation, the name thereof should be given.

[2] If the application is on behalf of an organization, the signature should be that of the head of the department.

FORM II

Application For Licence To Excavate In A Protected Area
(Vide rule 12)

1. Name and address of applicant[1]

2. Name of the site

   Locality District State

3. Extent of the proposed excavation (a plan of the site in triplicate showing in red outline the extent of the proposed excavation should be attached).

4. Approximate duration and date of commencement of the proposed excavation.

5. Approximate expenditure on the proposed excavation.

6. Name and status of the Director of the proposed excavation.

7. Details of photographic, surveying and other equipments available for the proposed excavation.

I declare that the above information is correct. I also undertake to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules made there under.

Station

Seal of the institution

Date

Signature of the applicant[2]

[1] If the application is on behalf of an institution, the name thereof should be given.

[2] If the application is on behalf of an institution, the signature should be that of the head of the institution, which term includes the Registrar of a University.

FORM III

Licence for excavation in a protected area
(See rule 13)

Whereas_____has applied for a licence for carrying out excavation operation in the protected area known as _____at_____, District _____, State_____, and has undertaken to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958 and the rules made thereunder and has further deposited the sum of Rs._____ (Rupees_____only) as required by the rules, I, _____, Director General of Archaeology, do hereby grant this licence under sub-rule (1) of rule 13 of the said rules to the said_____to carry out excavation operations in the area indicated in red outline on the plan attached hereto.

The licence is granted subject to the provisions of the said Act and rules and is further subject to the conditions that _____ of_____shall be the director of the excavation.

The licence is not transferable. It shall be valid for_____commencing with _____day of_____2000.

Station

Seal of the Department of Archaeology of the Government of India

Date

Signature of the Director General of Archaeology.

FORM IV

Report on antiquities in a protected area
(See rule 16)

Name of the site

Locality

District

State

Report for the period from _____ 20 to _____ 20

Sl. no.	Class of antiquities	Material	Number of antiquities[1]		Approximate age	Remarks
			Complete	Fragmentary		

Station
Date

Signature of the licensee

[1] In the case of potsherds, the approximate number should be stated.

FORM V

Report on antiquities by an archaeological officer
(See rule 27)

Name of the site

Locality

District

State

Report for the period from _____ 20 to _____ 20

Serial no.	Class of antiquities	Material	Number of antiquities[1]		Approximate age	Remarks
			Complete	Fragmentary		

Station
Date

Signature of the archaeological officer

[1] In the case of potsherds, the approximate number should be stated.

FORM VI

Application for the moving of antiquities
(See rule 28)

1. Name and address of applicant[1]

2. Name of the place from which antiquities are to be moved

   Locality District State

3. Description of antiquities proposed to be moved
   (Photographs showing details of the antiquities should be attached)

4. Approximate date of the moving

5. Purpose of moving

6. Whether the antiquities or any of them are objects of worship

   I declare that the above information is correct

Seal of the organization

Station
Date

Signature of the applicant[2]

[1] If the application is on behalf of an organization, the name thereof should be given.

[2] If the application is on behalf of an organization, the signature should be that of the head of that organization.

FORM VII

Application for licence for mining operation/construction within a regulated area (See rule 34)

1. Name and address of applicant[1]

2. Name of the monument near or adjoining which the regulated area is situated.

   Locality District State

3. Nature and details of the proposed mining operation/construction in respect of which permission is sought

   (In the case of mining operation, a site-plan in triplicate showing in red outline, the extent of the operation in relation to the monument and the regulated area should be attached; and the details regarding the depth down to which the operation is to be carried out, the mode of the operation, the method of the muffling of sound, the kind and charge of blasting material and the depth and number of blast-holes to be fired at a time should be specified.

   In the case of construction, a site-plan in triplicate showing in red outline the location of the building in relation to the monument and the regulated area and the plan and elevation of the building should be attached; and the colour, external appearance and method of the screening of the building and the depth down to which the soil will be excavated for the appurtenances of the building should be specified.)

4. Purpose of the proposed mining operation/construction

5. Approximate duration and date of commencement of the proposed mining operation/construction

   I declare that the above information is correct. I also undertake to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act 1958, and the rules thereunder.

Station

Seal of the organisation

Date

Signature of the applicant[2]

[1] If the application is on behalf of an organization, the name thereof should be given.

[2] If the application is on behalf of an organization, the signature should be that of the head of that organization.

Form VIII

Licence of mining operation / construction within a regulated area
(see rule 35)

Whereas …….. of ……. Has applied for a licence for in the regulated area near or adjoining …… at …….. District …….. State …….. and has undertaken to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules thereunder, …… I, …….. Director-General of Archaeology, do hereby grant this licence under sub-rule (1) of rule 35 of the said rules to the said …… for …… in the area indicated in red outline on the plan attached hereto.

The licence is granted subject to the provisions of the said Act and rules and is further subject to the following condition, namely:

The licence is not transferable. It shall be valid for commencing with ……. day ……. of 20 …….

Station

Seal of the Department of Archaeology of the Government of India

Date

Signature of the Director General of Archaeology

Form IX

Application for licence of filming operation at a protected monument
(See rule 43)

1. Name and address of applicant[1].

2. Name of the monument at which the proposed filming operation is to be carried out.

Locality District State

3. Part of the monument proposed to be filmed.

4. Nature and purpose of the proposed filming operation and the context in which the monument is proposed to be filmed (relevant extract of the script should be attached in triplicate and details of the scenes to be filmed should be furnished in triplicate).

5. Number of persons in the cast.

6. Approximate duration and date of commencement of proposed filming operation.

I declare that the above information is correct. I also undertake to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act 1958, and the rules thereunder.

Station

Seal of the organisaion

Date

Signature of the applicant[2]

[1] If the application is on behalf of an organisation, the name thereof should be given.
[2] If the application is on behalf of an organization, the signature should be that of the head of that organization.

FORM X

Licence for filming operation at a protected monument
(See rule 44)

Whereas_____of_____has applied for a licence for filming operation at the protected monument known as _____ located at_____District_____State_____, and has undertaken to observe the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules made thereunder, I,_____, Director-General of Archaeology, do hereby grant this licence under rule 44 of the said rules to the said_____for the carrying out of filming operation, as per script and details of scenes attached hereto, in the following parts of the monuments, namely:-

The licence is granted subject to the provisions of the said Act and rules and is further subject to the following conditions, namely:--

The licence is not transferable. It shall be valid for _____ commencing with _____ day of _____ 2000.

Seal of the Department
of Archaeology of the
Government of India
Station
Date

Signature of the
Director General of Archaeology.

THE GAZETTE OF INDIA

DEPARTMENT OF CULTURE
(ARCHAEOLOGICAL SURVEY OF INDIA)
NEW DELHI, THE 16TH JUNE 1992
(ARCHAEOLOGY)

S.O.1764.—Whereas by the notification of the Government of India in the Department of Culture, Archaeological Survey of India no. S.O. 1447 dated the 15th May 1991, published in the Gazette of India, part II, Section 3, sub-section (ii) dated the 25th May 1991, the Central Government gave one month's notice of its intention to declare areas upto 100 meters from the protected limits and further beyond it upto 200 meters near or adjoining protected monuments to be prohibited and regulated areas respectively for purposes of both mining operation and construction;

And whereas the said Gazette was made available to the public on the 5th June 1991:

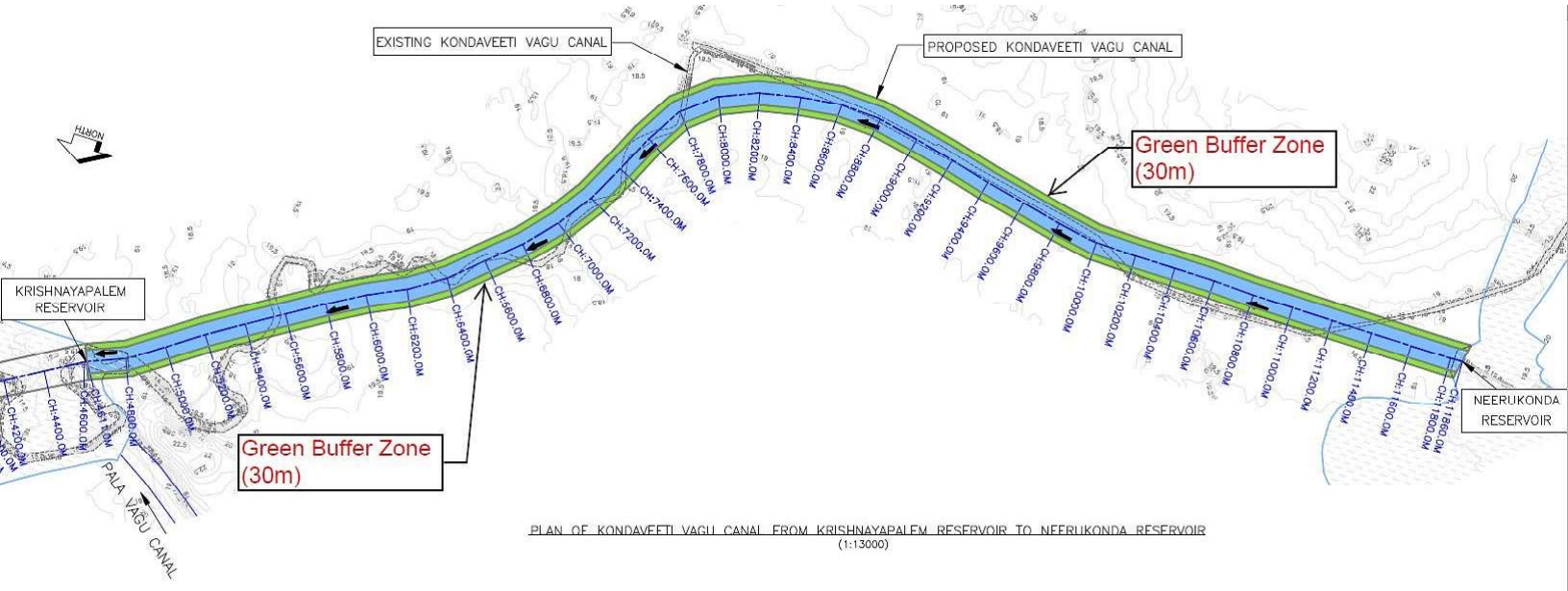
And whereas objections to the making of such declaration received from the person interested in the said areas have been considered by the Central Government.

Now, therefore, in exercise of the powers conferred by rule 32 of the Ancient Monuments and Archaeological Sites and Remains Rules, 1959, the Central Government hereby declares the said areas to be prohibited and regulated areas. This shall be in addition to and not in any way prejudice to similar declarations already made in respect of monuments at Fatehpur Sikri; Mamallapuram; Golconda Fort, Hyderabad, Andhra Pradesh; Thousand Pillared Temple, Hanamkonda, district Warangal, Andhra Pradesh; Sher Shah's Tomb, Sasaram, Bihar; Rock Edict of Ashoka, Kopbal, district Raichur, Karnataka; Fort Wall, Bijapur, Karnataka; Gomateswara Statue at Sravanabelagola, district Hassan, Karnataka; Elephanata Caves, Gharapuri, district Kolaba, Maharashtra.

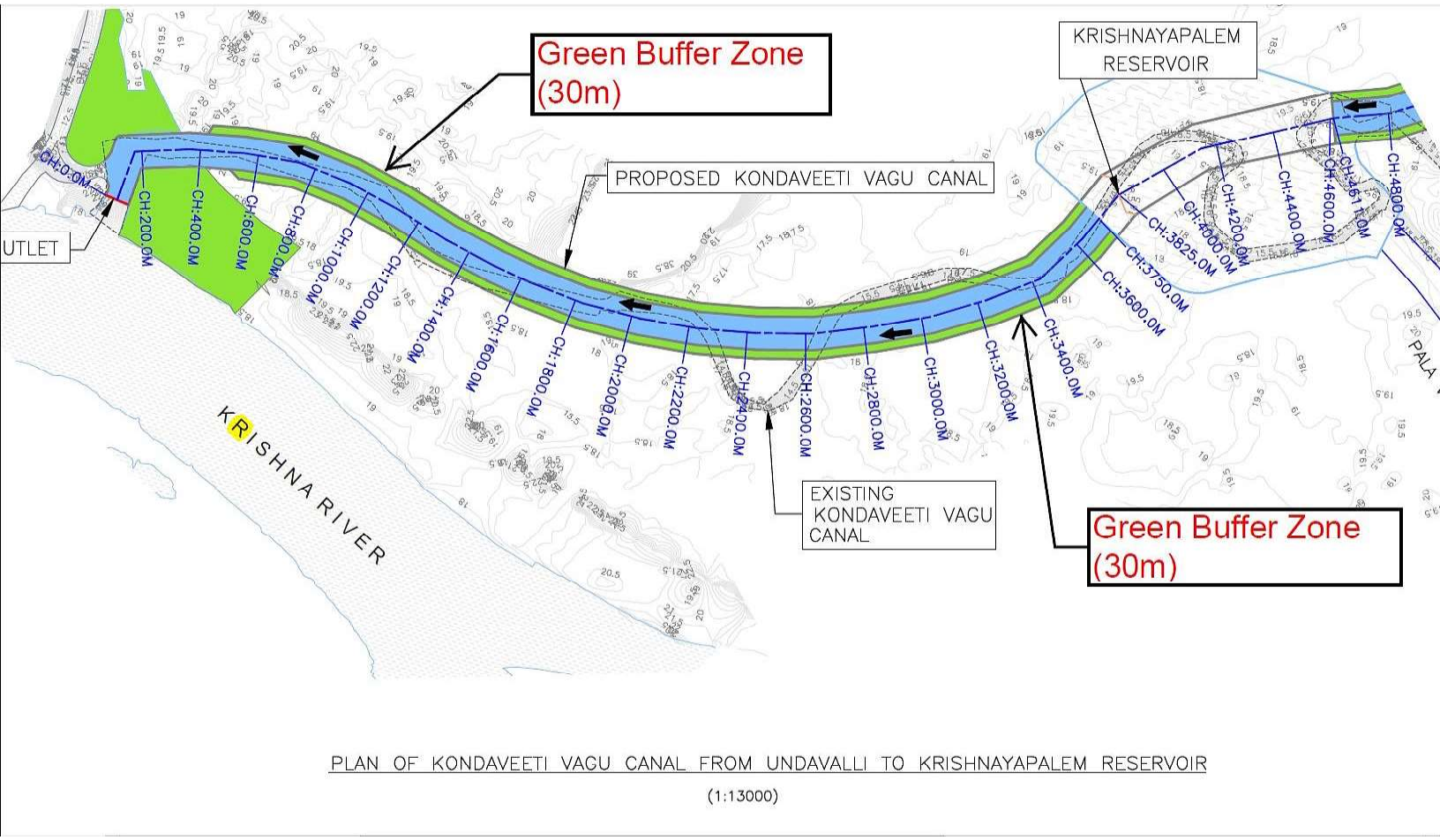
[No. F. 8/2/90-M]
M.C. JOSHI,
Director General.

ANNEXURE-XIV

GREEN BUFFER ZONE MARKED ON ALONG WITH THE CANALS

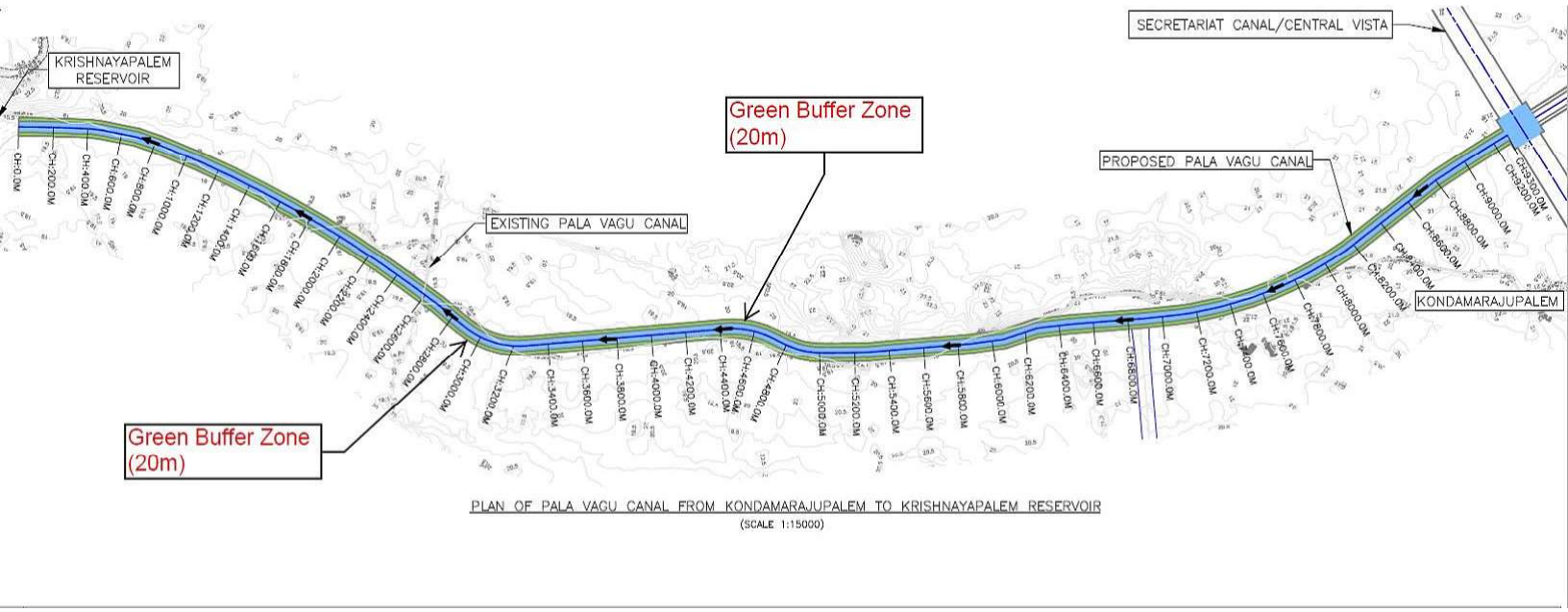


PLAN OF KONDAVEETI VAGU CANAL FROM KRISHNAYAPALEM RESERVOIR TO NEERUKONDA RESERVOIR
(1:13000)



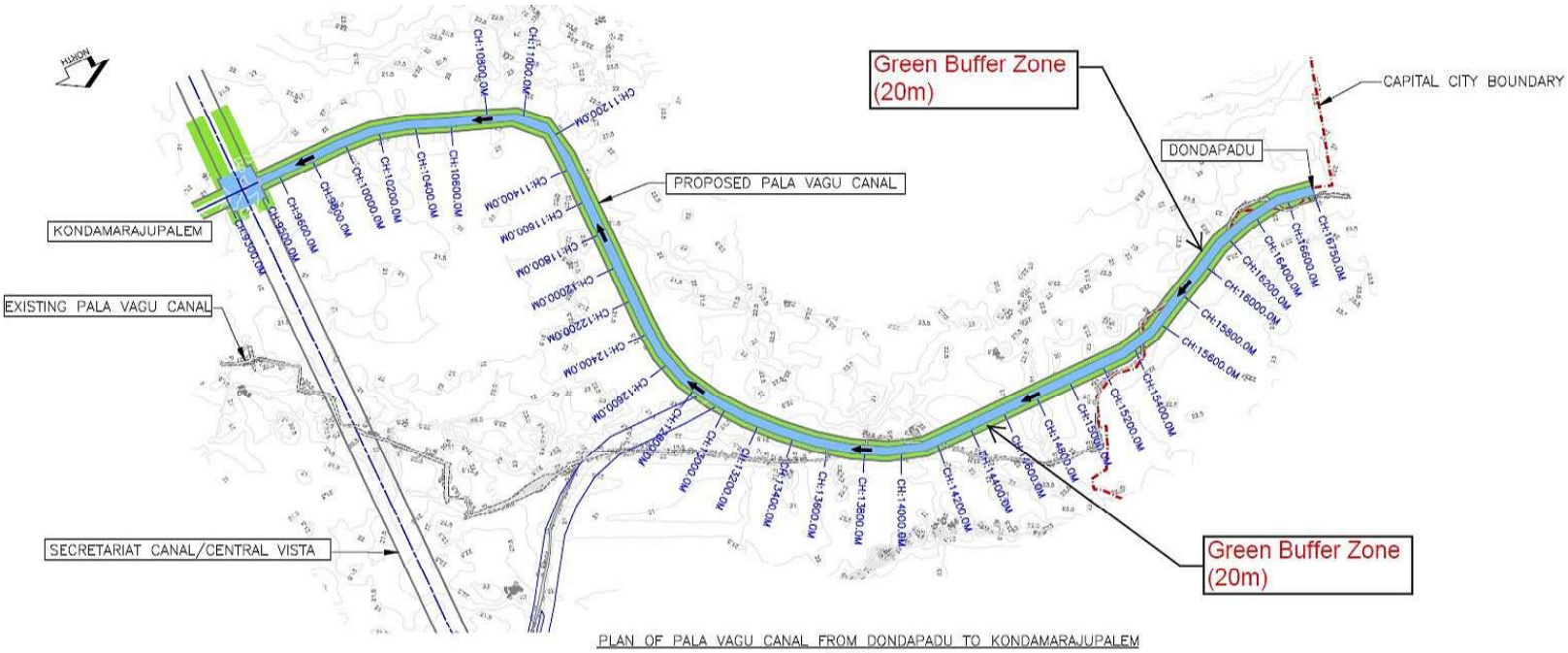
PLAN OF KONDAVEETI VAGU CANAL FROM UNDAVALLI TO KRISHNAYAPALEM RESERVOIR

(1:13000)



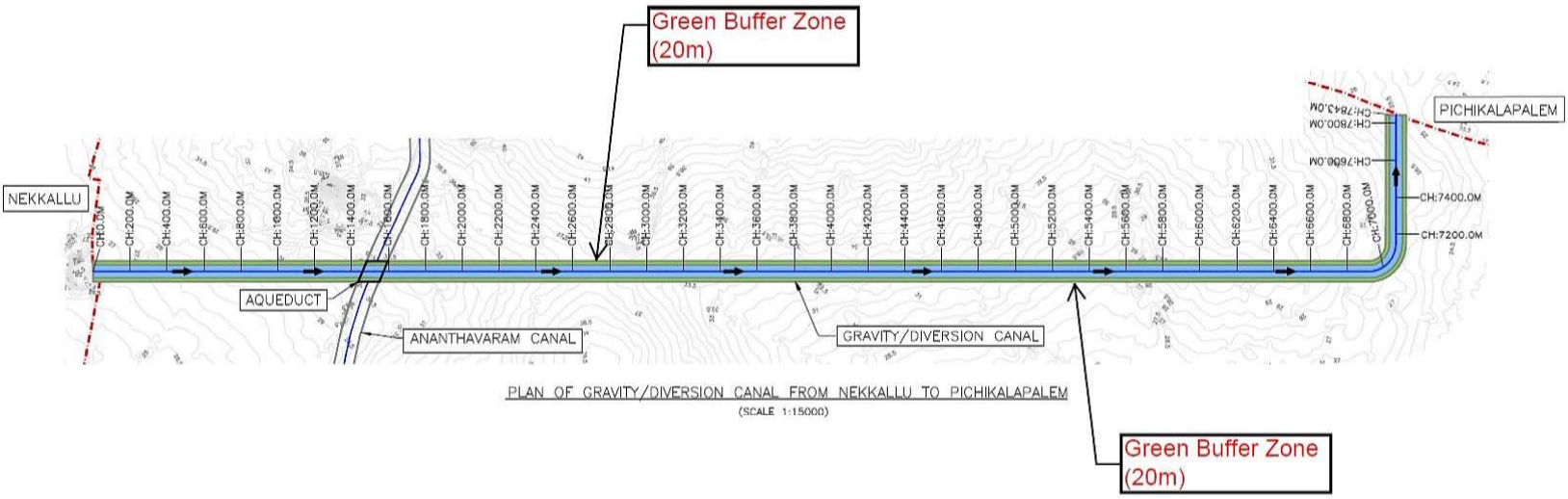
PLAN OF PALA VAGU CANAL FROM KONDAMARAJUPALEM TO KRISHNAYAPALEM RESERVOIR

(SCALE 1:15000)



PLAN OF PALA VAGU CANAL FROM DONDAPADU TO KONDAMARAJUPALEM

(1:15000)



PLAN OF GRAVITY/DIVERSION CANAL FROM NEKKALLU TO PICHIKALAPALEM

(SCALE 1:15000)

ANNEXURE-XV

This Annexure is left Blank intentionally

ANNEXURE-XVI

SITE VISIT REPORT-BLUE CONSULTANT PROJECT

Environmental and Impact Assessment (EIA) for Waterways, River Training and Water Bodies for Amravati Capital City (Blue Consultant)
Site Visit Report

Introduction: This report describes the Environmental and Social Impact Assessment (ESIA) of the following objectives for Amravati Capital City.

- Flood management,
- Urban Waterways and
- Stabilization of right bank of Krishna River and islands

FLOOD MANAGEMENT

a. Flood management measures in the capital by improving Kondaveeti Vagu and its infalling drains to required standards for safe disposal of flood discharge, and prevent to inundation.

b. Leverage flood management studies to identify locations for developing multi-purpose reservoirs.

c. Contribute to plan for road network duly fixing the top levels in consideration of the floods for avoiding inundation or breaches.

URBAN WATERWAYS

a. Undertake a feasibility study for potential development of interconnected network of navigation eligible canals in Amaravati including the provision for disposal of peak floods (storm water discharge) along with buffer for green development including urban irrigation.

b. Engage with Integrated Infrastructure master planner to identify boarding and deboarding sites and ensure seamless connectivity with other modes of transport.

c. The plan includes operational challenges including financial viability and pollution control and proposing solutions for effective implementation of urban waterways. The plan would also involve preparation of a strategy to increase the viability & popularity of urban waterways.

d. Undertake various studies including soil investigations required for detailed engineering.

STABILIZATION OF RIGHT BANK OF KRISHNA RIVER AND ISLAND

a. Validate reports and information available with APCRDA and perform necessary modifications or rectify any anomaly, to suit field conditions.

b. Protection / reformation of islands: There are multiple river islands in the river Krishna along the 36 Km stretch from Prakasam barrage till 5 km upstream of the existing Amaravati village. As part of this study the consultant should identify the islands fit for retention and further development. For such islands the consultant need to propose hydrological protection plan.

c. Flood bank strengthening: To develop a stable right flood bank of the river Krishna, considering Maximum Flood Discharge, including the development of River front.

Site visited:

1. Visited the Amravati Development Authority and met Mr. Majendrian, TCE, Mr. Rob, Arcadis, Mr. Johan, Arcadis, Mr. Kasper, Arcadis, Amaravati Development Authority officials and Arvee Associates Consultants regarding Environemntal Social Impact Assessment report for Blue consultant project.

2. Undavalli to Vikuntapuram bund stretch (24 km) was visited and physically identified the Eco-sensitive spots, agricultural, water canals (Kondaveeti Vagu, Pillala Vagu), Social conditions, Flora and Fauna Species.

3. Krishna river right bank, Left bank, Prakasam barrage upstream and downstream sites were visited along with the Arcadis team and physically identified the Eco-sensitive spots, agricultural, Social, Flora and Fauna Species.

4. Visited the Chief Engineer Office, Irrigation department, Govt of Andhra Pradesh and met Mr. Venkateswara Rao, Chief Engineer regarding Environmental Social Impact Assessment report for Blue consultant project.

Observations:

a. Right bank of the Krishna River is agricultural land. Fully green areas with majority paddy cultivation.

b. The project will be involved the human socioeconomic environment and biological environment (Flora & Fauna).

c. Project area does not cover National Park, Wildlife Sanctuary, etc. within 10 km radius boundary.

d. Tadepalli, Mnaglagiri, Karlapadi, Motadaka, Kotturu and Kondapalli reserve forest are within the project site.

e. Reserve Forest (RF) diversion, wild life clearance, protected forest clearance are not applicable.

f. Tadepalli hills are located within the project site.

g. The famous Undavalli caves, which is an Archeologically Important Site is located in the Project area.

h. CRZ clearance zones are not caused as the project area is not within a coastal zone.

i. Plan for riparian edge restoration has been proposed with saving of all the trees along the bund.

j. Adequate Solid Waste Management to be taken in the project.

Photo Presentation

	
Pillalavagu at Vikunatapuram	Pillalavagu confluence with Krishna River at Vikuntapuram
	
Prakasam Barrage	Krishna River Left Bank

Photo Presentation

Paddy Cultivation at Vikuntapuram (CRDA Area)

Group discussion in the Nelapadu Village (CRDA Area

Group discussion in the Bethapudi Village (CRDA Area)

Jasmine plantation in the project area

ANNEXURE-XVII

THE CONSTITUTION OF THE TEC & LIST OF KEY STAKEHOLDERS CONSULTED

Capital City Development and Management Corporation
(Renamed as Amaravati Development Corporation)
11, Road No. 2 Sector 4, Lotus Land Mark, Kedareswarpet, Ayodhyanagar, Near ASR Raju Park, Vijayawada
201, Block 1, White House, Begumpet, Main Road, Hyderabad

September 08, 2016

Sub: **Technical Expert Committee (TEC) - Third Meeting for Flood Management of Kondaveeti Vagu _ Draft Minutes of Meeting**

Present:

- Smt. D. Lakshmi Parthasaratthy, IAS (R), CMD, CCDMC

Expert Committee

- Sri. Venkateswara Rao, Engineer-in-Chief, WRD, Hyderabad. - Chairman
- Dr. Rajendra Prasad, Dept. of Geo Physics, Andhra University - Member
- Mr. B.S. N. Reddy, Engineer-in-Chief (Retd.) WRD - Member
- Dr. I.S.N. Raju, Chief Engineer (Retd.), WRD - Member
- Mr. Sri Rama Murthy, Chief Engineer, ADC - Member/ Convener

Experts on Invitation:

- Sri. Routhu Satyanarayana
- Sri. K.V. Subba Rao
- Dr. Y.R. Satyaji Rao

Invitees:

- Mr. D. Kasi Visweswara Rao, Chief Engineer, CRDA
- Mr. Vishwanth Sista , CPO, CCDMC
- Dr. K.V. Ganesh Babu, Principal Planner (Infra Plg.), CRDA
- Mr. Srinivas Reddy, Senior Planner, CCDMC
- Mr. K. Sai Charan, Infrastructure Planner, CCDMC

Consultants:

Blue Consultant (M/s. TCE and Arcadis)

- Mr. K.R.T. Achar, Team Leader, Blue Consultant
- Mr. Jeroen Helder, Flood Expert, Arcadis, Blue Consultant
- Mr. Magendiran Vaiyapuri, Deputy General Manager, TCE, Blue Consultant

Aarvee Associates

- Dr. K Prasad, V.P., Aarvee Associates
- Dr. Sravan Kumar, V.P., Aarvee Associates
- Ms. Cini Sobha, Manager, Aarvee Associates

Mr. Jeroen Helder, Flood Expert, Arcadis, Blue Consultant had made a technical presentation and briefed on River Kondaveeti Vagu along with urban waterways and strengthening of right bank including islands of river Krishna , navigation vertical clearance required under the deck of the bridge radius of curves as per the Class I cargo as recommended by Inland Water Authority (IWA) guidelines and the existing and revised alignment of Kondaveeti Vagu and Palavagu, proposed Kondaveeti Vagu cross section, controlling arrangements on canals, detention ponds, and diversion from Neerukonda.

During the presentation to the expert committee, the following points were discussed.

(1) In the absence of suitable and reliable methods to validate the flood flow estimates at different locations in the catchment area (upper and lower) carried out by Consultants i.e., Aarvee Associates; Blue Consultants, the Committee having looked into the data generated through model studies and the historical information has suggested that the peak discharges can be estimated approximately 470 cumecs. However, looking at the historical data, where a 70 mm rainfall can occur in one hour with 212 mm in a day, it is suggested that the canals may be designed for a flow of 470 cumecs for the entire catchment region, while provision for pumping facilities can be made for an additional capacity of 100 cumecs.

(2) For efficient flood management, the Government needs to take a decision to choose one of the following options:

Option I: Ponding reservoirs at Lam, Pedaparimi, Vaikuntapuram with capacities as suggested by both Aarvee Consultants and Blue Consultants. Further the reservoirs will be connected with each other with appropriate canal design to accommodate peak flows that can occur during storm surges as well as due to extreme rainfall events as per 100 year return period for the upper catchment. This will accommodate the surface and the drainage flows spread over an area of 190 square km as per the Blue Consultant leading to a total of (0.30 + 0.33 + 0.17) = 0.8 TMC storage and mitigate the flood at in lower part of the catchment up to Undavalli. Both consultants have to justify the reservoir capacities.

Implications:

a. The Government need to acquire additional land area approximately 1150 acres to develop reservoirs and construct the canals for a length of 17.85 km (8.65 + 9.2 km). The LS and CS of these Canals have to be furnished by the Consultants including green zone.

Option II: Alternate to the above proposal and to avoid huge land acquisition, it is also proposed to construct a ponding reservoir at Neerukonda to accommodate a maximum of 0.41 TMC and connect Lam and Neerukonda reservoirs with an appropriate canal via Secretariat Area to River Krishna. This would facilitate to accommodate an amount of 0.41 TMC of water as holding capacity in all the 2 reservoirs put together and within the canals. Though the length of the canal is marginally more than the above proposal, this would avoid land acquisition to a large extent. The canal length is 21.70 km from Lam to Neerukonda to River Krishna via secretariat area.

Note: In both Option 1 & Option 2 it is necessary to establish pumping station at Vaikuntapuram and secretariat area to discharge water into Krishna River when the river would be in spate of reaching water levels equal to or higher than the reservoir full level. At the same time the flows from Lam to Pedaparimi/ Vaikuntapuram to River Krishna will be by gravity. The difference between option 1 and 2 with respect to storage is only 0.5 TMC. The Option 1 requires (Lam 0.30 + Pedaparimi 0.33+ Vykuntapuram 0.17 + Neerukonda 0.41 + Krishnapalyam 0.07) = 1.28 TMC and the option 2 (Lam 0.30 + Neerukonda 0.41 + Krishnapalyam 0.07) = 0.78 TMC. The storage difference is 0.5 TMC between two options.

(3) As a matter of caution the most shallow ground water levels from ground need to be considered while understanding and designing the canal flow network.

(4) It is also proposed to lift flood water from Undavalli into Krishna River across the barrage. Whenever the levels go beyond the Maximum Reservoir Level.

(5) It is also suggested to delink the supplies to Guntur canal systems and the proposals made by the Dept during May, 2016 meeting for constructing a wall to separate the supplies from Kondaveetivagu and the Krishna barrage out flows and the eastern canal (Buckingham canal may be followed).

(6) In view of the huge requirements on the present and future information needs on land use land cover and possible changes in time and space, the accurate elevations, the existing canal and road networks, the geomorphic characteristics and many more, the Committee unanimously suggested that the Government may take up high resolution digital aerial photographic survey to provide aerial photographic maps of the entire region, derive ortho-photographic to derive a number of thematic maps for the region. This would not only help the proposal of evacuating the flood waters from capital region because of very low gradients and relatively low elevations at the centre of the catchment sequential photographs in intervals of 5 years would provide a very vital information for developing the capital region as a smart capital.

(7) The Committee also suggested that Blue Consultant may carry out the following:

a. Elevation maps generated by Aarvee Associates should be used.
b. Derive discharges at different points in Kondaveetivagu, Kotellavagu and Paalavaagu.
c. Regional analysis approach may be adopted for the catchment area. At least for comparison, models like HECRAS, SWMATH etc may be adopted for purpose of comparison.
d. The Committee realises that during monsoon and flood times, the entire vadose zone will be super saturated and will be connected to the ground water table. Hence the impact of ground water dynamics and its possible base flow characteristics need to be considered. The flows should be accounted in the flood estimation. The infiltrations rates need to be incorporated in the model studies while estimating the run off/discharge are being calculated.

e. Rainfall-Run off models under different scenarios at 20 mm, 30 mm, 50 mm, 70 mm, 90 mm, 120 mm, 170 mm, and 220 mm per hour may be worked out and the flood zones may be marked.

f. Based on this data, it is also suggested that the Blue Consultant may look into the variations in the rainfall data being collected within the basin at different stations including barrages for variations in the total amount of rainfall, number of rainy days, total variations in the highest rainfall events, variations in intensity with a possible comparison with Gannavaram data. This will be useful for giving site specific inputs while running the rainfall – run off models.

g. It is also suggested that the ground water table for the entire region may be collected from existing open wells irrespective of whether the water is brackish or not and also determine electrical conductivity in the field and the maps generated will be of immense use for providing inputs like hydraulic conductivity maximum channel depths etc., and also to understand the relation between surface water and ground water in the region. It is also suggested that at least 10 to 12 automatic water level recorders may be established immediately in the existing Kondavetivagu, Kotellavagu and Paalavaagu at appropriate locations. This will provide critical information on flows in the drainage vis-à-vis the quantum of rainfall. The committee also suggested that hourly rain gauge stations should be installed in the catchment area.

Annexure – XVIII

EC Conditions and Compliance

Point-wise compliance status to various stipulations, as laid down by State Environmental Impact Assessment Authority (SEIAA) Andhra Pradesh Clearance Order No. SEIAAJAP/GTN-15112015 dated 09/10/2015.

Compliance considered for Flood Mitigations Works

Item	Sr. No	EC Condition	Compliance requirement for Blue Scope
Part –A Specific Conditions			
Water Environment	i)	The Krishna River be protected from ALL TYPES of harmful discharges from all developmental activities before, during and after Capital Region Development.	No harmful discharges will be released in to the river Krishna before, during and after the capital region development. Each sub project of the capital city development project will have an environment management plan which will address waste management as per the standard procedures. The treated waste water from the Interim Government complex at Velagapudi is completely being used for the maintenance of the Greenery
	ii)	The proponent shall construct nine internal detention ponds and two reservoirs within the Capital City in addition to two external detention ponds of adequate capacity to overcome the flood menace posed by the Kondaveeti Vagu and its tributaries. The proponent shall carry detailed' hydrological study of the Kondaveeti vagu and its tributaries and plan. Location of detention ponds and reservoirs to achieve twin objectives -combat of inundation and utilization of water. The proponent shall consider factor of increase in intensity of the flow and volume due to pavement of the City and area inundated for 1 hour or more an having	It is planned to construct detention ponds and two reservoirs within the capital city with an objective to mitigate inundation and also to utilize the storm water. The storm water system will be designed considering the factors of

Item	Sr. No	EC Condition	Compliance requirement for Blue Scope
		water depth more than 6 inches may be considered as affected by water logging for designing of Storm Water Drainage System. The proponent shall take into account climate change considerations and design storm water drains form20% more capacity than the calculated discharge. The proponent shall protect and improve the existing natural drains and construct modem storm water drainage system to avoid flooding and water logging problems. Proponent shall ensure that sewage shall not enter into storm water drainage system under any circumstances. Proponent shall construct adequate detention ponds and reservoirs at appropriate locations to collect.	increased intensity due to paved surface and the climate change and drains will be designed with 20% more capacity than the calculated discharge. It is proposed to strengthen Krishna river bund, protect existing natural drains, river training etc.
	iii)	Detailed studies on the flood management of the Storm water drains, mainly Kondaveeti Vagu and its branches and a detailed plan to avoid inundation of the areas be developed taking in to account of the impact of the increased built up area. In different development zones of the project.	Detailed study on storm water drains in the capital city is done considering the built up area factor contribution in different development zones of the project and the same will be considered in the development of capital city to avoid inundation of the areas.
	iv)	The proponent shall provide continuous online water quality monitoring facilities for WTPs, STPs and upstream of drinking water source at Krishna River. Results of monitoring shall be linked to SPCB / CPCB website.	Water quality monitoring systems will be provided at the WTPs, STPs and upstream of River Krishna and the same will be linked with SPCB website. The Proposed SCADA system for the existing WTP at the Interim Government complex will be commissioned.
	v)	Water quality of all the surface water bodies, including the storm water drains be monitored during, pre monsoon and post-monsoon seasons, for their management purposes and the report is submitted as compliance.	Water quality of water bodies and the storm water drains in the capital city are provided in Annexure – 18a.

Item	Sr. No	EC Condition	Compliance requirement for Blue Scope
Ecology	i)	All construction activities by the proponent should ensure that the activities do not alter or do not adversely affect the water bodies and their ecology.	It will be ensured that the construction activities do not adversely affect the water bodies and it is regulated by terms and conditions as part of liability from the developer/contractor side. In the conditions of the Bid document the waste management in the construction site is part of the contractors' responsibility.
	ii)	Improvement or rehabilitation of existing natural streams, channels / nallas shall be carried out without disturbing the ecological habitat.	The improvement of the exiting natural streams, canals will be done without disturbing the ecological habitat.
	iii)	A buffer of 30m on either side of canals and streams; 50m around water bodies .and 100m along the Krishna River Front shall be reserved as greenbelt without allowing any development. Plantation along the side of the roads and in the open spaces shall be developed to act as sinks of air pollutants.	Buffer will be maintained with greenery on either side of canals and streams upto a distance of 30m ; and a buffer of 50m around water bodies and upto 100 m along Krishna river.
	iv)	The proponent shall utilize treated sewage water for irrigation of primary and secondary green areas by laying pipeline network.	The treated sewage water will be utilised for the development and maintenance of the greenery areas by laying a pipeline network.
	v)	All archaeological, cultural and ecologically-sensitive areas (i.e. estuaries, mangroves, rocky shores, caves etc.) in and around the Amaravati capital city be adequately protected and conserved. The proponent shall take appropriate measures for protection of Undavalli caves.'"The proponent has to declare no	All archaeological, cultural and ecological sensitive areas in and around capital city will be adequately protected and

Item	Sr. No	EC Condition	Compliance requirement for Blue Scope
		development activity Zone of 100 to 300 mtrs. Around Undavalli caves as per ASI regulations.	conserved. Further the area around Undavalli caves upto a distance of 100 to 300m will be declared as no development zone.
	vi)	A comprehensive PRIMARY BASELINE DATA on the productivity of the Krishna River in the CRDA area (primary, secondary tertiary productions), before and after Capital region development, shall essentially be collected and processed in a. Systematic and scientific way.	It will be complied with.
	vii)	Proponent shall create green and blue network interconnecting all reservoirs, water bodies and green spines as committed.	These aspects are already considered in the project design.
	viii)	The proponent shall create network of water ways as committed to/connect various eco tourism attractions on the cluster of islands in the river Krishna. These water ways have to inter connect Islands and mainland within the city.	These aspects are already considered in the project design.
	ix)	A major part of the development of the water bodies and green areas be completed before the end of the construction phase.	The development of water bodies and green areas will be developed simultaneously and will be completed before the construction phase
	x)	All construction activities by the proponent should ensure that the· activities do not adversely affect the water bodies and their ecology.	It will be ensured that the construction activities in the capital city do not adversely affect water bodies and its ecology.
	xi)	No natural water body shall be lined or no embankment shall be cemented except for-protection and safety of the people in the surrounding area. The water bodies shall be kept in natural conditions without disturbing the ecological habitat.	It will be complied with.
	xii)	Improvement or rehabilitation of existing natural streams, channels /nallas shall be carried out without disturbing the ecological habitat.	All the existing natural streams shall be protected and will be trained as per the flood mitigation plans without disturbing the ecological habitat.

Item	Sr. No	EC Condition	Compliance requirement for Blue Scope
			Further it will be seen that such activities will be taken up considering the flow conditions, surrounding landscape etc to prevent and minimise the impacts.
	xiii)	Mitigation .measures like providing adequate drainage, embankment consolidation and slope stabilization 'shall be taken on the built up areas and along the city roads to avoid soil erosion. Top soils (30 em) of the borrow pit sites shall be conserved and restored after completion of excavation. All the topsoil excavated during construction activities shall be stored for use in horticulture/ landscape development within the project site. Proper erosion control and sediment control measures shall be adopted.	Measures to avoid soil erosion will be taken up. The top soils will be conserved and reused to increase the level of the greenery.
	xiv)	Recognizing the fact that the Capital City project is being proposed on the Green & Blue Concepts, as such to protect the environment. The 24.29% of the land allocation for greening and open spaces, be achieved at the Development zone wise as far as possible.	The greening of the capital city will be done zone wise covering the entire capital city.
Resettlement and Rehabilitation	i)	The AP CRDA & CA shall submit the specific plans for the inclusion of the existing habitations in the capital area development and submit the details of the Project Affected Families and the RR Plans to address the PAFs. As far as possible, Least Dislocation Principle be adopted.	The habitations in the capital city are given first priority in the overall development. The village infrastructure will be developed and many social and economic development schemes are being implemented in the habitations. The village specific development plans are under preparation.

Item	Sr. No	EC Condition	Compliance requirement for Blue Scope
Disaster Management	i)	The proponent shall prepare and implement proper flood management plan to overcome threats posed by the Kondaveeti Vagu and its tributaries, Krishna River, heavy rains (more than 1000 mm) and cyclones.	The major intervention areas of the flood management plan of the capital city are as follows Construction of detention ponds, construction of reservoirs, river training works, bund strengthening works, water level monitoring etc..
	ii)	Proponent shall prepare emergency Health Management Plan.	It is ensured that each development project has Environment Health and safety policy.

Annexure – XIX

NGT Conditions and Compliance

Point-wise compliance status to various stipulations, as laid down by The National Green Tribunal (NGT) New Delhi, Judgement Dated 17th November 2017.

Compliance considered for Flood Mitigations Works, Amravati Capital City.

Sr. No	NGT Condition	Compliance requirement for Flood Mitigation Works
i)	The project proponent shall conduct or cause to be conducted a comprehensive study on hydro geomorphology of the area with a view to effectively plan water retention ponds/reservoirs, storm water drains and their interconnectivity, so as to optimize water conservation, both surface and sub surface.	Will be complied
ii)	Any alteration of the flood plains by construction of storm water drains, retention ponds and related development within the capital city should be done only after conducting a study.	Noted
iii)	No alteration of the river or natural storm water morphology, flow pattern and location by way of straightening shall be permitted, as such alteration may result in increase of soil erosion, sediment transport due to raised velocity and decrease in ground water recharge which may reduce base flow during the dry season.	Noted
iv)	No alteration to the pre-existing embankments if any should be permitted except as may be required for its strengthening for flood protection of the proposed Capital City. Even such exercise should be undertaken after detailed study of the flood pattern and hydraulics of the river or the storm water drains.	Noted
v)	All the hills and hillocks in the catchment area of KondaveetiVagu, its tributaries and other storm water drains/channels should be treated with intensive soil and water conservation measures including afforestation so as to minimize surface run off and improve ground water recharge.	Noted

Annexure – XX

Public Consultation Workshop Attendance List

Date: 06-01-2018

Village Name: KRISHNAYAPALEM

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
1.	K. Amar Babu	Farmer		9676370347	K.AMARBabu
2.	E VENU.	Farmer.		8686536647 Venueegani@gmail.com	E Venu.
3.	M. Suresh.	farmer		92[illegible]785[illegible]	M.
4.	E. Daniel	Farmer		9573203662	E. Daniel
5.	[illegible]			8978007829	[illegible]
6.	[illegible]			9160850464	[illegible]
7.	R. David.	Farmer		8106922848	R.
8.	[illegible]			9885024577	[illegible]
9.	[illegible]			9948616597	
10.	A. Nandakishor	Farmer	Agriculture	9494771289	

(21)

Date: 06-01-2018

Village Name: Krishnayapalem

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
11.	AVallu Venkateswara Rao			9440462772	
12.	M. Sai Nagesh			9441758728	
13.	Nagothu Maniadas.			9395374654	
14.	AV. Ramana Rao			9248880999	
15	M. Srinivas M-SRINIVAS			9440924228	
16	K. [illegible]				
17	V. Shekhar [illegible]			9490163787	
18	S. B. Kiran kumar	Manager	TCE	8455914890	

Date: 06-01-2018

Village Name: Neeru Konda

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
	No one agreed to sign the attendance sheet.				

Thullur -

(1)

Date: 06-01-2018

Village Name: Vi Thullur

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
1	T. RAVI	Farmer		9490574268	
2	G APPA Rao.	Farmer		9948469548	G APPA Rao
3	Ch. VRAO	Farmer		8328057792	Ch. VRAO
4	కొమ్మినేని శ్రీనివాసరావు	Farmer		8374294334	కొమ్మినేని శ్రీనివాసరావు
5	A. Phanendra	Farmer.		8985298579	A. Phan
6	P. Sambasivarao.	Farmer		9912651009	P.S.S.R
7	A. Rakshith	Farmer		9963636088	A. Rakshith
8	[illegible]	Farmer		9494537209	[illegible]
9	[illegible]	Farmer			
10	S. B. Kiran Kumar	Mayo	TCE	8452914190	

Thullur

Date: 06-01-2018

Village Name: Thullur

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
11	[illegible]	Farmer			9848986093
12	[illegible]	Farmer		9052914588	[illegible]
13	ALURISRINIVAS	Farmer		944043378	[signature]
14	[illegible]	Farmer		9705398288	[illegible]
15.	[illegible]	Farmer		9490574272	[signature]
16.	[illegible]	Farmer		9492977241	[illegible]

(1)

Date: 06-01-2018

Village Name: Mardam. 10 AM 2 PM

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
1.	JSRK SASTRY	Director	CRDA	9948438921	
2	Dr. Ganesh	HOD IPD	ADC	7095599572	
3	Dr B Keerthi	Team Leader WB-SDS NGO	Vabavya Mahila Mandali	9848542521	06/1/2018
4	Mallela Seshagiri Rao.	farmer. CRFF.	CRFF	9494399444	
5	[illegible]				MV SP 9848684105
6.	[illegible]			9849679862	
7	N. [illegible]			9000422762	
8	Ch Nirmalatha.	Advocate.		94403-13339	
9	K. Valuka Devi	"	CRFF		
10	G. N. SWAMY	"	"		

Date: 06-01-2018

Village Name: Mandadam

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
11	PASUPULETI JAMALAIAH	RTO DGM BSNL	BSNL	9490108899	
12	KALAPALA SARATH KUMAR	Dr.		9494765816	
13	G. Neeleswara	Farmer		9247425619	
14		Farmer		9966919479	
15	Katta. Niranjan	Farmer		9959162666	Katta. Niranjan
16.	D. V. Anjaneyulu	Farmer		9505319339	D.V Anjaneyulu
17	N. Suresh	11		9411 85425	N. Suresh
18.	K. Brahmaradhana Rao	11		7382205628	K.B.R.
19	G. Adinarayana Murthy				
20)	G. Sambasiva Rao	11			

(3)

Date: 06-01-2018

Village Name: Mandadam

(12)

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
				9441022565	
				9491920656	
				9963248007	
				7989666680	
				9912	
				9618395945	
				9000903689	
				9866038802	
				8985432348	

(4)

Date: 06-01-2018

Village Name: Mandadam

(2)

Public Consultation Workshop on draft EIA/EMP and RAP for Flood Management Works

S.No	Name	Designation	Organization	Mobile No. & Email Id	Signature
	[illegible]			9493448676	[illegible]
	[illegible]				[illegible]

Annexure – XXI

FLOOD EARLY WARNING SYSTEM (FEWS) FOR AMARAVATI

ANNEXURE XXI

ADVANCED FLOOD EARLY WARNING SYSTEM (FEWS) FOR AMARAVATI

1. Introduction of Advanced (Early) Warning System (EWS)

Conventionally, at the stage of city growing, it is desirable that society's infrastructure and economy are developing with good balance. However, in reality, economy was prioritized and economic growth was pursued even though infrastructures have not been well-developed yet. In this situation, when disaster occurred, disaster prevention system was needed to add afterwards. As a result, unnecessary additional cost was incurred. It was a common style when city was growing in the past.

The advanced disaster prevention system at a stage of planning of new capital Amaravati could result effecting flood management by helping to achieve more efficient operation system. Specifically speaking, the existing flood management system could detect only the change of river level, i.e. could detect it only after raining. On the other hand, early warning system with their advanced radar can catch the prognostic of heavy rain, which, can detect heavy rain 30-60 minutes earlier than the existing system before it rains. The early warning system can decrease the damage by the heavy rain significantly.

Operational forecasting of flood flow is becoming increasingly widespread, answering to several objectives such as the provision of early warning of floods to initiate a timely response, prediction of low flows for navigation, or water resource predictions to support reservoir operation. Typically delivery of operational flow forecasting is the mandate of operational agencies. Real time observations, and in most cases model predictions, are used as guidance to decision makers on actions to be taken in response to an observed or forecast state of the water system.

To organise the complex process of using data and models in real time, and to combine these in products that can be used in guidance to the decision making process, most operational centres employ flood/flow forecasting systems. Such systems form a special class of environmental decision support systems as they operate in real time, rather than as a tool in support of strategic planning.

2. Role within the Forecasting and Warning Process

Operational forecasting and warning capabilities have been developed in many river basins across the world. The key elements of the flood forecasting and warning process are summarized as four main steps; (i) Detection, (ii) Forecasting, (iii) Dissemination and Warning and (iv) Response. Within these four steps, focuses should be given on the second, or the forecasting step. The primary objective of this step is to provide additional lead time through predictions of short term future hydro-meteorological conditions. These predictions are used as guidance in making the decision to take an action such as the issuing of a warning. This may then lead to an appropriate response being initiated. As the name suggests, forecasting systems provide support primarily for the second step. This requires the ability to integrate real-time data from hydrological and meteorological observation networks, and the dissemination of prediction results through appropriate products to the warning process. Within the forecasting step, hydrological and hydraulic models may be used to develop a prediction, and the forecasting system needs to support the operation of these models in real-time. These models use realtime input data that has been processed to an appropriate spatial and temporal scale. Additional to the use of these data in running models, the forecasting system needs to support data assimilation and updating, whereby simulated model results are updated to reduce predictive uncertainty. When using real-time data, these should be subjected to a rudimentary quality control. It is clear that a full quality control cannot be applied during the forecasts process given the time available. This will often occur at a later stage, with the quality controlled data then being stored in the hydrological archive. To increase lead time, meteorological forecast data from for example Numerical Weather Prediction models can be used. This requires the forecasting system to import and process the data from these to serve as future precipitation inputs for the hydrological and hydraulic model chain. Figure 1 provides a schematic view of the connection between the forecasting system to real time data acquisition systems and dissemination systems. The figure also shows the link to climatological and reference information, as well as archived data. These provide important auxiliary information to the forecaster and can be of use in the verification of forecasts. Operational systems, such as flood forecasting systems will usually be used for quite a period of time, in some cases this may be 20 years or longer. Clearly during this period neither real-time data availability, information requirements in the warning process, nor capabilities of meteorological, hydrological, and hydraulic models will remain the same. There will be a strong desire to incorporate advances in these into the operational domain, thus requiring the forecasting systems to be adaptable to these changing needs.

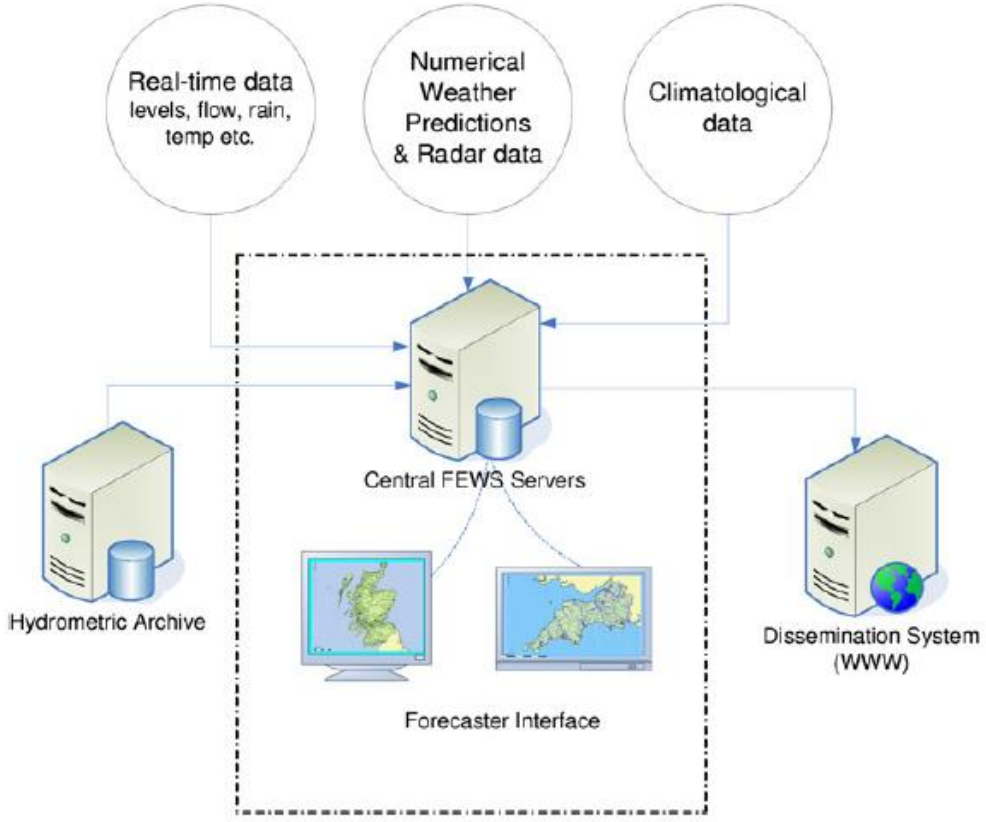


Figure 1 Schematic structure of a flood forecasting system, showing the connection between the forecasting systems to real time data acquisition systems

3. Effect of 1 hour Prior Warning

An hour prior warning would result the respective agency will have precious time for preparedness to protect people, evacuate important assets and make basic preparation in the event of the disaster. The prevention disaster system like an Early Warning System can prevent the economic damage before it occurs. An hour prior information could reduce economic damage by at least 20% in comparison with no Early Warning System.

4. Feature of Early Warning System & Radar

EWS can find the raindrop in the mid-air at the time it occurs. So that, the warning can be issued 1 hour prior before the water level of river is going to be reached the dangerous level. Especially, to observe weather phenomenon like “Cloud-burst” (it is that cloud occurs, grow up, decline, and disappear within 30 min to 1 hour) quickly and promptly and control infrastructures

against the disaster, EWS Rader which can observe whole cumulonimbus quickly and predict its growth tendency promptly.

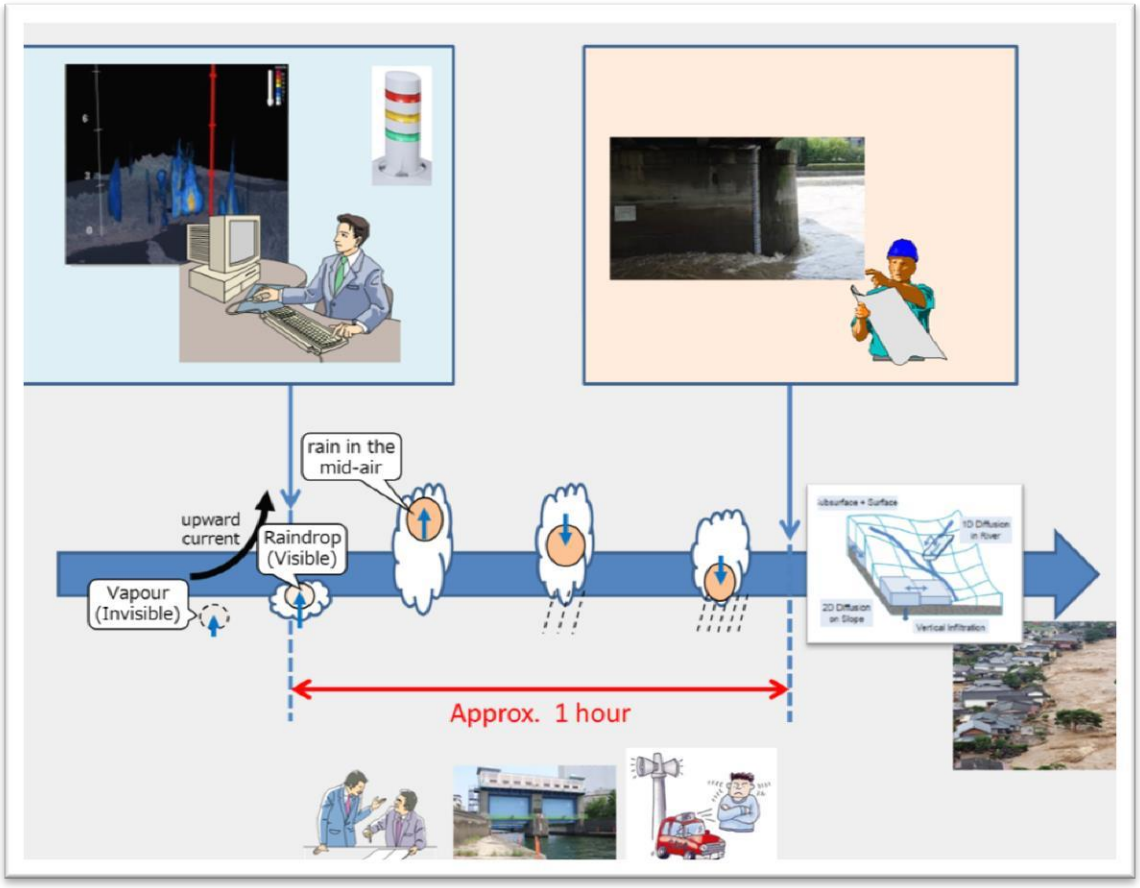


Figure 2 Schematic of warning system & radar

5. Benefit of Combination with IMD & Weather Radar Network

As mentioned above, WR is the urban-type system, which is good at observing whole cumulonimbus quickly and predicting its growth tendency promptly. However, for weather phenomenon, which is moving slowly from a long distance like cyclone, to observe it early and predict its course, combining information of IMD Weather Radar Network (which is good at observing wide range), would be effective. Weather phenomenon like cyclone cause damage over a wide area, if, so predicting its course earlier (a few days ago) and taking emergency actions quickly is quite necessary. Considering the cost performance, it is thought that combining information of the existing weather radar network of IMD and EWS is the best plan.

This message from the system can be communicated by mobile phones to the downstream communities. A properly designed and implemented system can save lives and reduce property damage by increasing the time to prepare and respond to the threat of floods or flash floods.

6. Sample EFWS Model

A sample EFWS Model is presented in Figure 3 represents the flood forecasting system. Inverted (blue) triangles represent the network of hydrological gauges, while (green) circles, diamonds and squares represent meteorological gauges from different agencies. The triangle with an exclamation mark indicates a threshold crossing, crosses indicate missing data at that station.

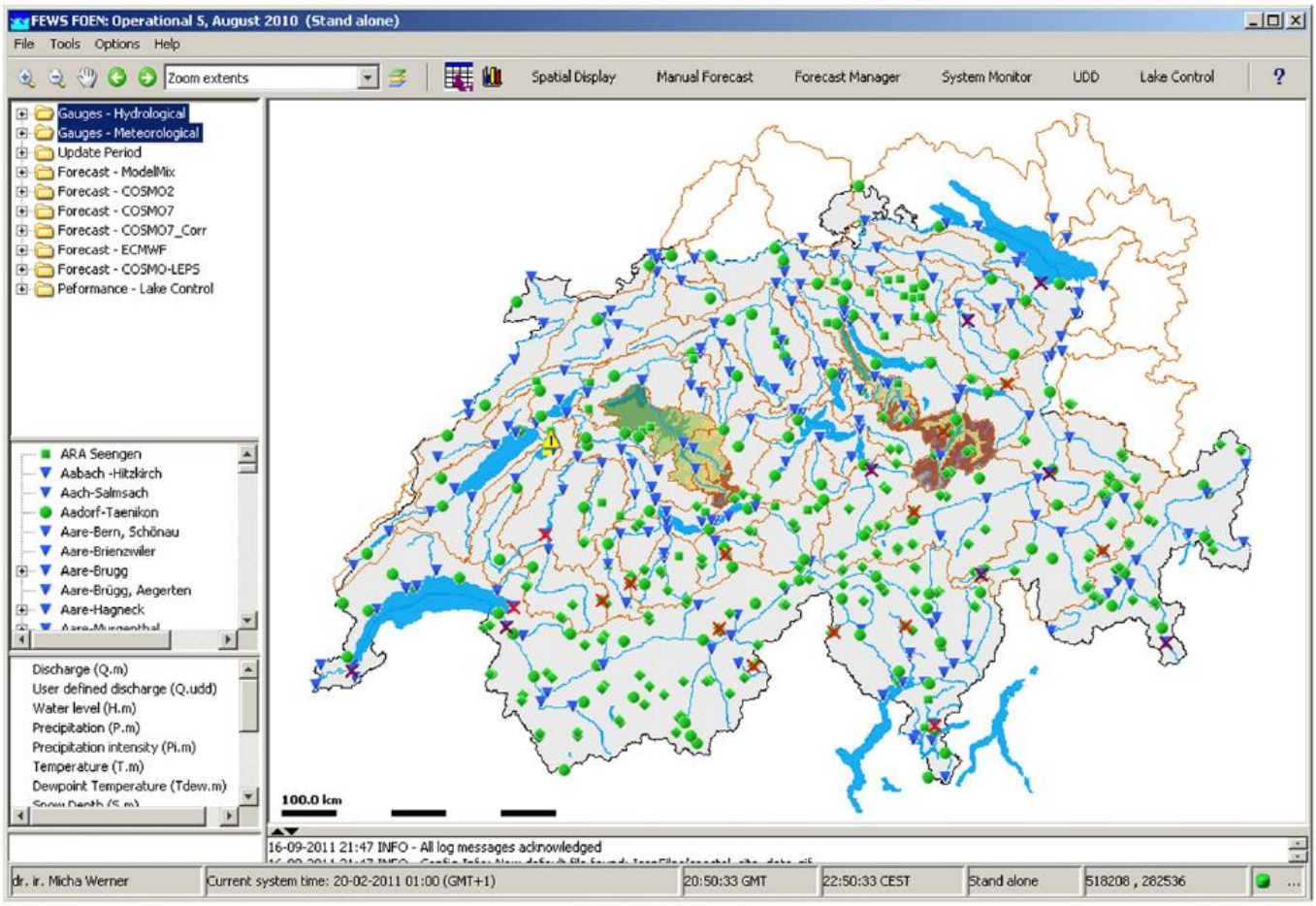


Figure 3 Sample Model displaying of the forecasting system

Annexure – XXII

O&M Aspects

ANNEXURE -XXII

OPERATION AND MAINTENANCE ASPECTS

1.1 GENERAL

In order that the canals and reservoirs are designed within the capital city serves the dual purpose of flood mitigation (containment) and navigation (cargo movement, commutation and recreation purposes) and the same becomes ready for the next monsoon rains as well as the following dry season, it is crucial that these canals are maintained in tandem with the water level control in the connecting reservoirs Neerukonda, Krishnayapalem and Sakhamuru within the capital city and at a later date with Lam, Pedaparimi and Vykuntapuram Reservoirs.

1.2 OPERATION AND MAINTENANCE (O&M) ASPECTS

Following are the important O&M aspects:

1. De-silting of Canals and Reservoirs;
2. Removal of Floating Debris, Leaves, Logs, etc.;
3. Maintenance of facilities at Boarding and De-boarding Stations;
4. Operation and Maintenance of Pumps at Undavalli Pumping Station;
5. Operation and Maintenance of Inlet gates at Secretariat Complex; and
6. Monitoring of water quality parameters.

1.3 DE-SILTING OF CANALS AND RESERVOIRS

Canals and Reservoirs within the capital city are subject to siltation, especially after the monsoon season which prevails for about 4 months – June to September and almost dry for the months of the year. For this reason it is necessary that both canals and reservoirs be de-silted annually. The frequency of de-silting may however be fixed up based on the observation for a few monsoons. Furthermore this becomes essential since it is prudent to keep the reservoirs and canals empty before the onset of monsoon for effective flood management.

The operation of de-silting needs to be substantiated with the sequential maintenance of water levels in the reservoirs and canals by adhering to the pumping schedule proposed. Pumping schedule at Undavalli has to be in-line not only with the discharge of flood waters but also aiding in maintaining the desired maximum water level of RL 15.0m in the canals so that gravity discharge of storm water from the urban area into the canals take place without any flooding.

1.4 REMOVAL OF FLOATING DEBRIS, LEAVES, LOGS, ETC.

Water bodies like canals within an urban environment are to be maintained since they would be in the near vicinity of the living public. This nearness of the living public would in fact make it easy for the public to misuse it. In order to avoid this, it is essential that the living population is advised against dumping unwanted material into the canal. Building community awareness and penalizing for the offence could avoid the said offence. Furthermore campaigns at the community level are essential to bring in public awareness for cultivating a 'sense of belonging' of public assets.

1.5 OPERATION AND MAINTENANCE OF PUMPS AT UNDAVALLI PUMPING STATION

The Master Control Room at the Undavalli Pumping Station shall be updated of the water levels at various locations including the other parameters. The water levels at the upstream reservoirs Krishnayapalem and Neerukonda are to be updated. Based on these water levels at a given point in time, signals shall be sent to the pumps at Undavalli to be operated so that the water levels in the canals are depleted by pumping put excess water.

The schedule for pump operation for given water levels upstream for given water levels upstream and in the current pump sump shall be adhered to for avoiding any upstream eventualities of water level rising. Furthermore, small pumps installed in the main pump house at Undavalli shall be used to apart from the main flood pumps to pump out small quantities of flow during canal replenishment or for any maintenance activities.

1.6 OPERATION & MAINTENANCE OF INLET GATES AT SECRETARIAT COMPLEX FOR REPLENISHMENT

Water is drawn into the canals within the capital city from the inlet at the Secretariat complex through the existing bund on the right bank of River Krishna. Gates and Stop Logs are located at two locations across the bund. The upstream gate is located at the point where the inlet channel merges with the bund and two number of MS pipes commence. The downstream gate is located at the downstream side across the bund where the pipes terminate into the Diversion Canal which takes off from this location till Pala Vagu.

These gates and stop logs are operated at times where water in the canal system needs to be replenished both from the point of view of pumping put bad quality water as well as for the purpose of maintaining the required water depth for navigation facilities to be functioning. Care should be exercised that these gates are operated in such a way that water is let into the

system only when necessary and for the required time only and there is no mechanical problem of these gates getting stuck up due to infrequent use.

1.7 MONITORING OF WATER QUALITY PARAMETERS AND CHLORINE DOSAGE TO MAINTAIN WATER QUALITY

Water levels in the canals are lowered (pumped) when the water quality deteriorates below its standard limits as per guidelines. Water quality parameters in the canal have to be measured on-line.

Water quality parameters are measured at salient locations along the canal system including the reservoirs in the capital city. These parameters are monitored at the Central Control Station proposed to be located at Undavalli Pumping Station. Based on the allowable limits for various parameters action needs to be initiated at the affected canal / reservoir location so that water in the system shall be deemed fit for navigation. Incidentally, since there are also weather monitoring measurements that are controlled at the Central Control Station, water quality parameters also can be monitored and controlled through the same network itself. Figure 1 represents Schematic of Online based Flood and Water Quality Monitoring System.

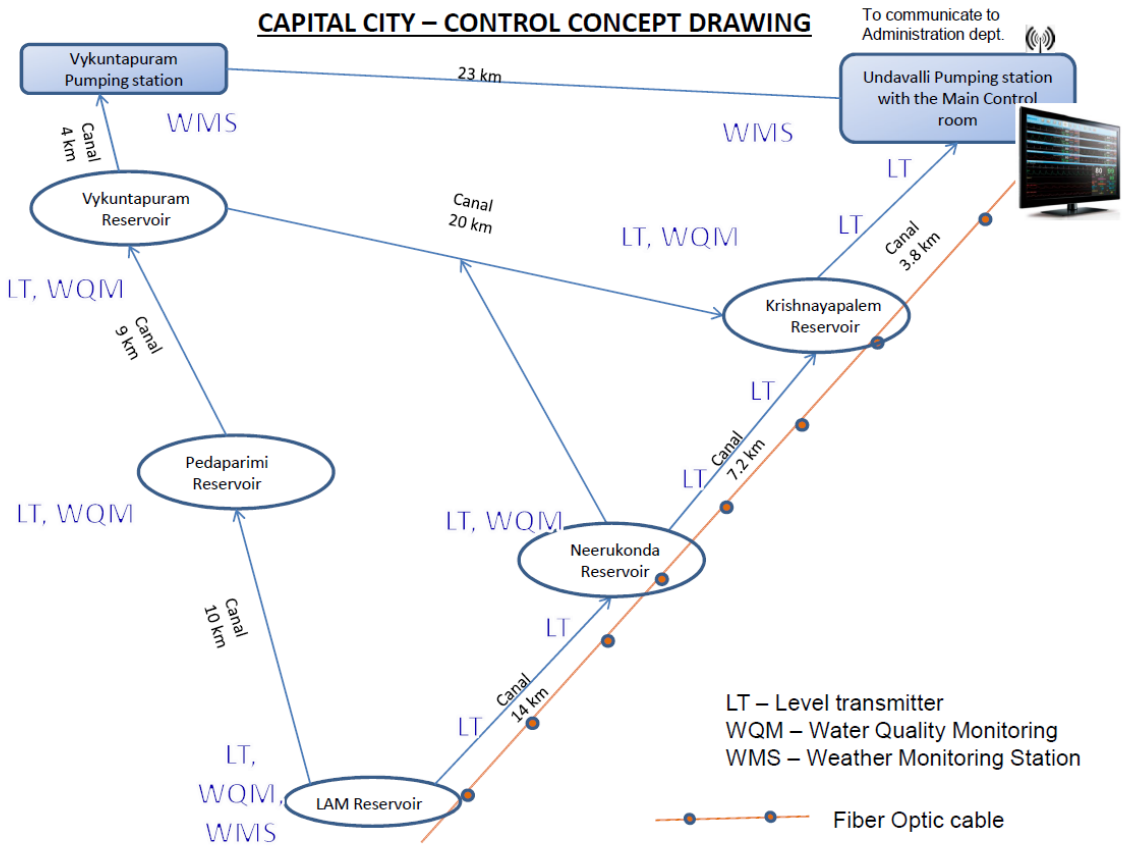


Figure 1 Schematic Drawing of Online based Flood and Water Quality Monitoring System

Annexure – XXIII

Details of Inlet and outlet water in canals

Details of Inlets and Outlets of Water in Canals

1. Maintenance of water level in the waterways for navigation

Proposed waterways (canals) in the capital city primarily are sized to cater to 1 in 100 year flood. However, in view of the large size of canals and its proximity to the upcoming National Waterway 4 (NW-4) running from Kakinada in the north AP up to Puducherry in the south, it is prudent that these canals are also utilized for movement of cargo, commutation and recreation facilities.

A minimum depth of 3 m is necessary to be maintained in all canals within the capital city fit for Cargo transport catering to Class-I vehicles and a depth of 2 to 2.5 m would be essential.

2. Water Flow and Level Control

Flow in the canals shall be controlled for the following purposes:

I. Meeting the requirements for the purpose of vehicles moving for commutation (water taxis and small boats);

II. Meeting the requirements for the purpose of vehicles moving for recreation (small boats and ferries); and

III. Meeting the requirement for the purpose of Cargo movement (Class-I) in the designated canal stretch (Kondaveeti Vagu).

Minimum water depth or level in the canals should be maintained at 3 m for Class I vessels and for commutation and recreation purposes the largest ships need approximately 1.5 m of water depth.

3. Computation of Water quantity required for navigation and replenishing

The total quantity of water that the designed canals in the capital city that can hold deemed fit for Navigation purposes is computed to be around 0.35 TMC (Refer Table 1). Optimization was carried out considering different water levels in the water conductor system. Accordingly, for a water level in the canals corresponding to RL 13.0 m and RL 14.0 m was considered and the total volume of water in canals was computed. This results in water quantity of 0.23 TMC and 0.35 TMC, respectively. The water volume corresponding to a water level of RL 14.0m in the canals, namely 0.35TMC (navigation depth of 3 m) - WL RL 14.0m is sufficient and necessary.

Table 1 Calculation of Water Volume in the canals in Capital City

SL. No.	Description	Length (km)	Suggested Water Level (m)	Depth of water (m)	Volume of Water (Mm^3) at RL 13.0m	Volume of Water (Mm^3) at RL 14.0m
1.	Kondaveeti Vagu (Undavalli to Krishnayapalem)	3.8	14.0	3.0	0.60	0.90
2.	Kondaveeti Vagu (Krishnayapalem to Neerukonda)	7.2	14.0	3.0	1.10	1.70
3.	Pala Vagu (Secretariat to Krishnayapalem)	9.3	14.0	3.0	0.50	0.80
4.	Pala Vagu (Non-navigable)	5.9	14.0	1.0	0.00	0.10
5.	Krishnayapalem Reservoir	-	14.0	3.0	1.30	2.00
6.	Neerukonda Reservoir	-	14.0	3.0	3.00	4.50
	TOTAL				**6.60 (0.23TMC)**	**10.00 (0.35TMC)**

The computed quantity of water to the tune of 10 Mm^3 or 0.35 TMC needs to be sourced into the canals in the capital city. The various sources of water from where water could be sourced into the canal system for the purpose of replenishment as well as maintaining sufficient water depth to enable navigation is described in the following sections.

4. Computation of Water losses

Water in the canals of the capital city that are amenable for cargo transportation commutation and recreation purposes need to be replenished to help in its usage. The quantity of replenishment should also compensate the water losses. Water losses in the canals are due to the following:

I. Evaporation – Considering the Pan Evaporation data from the nearby Rajahmundry Station, an annual quantity of around 4 Mm^3 or 0.14 TMC is required for the water replenishment. Refer Table 2.

II. Water Usage from Lawns and Greens – Approximately 5mm/ sq. m/ day of water would be required. Considering a total green area adjacent to the navigable canals and reservoirs of 386 Acres (1.56Mm^3), the volume of water required corresponds to 8000m^3 per day (0.24Mm^3 per month).

Table 2 Computed Annual Evaporation Losses

Month	Evaporation* (mm/day)	Pan Evaporation (mm)	Evaporation (Mm^3)	Water qty for repl. (Mm^3)
Jan	4.9	152	0.41	0.41
Feb	6.2	174	0.47	0.47
Mar	8.1	251	0.68	0.68
Apr	9	270	0.73	0.73
May	10.5	326	0.88	0.88
Jun	9.4	282	0.76	0.00@
Jul	6.7	208	0.56	0.00@
Aug	5.7	177	0.48	0.00@
Sep	5.6	168	0.45	0.00@
Oct	5.3	164	0.44	0.00@
Nov	5.1	153	0.41	0.41
Dec	4.9	152	0.41	0.41
Annual	6.7	2476	6.7	**4 (0.14TMC)**

- *- Pan Evaporation Data of nearby Rajhamundry Station*
- *@ - Water lost due to evaporation is expected to be replenished from rainfall in the catchment area during the monsoon months of Jun to Oct.*

During approximately 8 months in a year little or no influx of water due to precipitation is expected. This can/ will lead to standing waters during the larger part of the year. This is not desired from a water quality and health perspective.

As the canals need water replenishment and refreshment from a water quality perspective, they also allow for maintaining the water levels at sufficient depth to allow for navigation.

An inlet structure for water refreshment is proposed to be located in the bund near the Secretariat area. This inlet functions under gravity flow allowing refreshment of water in the canals.

Figure 1 Recommended waterways water levels, inlets and ship locks

Figure 1 provides the recommended water levels in waterways, location of inlets and ship locks.

5. Water Sourcing

I. From River Krishna at the Secretariat Area;

II. From River Krishna at proposed Vykuntapuram Barrage;

III. From treated sewage water of the developed capital city; and

IV. From other sources including the ground water.

OPTION-1: Water from river Krishna at the secretariat area

In this option, water is planned to be sourced from River Krishna near the Secretariat Area. Availability of water in the river at this location is reliable both for short term and long term scenario. Since River Krishna is proposed to be connected to national Waterway-4 (NW-4), availability of water at RL of 17.0m is assured throughout the year. Water can be sourced therefore by gravity through an inlet arrangement as shown in the figure. Further, water from here can be conveyed to the waterways in the capital city through a diversion canal from Rayapudi till Pala vagu.

Figure 2 presents the option of drawing water by gravity from River Krishna at the Secretariat Complex into the canals in the capital city. There are further two routes

possible as indicated in the figure. First is from the Secretariat Canal confluence while the second is from the recreational canal. The former is ruled out since the Area around the Secretariat Canal is higher and flow from Krishna by gravity may not be possible but needs pumping.

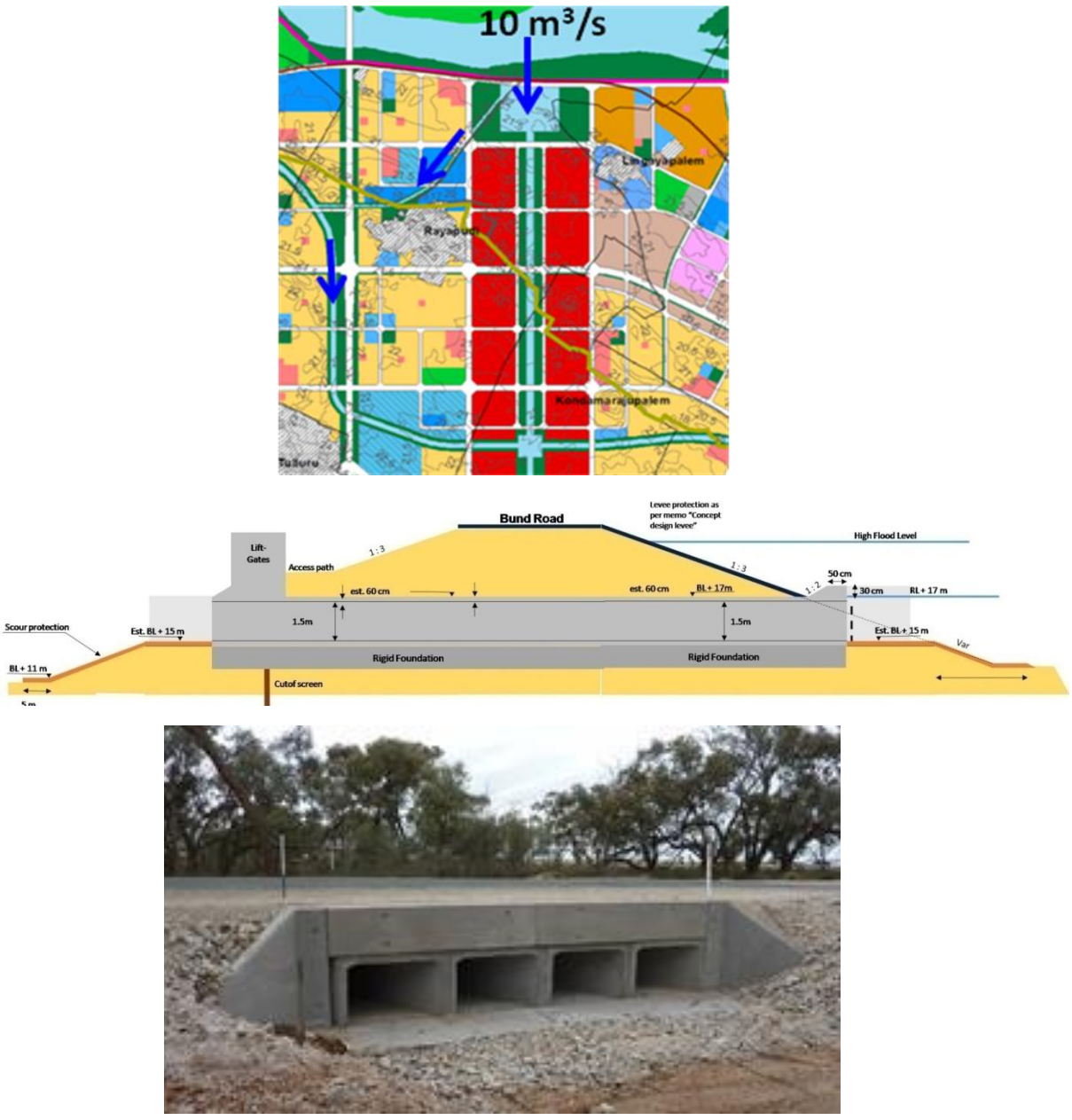


Figure 2: Option-1: Drawing Water from River Krishna at Secretariat Complex

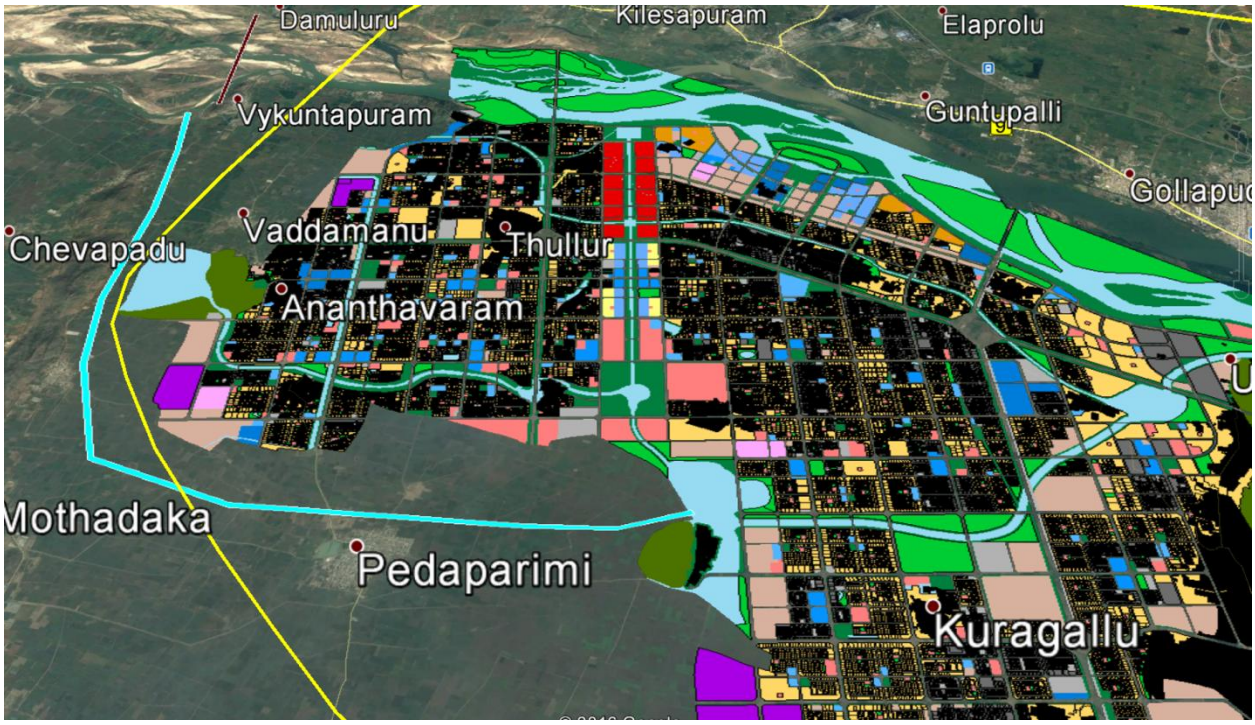


Figure 3: Option-2: Sourcing Water from the proposed Vykuntapuram Barrage

Option-2: Water from River Krishna at Vykuntapuram Barrage

In this option, water is planned to be sourced from River Krishna at the proposed Vykuntapuram Barrage located upstream. The disadvantage of this option is that it will not be suitable for drawing water immediately since the proposed Barrage is under planning stage only and hence this may therefore be suitable only in the long-term. Furthermore, the diversion canal from the Vykuntapuram Barrage will be a route through high elevations before joining the water ways in the capital city at Neerukonda. This therefore incurs high cost and time in view of land acquisition. Refer Figure 3 above for the proposed route. For these reasons, this option of drawing water from River Krishna at Vykuntapuram barrage proves unwieldy and is not considered.

As compared to the option of drawing water from the proposed Vykuntapuram Barrage as indicated in the figure above that involves longer distance and higher land acquisition cost, it is suggested that a diversion canal of approximately 6km length from the Secretariat Area is diverted to Pala vagu instead of circumventing the entire capital city. Comparison of the two routes of drawing water is made in the following Table 3.

Figure 4 and Figure 5 present the longitudinal routes of the diversion canals for the two routes described. As indicated, both the routes involve a high peak to traverse but the amount of cutting and land acquisition is drastically low compared to the route depicted by Blue Consultants.

Table 3: Option-2: Comparison of Water Drawal Routes

Sl. No.	Description	Irrigation Department Proposal	Blue Consultant Proposal
1.	Barrage	Vykuntapuram	Vykuntapuram
2.	Connectivity to Capital City and NW-4	Yes	Yes
3.	Length of Canal	Approx 21 km	6 km (new canal) 7.4 km (existing canal to be modified)
4.	Land Acquisition	High	Low
5.	Capital Cost	High	Low
6.	Technical feasibility	Requires either more ship locks or deep excavation to maintain navigable water depths (more construction time)	Deep excavation for a shorter length (relatively less construction time)

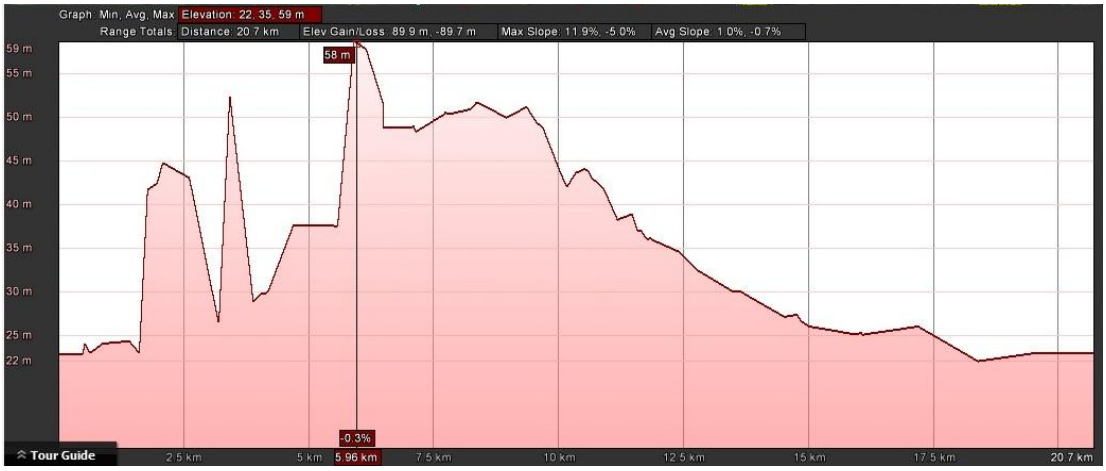


Figure 4: L-S of the proposed diversion canal route (suggested by ID)

Figure 5: L-S of the proposed diversion canal route by Blue Consultant

Option-3: Water sourcing from treated sewage of capital city

Treated Sewage as a source of water for replenishment is examined in this Option. It is understood from the Infrastructure Consultant of the Capital City that around 450 MLD (0.45Mm^3/ day) will be discharged into the vagus on complete development of the capital city (long term). This volume accounts for only 5% of the total water required for maintaining navigable depths in the canals. Considering this small magnitude, treated sewage therefore cannot be considered as an independent source both in short term as well as long-term scenario, However, this small quantity of treated sewage that is let out into the canals can be used to replenish water losses due to evaporation, seepage, watering of green area and lawns, etc.

Option-4: Water sourcing from Other Sources

Other water sources include Ground Water. However, considering the large quantity of water requirement, ground water cannot be considered as a source of maintaining navigation in the city canals.

A comparison between the above mentioned options is made in Table 4 below:

Table 4: Options of Water Sourcing

Sl. No.	Description	Technical Feasibility
1.	Option-1 River Krishna (Secretariat Area)	a) Reliable option both in short term and long term scenario b) Water availability may not pose problem, as it is part of NW-4 c) Required qty. of water can be drawn by gravity through an inlet arrangement near Secretariat area d) Water is proposed to be conveyed through a diversion

Sl. No.	Description	Technical Feasibility
		canal near Rayapudi.
2.	Option-2 River Krishna (Vykuntapuram Barrage)	a) Not feasible in short term (until completion of Vykuntapuram Barrage b) Water can be drawn by gravity (subsequent to completion of barrage c) Involves land acquisition and high capital costs. Hence not recommended
3.	Option-3 (Sewage Treated Water)	a) Quantity (450 MLD) is adequate to meet only about 5% of total water requirement. b) Cannot be considered as an independent source. c) However, treated sewage can be used to replenish water loss in canal due to evaporation, seepage, watering of lawns, etc.
4.	Option-4 Other Sources	Considering the requirement Ground water cannot be considered as a source.

From the above comparison of various sources it is clear that providing an Inlet from River Krishna at Secretariat Area is a reliable option for both short and long term considerations.

Further details on the selected option (Option-1) are provided in the following paragraphs.

6. Inlet for Water Replenishment at Secretariat Area

The Layout Plan of Water Replenishment Scheme is given in Figure 6. As indicated, an approach canal leads water from River Krishna to the existing bund. Two numbers of MS pipes further lead water through and under the strengthened bund to Diversion Canal of about 2km length before culminating with the existing Pala Vagu at Dandapadu. Water thus enters from this location to replenish the remaining waterways in the Capital City.

The details of longitudinal section and cross sections of the Inlet Arrangement are shown in **Annexure -VI.** As indicated in the Longitudinal Section, the Approach Canal is in two parts – the first part is 140 m in length from River Krishna till the beginning of the strengthened bund and the second part is 2 nos. of 1800 mm diameter MS pipes under the strengthened bund. The bed level of approach canal from River Krishna at the Inlet location is RL 15.0m and terminates at RL 14.0 m.

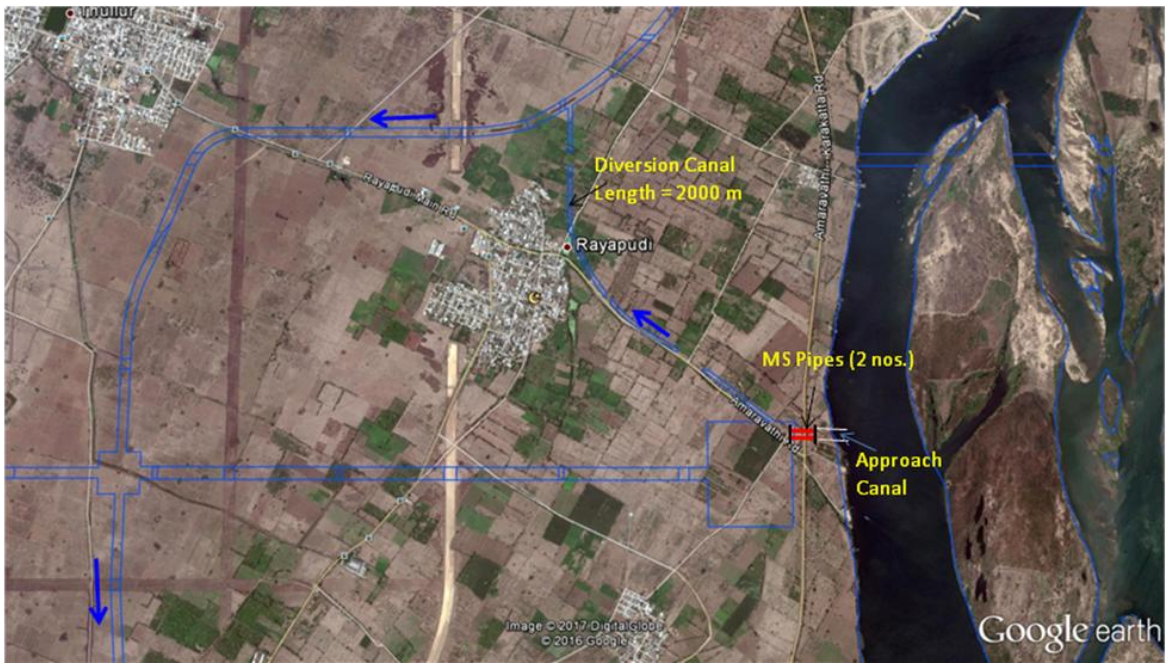


Figure 6 Location of the proposed Inlet for Water Replenishment at Secretariat Area

The FRL at River Krishna at the said location as indicated is RL 17.30 m and HFL is at RL 26.80 m. Two numbers of MS pipes 1.8 m in diameter encased to result in an outer diameter of 2.2 m leads water from the approach canal under the strengthened bund (whose top is at RL 28.60 m and proposed width for 4 lane road corresponding to 60 m) till the beginning of the Diversion canal.

Control Arrangement for water inlet into the system is in the form of Gates and Stop Logs provided at the beginning entrance and its end under the bund, where the pipe culminates into the open diversion canal. The ground level at the beginning of the pipe section is RL 14.93 m while it is RL 14.65 m at the end. The GL at the end of the pipe section is RL 22.0 m as indicated. The Diversion canal which is 2 km in length is planned through Rayapudi till it culminates with the Pala Vagu at Dandapadu.

Typical cross-section of approach and diversion canal near Rayapudi leading to Pala vagu is indicated in **Annexure – III.**The base width of the canal is 4 m. The RL at the canal invert varies from RL 13.0 m to 14.0 m and the GL varies from RL 20.0 m to 21.5 m.

7. Outlets for Removal of Water from the Canals

Water from the various waterways (canals) in the capital system needs to be disposed off either to empty them before replenishing or to empty any excess water. For this purpose, following three options are considered:

1. Option-1: Diversion to KWD Canal;
2. Option-2: Diversion to Guntur Canal; and

3. Option-3: Diversion to River Krishna.

Option-1: Diversion to KWD Canal

Discharging water into the Krishna Western Delta (KWD) Canal at Undavalli is one of the options. Water level in the navigable canals in the capital city shall be maintained at RL 14.00m while the Sill level of KWD canal is at RL 13.40 m with its bed at RL 12.21 m. This clearly indicates that disposal of water from the canals in the capital city into KWD by gravity is not possible, thus pumping needs to be resorted. This option can however be used when there are no flow in KWD canal which also necessitates modification of existing escape regulator.

Option-2: Diversion to Guntur Canal

Discharging water to Guntur Canal is examined. The bed level of the existing Guntur canal is RL 14.78 m and the design discharge is 600 cusecs. The Full Supply Level of the canal is RL 17.39 m. The water level in the canals of the capital city is Rl 14.0 m. There is also a proposal of de-linking the Guntur canal so that water is drawn directly from Krishna. Considering these situations, water conveyance into Guntur canal by gravity is not possible. This option therefore is ruled out.

Option-3: Diversion to River Krishna

Third option of discharging water into River Krishna is examined. The FSL of River Krishna at Undavalli is RL 17.39 m and water level in the canals of the capital city is RL 14.0 m. Therefore discharge of water into River Krishna is not possible by gravity and pumping has to be resorted to. For this purpose, the main Flood Pumping Station at Undavalli that is proposed at Undavalli has in addition to the main flood pumps of rated capacity of the order of 20 m3/sec also has a provision of three number of small pumps each of rated capacity 3 m3/sec. These pumps therefore can be used for pumping out water from the canals in the capital city to River Krishna at all normal circumstances while the larger duty flood pumps will be used for pumping flood waters.

Table 5 provides a comparison of these options. As can be seen from the Table, Option-3 of diverting to River Krishna is the most feasible. While all the options do not provide the disposal by gravity, pumping is necessitated in all the options. Option-3 is best suited since three number of small pumps with a rated capacity of $3m^3$/sec each is proposed in the flood pump house at Undavalli for this purpose.

Table 5 Options of Water Outlets

Sl. No.	Description	Technical Feasibility
1.	Option-1: Diversion to KWD Canal	a) Diversion by gravity is not feasible b) Pumping is required for most of the time. c) This alternative can be used when there are no flows in KWD canal. However, existing escape regulator has to be modified to

Sl. No.	Description	Technical Feasibility
		deplete the water from canals.
2.	Option-2: Diversion to Guntur Canal	a) Diversion by gravity is not feasible. b) Pumping is required for most of the time.
3.	Option-3: Diversion to River Krishna	a) Diversion by gravity is not feasible b) Pumping is necessary c) Three (3) nos. of 3 m^3/s pumps at Undavalli can be used to remove the water from canals. d) Further diversion of water by gravity, either to KWD canal or Guntur canal can be made from Prakasam barrage.

Annexure – XXIV

Tree Survey Report

Annexure XXIV

Table 1: Pala Vagu Left side Tree Survey Report

Total Length & Breadth: 9.3 km & 40m

S.No	Species name	Common Name	Age	Height	DBH	Tree Health	Latitude	Longitude	Remarks
1	*Borassus flabellifer*	tadi chettu	25 years	20 mt	80 cm	GOOD	N 16°33.22	E 80°28.30	To be cut
2	*Borassus flabellifer*	tadi chettu	20 years	15 mt	80 cm	GOOD			To be cut
3	*Abutilon indicum*	Tuttur benda	3 years	2 mt	20 cm	GOOD	N 16°33.22	E 80°28.30	herbs
4	*Abutilon indicum*	Tuttur benda	3 years	2 mt	20 cm	GOOD	N 16°33.22	E 80°28.30	
5	*tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°33.22	E 80°28.30	herbs
6	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°33.22	E 80°28.30	
7	*Crotan bonplandinum*	Meedi	1year				N 16°33.22	E 80°28.30	Shrubs
8	*Crotan bonplandinum*	Meedi	1year				N 16°33.22	E 80°28.30	Shrubs
9	*Citrus spp*	nimma	5 years	20 mt	20 cm	GOOD	N 16°33.22	E 80°28.30	Relocated
10	*Citrus spp*	nimma	5 years	20 mt	20 cm	GOOD	N 16°33.22	E 80°28.30	Relocated
11	*Bambusa vulgaris*	veduru chettu	15 years	10 mt	25 cm	GOOD			To be cut
12	*Bambusa vulgaris*	veduru chettu	15 years	10 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	To be cut
13	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD			To be cut
14	*Borassus flabellifer*	tadi chettu	20 years	15 mt	80 cm	GOOD			To be cut
15	*Abutilon indicum*	tuttur benda	1 year	1.5 mt	15 cm	GOOD			herbs
16	*Pithacalobium dulci*	seema chinta	6 years	5 mt	40 cm	GOOD			To be cut
17	*moringa oleracea*	mulaga	2 years	3 mt	30 cm	GOOD	N 16°32.71	E 80°29.29	Relocated
18	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	herbs
19	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	
20	*Abutilon indicum*	tuttur benda	3 years	2 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	
21	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°32.71	E 80°29.29	Shrubs
22	*calotropis gigantia*	jilledu	1.5 years	1 mt	10 cm	GOOD	N 16°32.71	E 80°29.29	
23	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	

S.No	Species name	Common Name	Age	Height	DBH	Tree Health	Latitude	Longitude	Remarks
24	*Acacia nolatica*	nalla tumma	10 years	5 mt	60 cm	GOOD	N 16°32.42	E 80°29.59	To be cut
25	*Abutilon indicum*	tuttur benda	1 year	1.5 mt	15 cm	GOOD			
26	*Acacia nolatica*	nalla tumma	10 years	5 mt	60 cm	GOOD			To be cut
27	*Abutilon indicum*	tuttur benda	1 year	1.5 mt	15 cm	GOOD			
28	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD			Shrubs
29	*Ipomea cairica*	rail road creeper	2 years	creeper	10-15 cm	GOOD			
30	*Curcuma longa*	pasupu	5 months	80 cm	15 cm	GOOD	N 16°32.24	E 80°29.90	
31	*Croton bonplandinum*	Galivana mokka	3 months	30 cm	10 cm	GOOD	N 16°32.24	E 80°29.90	
32	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°32.24	E 80°29.90	herbs
33	*Ricinus communis*	Amudam	1 year	2 mt	10 cm	GOOD	N 16°32.24	E 80°29.90	
34	*Dolicos lab lab*	Chikkudu	3 months	40 cm	5 cm	GOOD	N 16°32.24	E 80°29.90	
35	*Borassus flabellifer*	Tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°32.24	E 80°29.90	To be cut
36	*Borassus flabellifer*	Tadi chettu	20 years	20 mt	80 cm	GOOD			To be cut
37	*Prosopis juliflora*	Mulla tumma	3 years	3 mt	30 cm	GOOD			To be cut
38	*Acacia nilotica*	Nalla tumma	5 years	4 mt	50 cm	GOOD			
39	*Coccas nucifera*	Kobbari	10 years	5 mt	60 cm	GOOD			Relocated
40	*Ricinus communis*	Aamudam	1 year	2 mt	10 cm	GOOD	N 16°32.01	E 80°29.89	herbs
41	*Ricinus communis*	Aamudam	1 year	2 mt	10 cm	GOOD			
42	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD			
43	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
44	*Pithacalobium dulce*	seema chinta	6 years	5 mt	40 cm	GOOD			To be cut
45	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
46	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
47	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD	N 16°32.01	E 80°29.89	Relocated
48	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD	N 16°32.01	E 80°29.89	Relocated
49	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD	N 16°32.01	E 80°29.89	Relocated
50	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°32.01	E 80°29.89	

S.No	Species name	Common Name	Age	Height	DBH	Tree Health	Latitude	Longitude	Remarks
51	*Lilium candidum*	lily flower	6 months	creeper	5 cm	GOOD	N 16°32.01	E 80°29.89	
52	*Cypres rotandus*	green grass	3 months	10 cm	2 cm	GOOD	N 16°32.01	E 80°29.89	herbs
53	*Tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°32.01	E 80°29.89	
54	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°32.01	E 80°29.89	
55	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°32.01	E 80°29.89	herbs
56	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
57	*Coriandrum sativum*	kothimeera	4 months	15 cm	2 cm	GOOD			
58	*Occimum sanctum*	tulasi	2 months	40 cm	5 cm	GOOD	N 16°31.94	E 80°330.10	herbs
59	*Ruellia tuberosa*	Citapata Kaayalu mokka	4 months	15 cm	3 cm	Infected			
60	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD			
61	*Prosopis cinraria*	Jammi chattu	5 years	4 mt	30 cm	GOOD			To be cut
62	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°31.94	E 80°330.10	
63	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°31.94	E 80°330.10	
64	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°31.94	E 80°330.10	herbs
65	*pennisetum glacum*	sajjalu	6 months	1.5 mt	5 cm	GOOD			
66	*Achyranthus aspera*	uttareni	4 months	50 cm	5 cm	GOOD	N 16°31.94	E 80°330.10	herbs
67	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
68	*Carica pappaya*	boppai	2 years	2 mt	30 cm	Infected			
69	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
70	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD			To be cut
71	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
72	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°31.85	E 80°30.35	herbs
73	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
74	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD			To be cut
75	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°31.85	E 80°30.35	
76	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°31.85	E 80°30.35	Shrubs
77	*Abelmosehus*	benda	6 months	50 cm	10cm	GOOD	N 16°31.85	E 80°30.35	

S.No	Species name	Common Name	Age	Height	DBH	Tree Health	Latitude	Longitude	Remarks
	esculentus								
78	*Curcuma longa*	pasupu	5 months	80 cm	15 cm	GOOD	N 16°31.85	E 80°30.35	
79	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD	N 16°31.85	E 80°30.35	
80	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°31.85	E 80°30.35	
81	*Tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°31.85	E 80°30.35	
82	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°31.85	E 80°30.35	
83	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°31.85	E 80°30.35	
84	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
85	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
86	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
87	*Zizipus Zuzuba*	regu	3 years	2 mt	15 cm	GOOD	N 16°31.82	E 80°30.52	Shrubs
88	*Zizipus Zuzuba*	regu	3 years	2 mt	15 cm	GOOD			
89	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD			Shrubs
90	*Carica pappaya*	boppai	3 years	3 mt	40 cm	GOOD			
91	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
92	*Manikara zapota*	sapota	4 years	5 mt	60 cm	GOOD			Relocated
93	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°31.82	E 80°30.52	To be cut
94	*Coccinia cordifolia*	donda	6 months	creeper		GOOD	N 16°31.82	E 80°30.52	creeper
95	*Achyranthus aspera*	uttareni	3 months	50 cm	10 cm	GOOD	N 16°31.82	E 80°30.52	
96	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°31.82	E 80°30.52	To be cut
97	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°31.82	E 80°30.52	
98	*Curcuma longa*	pasupu	5 months	80 cm	15 cm	GOOD	N 16°31.82	E 80°30.52	
99	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD	N 16°31.82	E 80°30.52	To be cut
100	*Thrattidion noctivagus*	sanaga	5 months	20cm	2 cm	GOOD			
101	*Borassus flabellifer*	tadi chettu	23 years	40mt	80 cm	GOOD			To be cut
102	*Borassus flabellifer*	tadi chettu	23 years	40 mt	80 cm	GOOD	N 16°31.60	E 80°30.60	To be cut
103	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD			

S.No	Species name	Common Name	Age	Height	DBH	Tree Health	Latitude	Longitude	Remarks
104	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
105	*Azadirachta indica*	vepa	5 years	5 mt	80 cm	GOOD			Relocated
106	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
107	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
108	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
109	*Citrus spp*	nimma	5 years	20 mt	20 cm	GOOD			Relocated
110	*Citrus spp*	nimma	5 years				N 16°31.60	E 80°30.60	Relocated
111	*Manikara zapota*	Sapota	5 years				N 16°31.60	E 80°30.60	Relocated
112	*Manikara zapota*	sapota	5 years				N 16°31.60	E 80°30.60	Relocated
113	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD	N 16°31.60	E 80°30.60	
114	*Pithacalobium dulci*	seema chinta	6 years	5 mt	40 cm	GOOD	N 16°31.60	E 80°30.60	
115	*Borassus flabellifer*	tadi chettu	23 years	40 mt	80 cm	GOOD	N 16°31.60	E 80°30.60	To be cut
116	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
117	*Prosopis cineraria*	Jammi	15 years	25 mt	70 cm	GOOD			
118	*Ficus bengalensis*	marri	20 years	30 mt	60 cm	GOOD			To be cut
119	*Acacia nolatica*	nalla tumma	10 years	5 mt	60 cm	GOOD	N 16°3.65	E 80°30.68	To be cut
120	*Prosopis juliflora*	mulla tumma	9 years	6 Mt	80 cm	GOOD			
121	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD			To be cut
122	*Curcuma longa*	pasupu	7 months	60 cm	20 cm	GOOD	N 16°3.65	E 80°30.68	
123	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°3.65	E 80°30.68	
124	*Coriandrum sativum*	kothimeera	4 months	15 cm	2 cm	GOOD			
125	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°31.59	E 80°30.85	
126	*Mimordia charantia*	kakara	2 months	creeper		Infected	N 16°31.59	E 80°30.85	
127	*Curcuma longa*	pasupu	5 months	80 cm	15 cm	GOOD	N 16°31.59	E 80°30.85	
128	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°31.59	E 80°30.85	
129	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
130	*Azadirachta indica*	vepa	5 years	5 mt	80 cm	GOOD			Relocated

S.No	Species name	Common Name	Age	Height	DBH	Tree Health	Latitude	Longitude	Remarks
131	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD			
132	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
133	*Coriandrum sativum*	kothimeera	4 months	15 cm	2 cm	GOOD			
134	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
135	*Zizipus Zuzuba*	regu	3 years	2 mt	15 cm	GOOD			Shrubs
136	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
137	*Zizipus Zuzuba*	regu	3 years	2 mt	15 cm	GOOD			
138	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
139	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
140	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
141	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°31.33	E 80°31.68	
142	*Coriandrum sativum*	kothimeera	4 months	15 cm	2 cm	GOOD	N 16°31.33	E 80°31.68	
143	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD	N 16°31.33	E 80°31.68	To be cut
144	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°31.33	E 80°31.68	To be cut
145	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°29.91	E 80°3.01	
146	*Coriandrum sativum*	kothimeera	4 months	15 cm	2 cm	GOOD	N 16°29.91	E 80°3.01	
147	*Zizipus Zuzuba*	regu	3 years	2 mt	15 cm	GOOD	N 16°29.91	E 80°3.01	
148	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°29.91	E 80°3.01	
149	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°29.91	E 80°3.01	
150	*Thrattidion noctivagus*	sanaga	5 months	20cm	2 cm	GOOD			
151	*Cassia oxidentalis*	tangaadu	10 years	5 mt	60 cm	GOOD			To be cut
152	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut

Total No of Trees – 152
Trees to be cut – 37
Trees to be relocated - 19

Table 2: Pala Vagu Right side Tree Survey Report

Total Length & Breadth: 9.3 km & 40m

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
1	*Cassia oxidentalis*	tumma	10 years	5 mt	60 cm	GOOD	N 16°33.22	E 80°28.30	To be cut
2	*Calotropis gigantia*	jilledu	1.5 years	1 mt	10 cm	GOOD			Shrubs
3	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°33.22	E 80°28.30	Shrubs
4	*Argemonan mexicana*	pichi dosa	2 years	Creeper		GOOD	N 16°33.22	E 80°28.30	
5	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD	N 16°33.22	E 80°28.30	
6	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD	N 16°33.22	E 80°28.30	
7	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	
8	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD			
9	*Lantana camera*	lantanas	3 years	2 mt	40 cm	GOOD			
10	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
11	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD			
12	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°32.71	E 80°29.29	To be cut
13	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°32.71	E 80°29.29	
14	*Lantana camera*	lantanas	3 years	2 mt	40 cm	GOOD	N 16°32.71	E 80°29.29	
15	*Calotropis gigantia*	jilledu	1.5 years	1 mt	10 cm	GOOD	N 16°32.71	E 80°29.29	Shrubs
16	*Ipomea cairica*	rail road creeper	4 years	creeper	10-15 cm	GOOD	N 16°32.71	E 80°29.29	
17	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°32.71	E 80°29.29	To be cut
18	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°32.71	E 80°29.29	To be cut
19	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
20	*Jetropha curcas*	Adavi aamudam					N 16°32.42	E 80°29.59	

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
21	*Jetropha gossypifolia*	Vearri aamudam							
22	*Phyllanthus amarus*	Neala usari							herbs
23	*Corallocarpus epigaeus*	Pamudonda							
24	*Diplocyclos palmatus*	Lingadonda							
25	*Acalypha indica*	Muripinda							Shrubs
26	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°32.24	E 80°29.90	
27	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°32.24	E 80°29.90	
28	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°32.24	E 80°29.90	
29	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°32.24	E 80°29.90	Shrubs
30	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°32.24	E 80°29.90	
31	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°32.24	E 80°29.90	
32	*Coccas nucifera*	kobbari	10 years	5 mt	60 cm	GOOD	N 16°32.24	E 80°29.90	Relocated
33	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD			
34	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD			
35	*Coccas nucifera*	kobbari	10 years	5 mt	60 cm	GOOD			
36	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°32.01	E 80°29.89	Shrubs
37	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD			
38	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD			
39	*Tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD			
40	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD			
41	*Coccas nucifera*	kobbari	10 years	5 mt	60 cm	GOOD	N 16°32.01	E 80°29.89	
42	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°32.01	E 80°29.89	
43	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°32.01	E 80°29.89	
44	*Coccas nucifera*	kobbari	10 years	5 mt	60 cm	GOOD	N 16°32.01	E 80°29.89	
45	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°31.94	E 80°330.10	Shrubs
46	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°31.94	E 80°330.10	
47	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD			
48	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD			Shrubs

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
49	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°31.85	E 80°30.35	
50	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD			
51	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD			
52	*Cypres rotandus*	green grass	3 months	10 cm	2 cm	GOOD	N 16°31.85	E 80°30.35	
53	*tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°31.85	E 80°30.35	
54	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°31.85	E 80°30.35	
55	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°31.85	E 80°30.35	Shrubs
56	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°31.85	E 80°30.35	
57	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°31.85	E 80°30.35	
58	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD	N 16°31.85	E 80°30.35	To be cut
59	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°31.85	E 80°30.35	
60	*Cassia oxidentalis*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
61	*Zizipus Zuzuba*	REGU	3 years	2 mt	15 cm	GOOD			Shrubs
62	*Cassia oxidentalis*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
63	*ZIZIPUS ZUZUBA*	REGU	3 years	2 mt	15 cm	GOOD			
64	*Cassia oxidentalis*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
65	*Thrattidion noctivagus*	sanaga	5 months	20cm	2 cm	GOOD			
66	*Thrattidion noctivagus*	sanaga	5 months	20cm	2 cm	GOOD			
67	*Thrattidion noctivagus*	sanaga	5 months	20cm	2 cm	GOOD			
68	*Zizipus Zuzuba*	REGU	3 years	2 mt	15 cm	GOOD	N 16°31.82	E 80°30.52	
69	*Cassia oxidentalis*	tumma	10 years	5 mt	60 cm	GOOD	N 16°31.82	E 80°30.52	To be cut
70	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°31.82	E 80°30.52	
71	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD			
72	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD			To be cut
73	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
74	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD			
75	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD			
76	*Azadirakta indica*	vepa	2 years	5 mt	50 cm	GOOD			Relocated

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
77	*Pithacalobium dulci*	seema chinta	6 years	5 mt	40 cm	GOOD			To be cut
78	*Pithacalobium dulci*	seema chinta	6 years	5 mt	40 cm	GOOD			To be cut
79	*Crotan bonplandinum*	Meedi	1year				N 16°31.60	E 80°30.60	Shrubs
80	*Crotan bonplandinum*	Meedi	1year				N 16°31.60	E 80°30.60	Shrubs
81	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD	N 16°31.60	E 80°30.60	To be cut
82	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°31.60	E 80°30.60	Shrubs
83	*Tephrosia purpurea*	Vampali					N 16°31.60	E 80°30.60	
84	*Mimosa pudica*	Attipatti					N 16°31.60	E 80°30.60	
85	*Enicostemma axillaraa*	Nealagolimidi					N 16°31.60	E 80°30.60	
86	*Typha angustata*	jammu gaddi	Grass				N 16°31.60	E 80°30.60	
87	*Saccharum spontaneum*	Rellu gaddi	Grass						
88	*Jetropha gossypifolia*	Vearri aamudam							
89	*Phyllanthus amarus*	Neala usari							
90	*Senna auriculata*	Tangadu	Shrubs				N 16°3.65	E 80°30.68	
91	*Pergularia daemia*	Juttupaku							
92	*Ceiba pentandra*	Tella buruga							
93	*Bogan vilia*	kagitam pulu	3 years	2 mt	20 cm	GOOD	N 16°3.65	E 80°30.68	
94	*Ficus religosa*	ravi	20 years	12 mt	1mt	GOOD			To be cut
95	*coriander sativem*	kottimera	3 months	10 cm	2 cm	GOOD			
96	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°31.59	E 80°30.85	
97	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD	N 16°31.59	E 80°30.85	To be cut
98	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°31.59	E 80°30.85	
99	*Thrattidion noctivagus*		5 months	20cm	2 cm	GOOD			sanaga
100	*Borassus flabellifer*	tadi chettu	20 years	20 mt	80 cm	GOOD			
101	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD			
102	*Ricinus communis*	aamudam	1 year	1 mt	15 cm	GOOD			
103	*Ricinus communis*	aamudam	1 year	1 mt	15 cm	GOOD			
104	*Sorgam bicolor*	jonna	8 months	1.5 mt	10 cm	GOOD			

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
105	*Calotropis zigantia*	jilledu	1 year	1 mt	10 cm	GOOD			
106	*Crotonbonplandinum*	galivana mokka	3 months	30 cm	5 cm	GOOD			
107	*Trinanthema portulacastrum*	Galijeeru					N 16°31.33	E 80°31.68	
108	*Allmania nodiflora*	Yarra baddaku	tree				N 16°31.33	E 80°31.68	
109	*Alternanthera sessilis*	Ponnagantikuura					N 16°31.33	E 80°31.68	
110	*Amaranthus spinosus*	Mundla totakuura	herbs				N 16°31.33	E 80°31.68	
111	*Marsilea quardifolia*	Chandamamakuura					N 16°31.33	E 80°31.68	
112	*Boerhavia diffusa*	Gudla malli							
113	*Indigofera tinctoia*	Neeli mandu					N 16°29.91	E 80°3.01	
114	*desmostchya bipinnata*	dharba					N 16°29.91	E 80°3.01	
115	*Heteropogan contortus*	Nallaginni gaddi	Grass				N 16°29.91	E 80°3.01	
116	*Saccharum spontanuem*	Rellu					N 16°29.91	E 80°3.01	
117	*Cassia oxidentalis*	tumma	10 years	5 mt	60 cm	GOOD	N 16°29.91	E 80°3.01	To be cut

Total Trees - 117
Trees to be cut – 19
Trees to be relocated - 2

Table 3: Kondaveeti Vagu left side Tree Survey Report

Total Length & Breadth: 10.3 km & 40 m

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
1	*Prosopis juliflora*	mulla tumma	9 years	6 Mt	80 cm	GOOD	N 16o°27.66	E 80°30.05	To be cut
2	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16o°27.66	E 80°30.05	
3	*Prosopis juliflora*	mulla tumma					N 16o°27.66	E 80°30.05	
4	*prosopis juliflora*	mulla tumma					N 16o°27.66	E 80°30.05	
5	*Prosopis juliflora*	mulla tumma					N 16o°27.66	E 80°30.05	
6	*Prosopis juliflora*	mulla tumma							
7	*Prosopis juliflora*	mulla tumma					N 16°28.03	E 80°30	To be cut
8	*Allmania nodiflora*	Yarra baddaku					N 16°28.03	E 80°30	
9	*Alternanthera ficoidea*	Adavi ponnaganti					N 16°28.03	E 80°30	
10	*Argemone mexicana*	Baluraccasi					N 16°28.03	E 80°30	
11	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°28.03	E 80°30	
12	*Solanum virginianum*	Nealavakudu					N 16°28.03	E 80°30	
13	*Gomphrena celosioides*	Aluka uttareaani					N 16°28.03	E 80°30	
14	*Acanthosperumhispidum*	Kukkamulla					N 16°28.03	E 80°30	
15	*Cypres rotandus*	green grass	3 months	10 cm	2 cm	GOOD	N 16°28.03	E 80°30	
16	*Tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°28.03	E 80°30	
17	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°28.03	E 80°30	
18	*Imperata cylandrica*	dharba							
19	*Albizia lebback*	Dirisena					N 16°28.10	E 80°30	To be cut
20	*ZIZIPUS ZUZUBA*	REGU	3 years	2 mt	15 cm	GOOD			To be cut
21	*Jetropha gossypifolia*	Vearri aamudam					N 16°28.10	E 80°30	
22	*Phyllanthus amarus*	Neala usari					N 16°28.10	E 80°30	
23	*Senna auriculata*	Tangadu					N 16°28.10	E 80°30	
24	*Sida cordifolia*	chiru benda	2 years	1.5 mt	10 cm	GOOD	N 16°28.10	E 80°30	

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
25	*Sida cordifolia*	chiru benda	1 year	1.5 mt	8 cm	GOOD	N 16°28.10	E 80°30	
26	*Enicostemma axillaraa*	Nealagolimidi					N 16°28.10	E 80°30	
27	*Euphorbia hirta*	Pachabottu					N 16°28.10	E 80°30	
28	*Euphorbia hetiriphylla*	Beadiaaku					N 16°28.10	E 80°30	
29	*Jetropha curcas*	Adavi aamudam					N 16°28.10	E 80°30	
30	*Opuntia microdays*	Bhrmajemudu					N 16°28.10	E 80°30	
31	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°28.10	E 80°30	
32	*calotropis gigantia*	jilledu	1.5 years	1 mt	10 cm	GOOD			
33	*Abutilon indicum*	tuttur benda	1 year	2 mt	15 cm	GOOD	N 16°28.01	E 80°31.33	
34	*Lepidagathis cristata*	Mulla banthi	Herbs						
35	*Justicia adhatoda*	Adda rasam					N 16°28.01	E 80°31.33	
36	*Aerva lanata*	Kondapindi					N 16°28.01	E 80°31.33	
37	*Catharanthus roseus*	Billagannaru					N 16°28.01	E 80°31.33	
38	*Gymnema sylvestre*	Podapatri					N 16°28.01	E 80°31.33	
39	*Oxystelma esculentum*	Dudipala					N 16°28.01	E 80°31.33	
40	*Pergularia daemia*	Juttupaku					N 16°28.01	E 80°31.33	
41	*Elipta prostata*	Guntagalaaraku					N 16°28.01	E 80°31.33	
42	*Xanthium strumarium*	Marulamatangi					N 16°28.01	E 80°31.33	
43	*Corallocarpus epigaeus*	Pamudonda					N 16°28.01	E 80°31.33	
44	*Diplocyclos palmatus*	Lingadonda					N 16°28.01	E 80°31.33	
45	*Acalypha indica*	Muripinda							
46	*Prosopis juliflora*	mulla tumma	9 yers	6 Mt	80 cm	GOOD	N 16°28.01	E 80°31.38	To be cut
47	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD			To be cut
48	*Borassus flabellifer*	tadi chettu	20 years	15 mt	80 cm	GOOD	N 16°28.01	E 80°31.38	7 Plants are located
49	*Borassus flabellifer*	tadi chettu	19 years	15 mt	80 cm	GOOD	N 16°28.01	E 80°31.38	
50	*Borassus flabellifer*	tadi chettu	25 years	15 mt	80 cm	GOOD	N 16°28.01	E 80°31.38	

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
51	*Calotropis zigantia*	Jilledu	2 years	2 mt	15 cm	GOOD	N 16°28.01	E 80°31.38	
52	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°28.01	E 80°31.38	
53	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°28.01	E 80°31.38	
54	*Borassus flabellifer*	tadi chettu	20 years	15 mt	80 cm	GOOD	N 16°28.01	E 80°31.38	To be cut
55	*Pycaus bengalensis*	Marri	10 years	20 mt	150cm	GOOD	N 16°28.01	E 80°31.38	To be cut
56	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
57	*Pithacalobium dulci*	seema chinta	8 years	5 mt	40 cm	GOOD			To be cut
58	*Prosopis juliflora*	mulla tumma	9 yers	6 Mt	80 cm	GOOD	N 16°27.90	E 80°32.04	To be cut
59	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16°27.90	E 80°32.04	To be cut
60	*Tectona grandis*	teak	4years	6 mt	30 cm	GOOD	N 16°27.90	E 80°32.04	Re locate
61	*Tectona grandis*	teak	5 years	8mt	35 cm	GOOD	N 16°27.90	E 80°32.04	Relocate
62	*Tectona grandis*	teak	7years	10mt	38cm	GOOD	N 16°27.90	E 80°32.04	Relocate
63	*Tectona grandis*	teak	5 years	8mt	30 cm	GOOD	N 16°27.90	E 80°32.04	Relocate
64	*Tectona grandis*	teak	8 years	12mt	40cm	GOOD			To be cut
65	*Jetropha curcas*	Adavi aamudam					N 16°27.87	80°32.33	
66	*Achyranthus aspera*	uttareni	4 months	50 cm	5 cm	GOOD	N 16°27.87	80°32.33	
67	*Prosopis cinraria*	Jammi chattu	5 years	4 mt	30 cm	GOOD	N 16°27.87	80°32.33	To be cut
68	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°27.87	80°32.33	
69	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°27.87	80°32.33	
70	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°27.87	80°32.33	
71	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°27.87	80°32.33	To be cut
72	*Achyranthus aspera*	uttareni	4 months	50 cm	5 cm	GOOD	N 16°27.87	80°32.33	
73	*ZIZIPUS ZUZUBA*	REGU	2 years	2 mt	15 cm	GOOD	N 16°27.87	80°32.33	
74	*ZIZIPUS ZUZUBA*	REGU	2 years	2 mt	15 cm	GOOD	N 16°27.87	80°32.33	
75	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°27.87	80°32.33	To be cut
76	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°27.87	80°32.33	To be cut
77	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°28.08	E 80°32.41	

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
78	*Saccharum spontaneum*	Rellu gaddi					N 16°28.08	E 80°32.41	
79	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD	N 16°28.08	E 80°32.41	To be cut
80	*Tephrosia purpurea*	Vampali					N 16°28.08	E 80°32.41	
81	*Mimosa pudica*	Attipatti	Herbs				N 16°28.08	E 80°32.41	
82	*Enicostemma axillaraa*	Nealagolimidi					N 16°28.08	E 80°32.41	
83	*Anisomeles malabarica*	Malabar					N 16°28.08	E 80°32.41	
84	*Argemone mexicana*	Baluraccasi					N 16°28.08	E 80°32.41	
85	*Passiflora foetada*	Gaajudonda	Creaper				N 16°28.08	E 80°32.41	
86	*Solanum virginianum*	Nealavakudu					N 16°28.08	E 80°32.41	
87	*Gomphrena celosioides*	Aluka uttareaani					N 16°28.08	E 80°32.41	
88	*Acanthosperumhispidum*	Kukkamulla					N 16°28.08	E 80°32.41	
89	*Lantanax aculeata*	Belika chattu					N 16°28.08	E 80°32.41	
90	*Saccharum spontaneum*	Rellu gaddi					N 16°28.08	E 80°32.41	
91	*Peltophorum*	Konda chinta							
92	*Dicliptera paniculata*	Kakanasa							
93	*Lepidagathis cristata*	Mulla banthi	Herbs				N 16°28.08	E 80°32.41	
94	*Justicia adhatoda*	Adda rasam							
95	*Aerva lanata*	Kondapindi	Herbs				N 16°28.08	E 80°32.41	
96	*Catharanthus roseus*	Billagannaru					N 16°28.08	E 80°32.41	
97	*Gymnema sylvestre*	Podapatri					N 16°28.08	E 80°32.41	
98	*Oxystelma esculentum*	Dudipala					N 16°28.08	E 80°32.41	
99	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°28.08	E 80°32.41	
100	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°28.08	E 80°32.41	To be cut
101	*Thrattidion noctivagus*		5 months	20cm	2 cm	GOOD	N 16°28.08	E 80°32.41	sanaga
102	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°28.08	E 80°32.41	
103	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD	N 16°28.08	E 80°32.41	To be cut
104	*Prosopis juliflora*	mulla tumma	9 yers	6 Mt	80 cm	GOOD	N 16°28.08	E 80°32.41	To be cut

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
105	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16°28.08	E 80°32.41	To be cut
106	*Tephrosia purpurea*	Vampali					N 16°28.08	E 80°32.41	
107	*Mimosa pudica*	Attipatti					N 16°28.08	E 80°32.41	
108	*Jetropha gossypifolia*	Vearri aamudam					N 16°28.08	E 80°32.41	
109	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16°28.30	E 80 32.51	To be cut
110	*Gomphrena celosioides*	Aluka uttareaani					N 16°28.30	E 80 32.51	
111	*Acanthosperumhispidum*	Kukkamulla					N 16°28.30	E 80 32.51	
112	*Lantanax aculeata*	Belika chattu					N 16°28.30	E 80 32.51	
113	*Acalypha indica*	Muripinda					N 16°28.30	E 80 32.51	
114	*Euphorbia hirta*	Pachabottu					N 16°28.30	E 80 32.51	
115	*Tephrosia purpurea*	Vampali					N 16°28.30	E 80 32.51	
116	*Mimosa pudica*	Attipatti	9 yers	6 Mt	80 cm	GOOD	N 16°28.30	E 80 32.51	
117	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16°28.30	E 80 32.51	To be cut
118	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16 28.55	E 80 32.72	To be cut
119	*ZIZIPUS ZUZUBA*	REGU	3 years	2 mt	15 cm	GOOD	N 16 28.55	E 80 32.72	To be cut
120	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16 28.55	E 80 32.72	
121	*Azadirachta indica*	vepa	5 years	5 mt	80 cm	GOOD	N 16 28.55	E 80 32.72	
122	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD	N 16 28.55	E 80 32.72	To be cut
123	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD	N 16 28.55	E 80 32.72	To be cut
124	*Prosopis juliflora*	mulla tumma	9 yers	6 Mt	80 cm	GOOD	N 16°28.74	E 80°33.20	To be cut
125	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16°28.74	E 80°33.20	To be cut
126	*Pithacalobium dulci*	seema chinta	10 years	20 mt	40 cm	GOOD	N 16°28.74	E 80°33.20	To be cut
127	*Borassus flabellifer*	tadi chettu	23 years	40mt	80 cm	GOOD	N 16°28.74	E 80°33.20	TO be cut
128	*Acacia nilotica*	Nalla Tumma	10 years	40mt	60 cm	GOOD	N 16°28.74	E 80°33.20	TO be cut
129	*Psidum guajava*	Jama					N 16°28.74	E 80°33.20	Grass
130	*Albizia lebback*	Dirisena	7 years	30 mt			N 16°28.74	E 80°33.20	
131	*Leucaena leucocephaala*	Subabul	10 years				N 16°28.74	E 80°33.20	To be cut

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
132	*Terminalia cataappa*	Badam	5 years				N 16°29.21	E 80°33.44	Relocated
133	*Pergularia daemia*	Juttupaku		Medicinal Plant			N 16°29.21	E 80°33.44	
134	*Ricinus communis*	aamudam	1 year	2 mt	10 cm	GOOD	N 16°29.21	E 80°33.44	
135	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD	N 16°29.21	E 80°33.44	To be cut
136	*Calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°29.21	E 80°33.44	
137	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD	N 16°29.21	E 80°33.44	To be cut
138	*Prosopis juliflora*	mulla tumma	9 yers	6 Mt	80 cm	GOOD	N 16°29.21	E 80°33.44	65 Plants are locacted & to be cut
139	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16°29.21	E 80°33.44	To be cut
140	*Abelmosehus esculentus*	benda	6 months	50 cm	10cm	GOOD	N 16°29.21	E 80°33.44	
141	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°29.21	E 80°33.44	
142	*Typha angustata*	jammu gaddi					N 16°29.21	E 80°33.44	
143	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD	N 16°29.21	E 80°33.44	10 plants are located & To be cut
144	*coccinia cordifolia*	donda	creeper	20 cm	2 cm	GOOD	N 16°29.21	E 80°33.44	
145	*tridox procumbance*	Gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°29.19	E 80°79	
146	*Crotan bonplandinum*	Glai vana mokka	3 months	40 cm	10 cm	GOOD			
147	*Prosopis juliflora*	Mulla tumma	9 yers	6 Mt	80 cm	GOOD			To be cut
148	*Prosopis juliflora*	Mulla tumma	7 years	7 mt	70 cm	GOOD			To be cut
149	*Ipomea cairica*	Rail road creeper	Shrubs						
150	*Ipomea cairica*	Rail road creeper							
151	*Prosopis juliflora*	Mulla tumma	5 years	6 mt	60 cm	GOOD			To be cut
152	*Prosopis juliflora*	Mulla tumma	4 years	5 mt	50 cm	GOOD	N 16°29.19	E 80°79	To be cut
153	*Moringa olieifera*	Mulaga							Reelocated

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
154	*Kajanus kajan*	Kandulu							
155	*Kajanus kajan*	Kandulu							
156	*Achyranthus aspera*	uttareni	4 months	50 cm	5 cm	GOOD	N 16°29.25	E 80°33.93	
157	*Azadirachta indica*	vepa	years	5 mt	80 cm	GOOD			Reelocated
158	*Manjifera indica*	Mamidi	10 years				N 16°29.25	E 80°33.93	To be cut
159	*Azadirachta indica*	vepa	5 years	5 mt	80 cm	GOOD			To be cut
160	*Marsilea quardifolia*	Chandamamakuura							
161	*Boerhavia diffusa*	Gudla malli							
162	*Indigofera tinctoia*	Neeli mandu							
163	*desmostchya bipinnata*	dharba		Medicinal Plants					
164	*Imperata cylandrica*	dharba		Medicinal Plants			N 16°29.29	E 80°34.05	
165	*Cassine glauca*	Buutankas							
166	*Cassia fistula*	Raala							
167	*Peltophorum*	Konda chinta					N 16°29.29	E 80°34.05	
168	*Dicliptera paniculata*	Kakanasa							
169	*Lepidagathis cristata*	Mulla banthi	herbs						
170	*Justicia adhatoda*	Adda rasam							
171	*Aerva lanata*	Kondapindi							
172	*Catharanthus roseus*	Billagannaru	herbs						
173	*Gymnema sylvestre*	Podapatri							
174	*Oxystelma esculentum*	Dudipala							
175	*Tephrosia purpurea*	Vampali							
176	*Mimosa pudica*	Attipatti					N 16°29.42	E 80°34.12	
177	*Enicostemma axillaraa*	Nealagolimidi							
178	*Anisomeles malabarica*	Malabar							

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
179	*Argemone mexicana*	Baluraccasi							
180	*Passiflora foetada*	Gaajudonda							
181	*Solanum virginianum*	Nealavakudu							
182	*Gomphrena celosioides*	Aluka uttareaani							
183	*Acanthosperumhispidum*	Kukkamulla							
184	*Phyllanthus emblica*	Usari					N 16°29.42	E 80°34.12	Reelocated
185	*Mangifera indica*	Mamidi							To be cut
186	*Azadirachta indica*	vepa	5 years	5 mt	80 cm	GOOD			To be cut
187	*Azadirachta indica*	vepa	2years	40 mt	1 mt	GOOD			To be cut
188	*Borassus flabellifer*	tadi chettu	23 years	40mt	1 mt	GOOD			To be cut
189	*Borassus flabellifer*	tadi chettu	23 years	40 mt	1 mt	GOOD			To be cut
190	*Coccas nucifera*	Kobbari	10 years	5 mt	60 cm	GOOD	N 16°29.58	E 80°34.17	To be cut
191	*Terminalia cataappa*	Badam							Relocated
192	*Azadirachta indica*	vepa	7 years	40 mt	1 mt	GOOD			To be cut
193	*Borassus flabellifer*	tadi chettu		40 mt			N 16°29.58	E 80°34.17	To be cut
194	*Azadirachta indica*	vepa	7 years	40 mt	1 mt	GOOD			To be cut
195	*Mangifera indica*	Mamidi							To be cut
196	*Borassus flabellifer*	tadi chettu		40 mt					To be cut
197	*Azadirachta indica*	vepa	7 years	40 mt	1 mt	GOOD			Relocated
198	*Moringa olieifera*	Mulaga					N 16°29.59	E 80°34.62	Relocated
199	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD			To be cut
200	*Leucaena leucocephaala*	Subabul							To be cut
201	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
202	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
203	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD	N 16°29.59	E 80°34.62	Relocated
204	*Curcuma longa*	pasupu	5 months	80 cm	15 cm	GOOD			crop field
205	*Azadirachta indica*	vepa	7 years	40 mt	1 mt	GOOD			Relocated

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
206	*Leucaena leucocephaala*	Subabul							To be cut
207	*Prosopis cineraria*	Jammi chettu	18 years	10 mt	90 cm	GOOD			To be cut
208	*Mangifera indica*	Mamidi							To be cut
209	*Curcuma longa*	pasupu	5 months	80 cm	15 cm	GOOD	N 16°29.59	E 80°34.62	crop field
210	*Zizupus zijuba*	REGU	3 years	2 mt	15 cm	GOOD			
211	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD			
212	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD			
213	*Prosopis juliflora*	mulla tumma				GOOD			To be cut
214	*Prosopis juliflora*	mulla tumma				GOOD			To be cut
215	*Azadirachta indica*	vepa							To be cut
216	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
217	*moringa oleracea*	mulaga	2 years	3 mt	30 cm	GOOD			Relocated
218	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
219	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
220	*Coccas nucifera*	Kobbari							Relocated
221	*Azadirachta indica*	To be cut	5 years	5 mt	80 cm	GOOD			Relocated
222	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
223	*Syzygium cumini*	Neareadu	20 years	30 mt	100 cm				To be cut
224	*Atrocarpus altilis*	Panasa							
225	*Mangifera indica*	Mamidi	10 years						To be cut
226	*Acacia nilotica*	tumma	10 years	5 mt	60 cm	GOOD			To be cut
227	*Azadirachta indica*	vepa	5 years	5 mt	80 cm	GOOD	N 16°29.84	E 80°35.49	To be cut
228	*Borassus flabellifer*	tadi chettu	20years	15 mt	80 cm	GOOD			To be cut
229	*Coccas nucifera*	Kobbari							To be cut
230	*Dolicous lablab*	Chikkudu	1 year plants						Crop field
231	*Bambusa vulgaris*	veduru chettu	30 years	20 mt	25 cm	GOOD	N 16°29.87	E 80°35.91	To be cut

S.No	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
232	*Bambusa vulgaris*	veduru chettu	15 years	10 mt	25 cm	GOOD			
233	*Pithacalobium dulci*	seema chinta	10 years	20 mt	40 cm	GOOD			To be cut
234	*Ficusreligiosa*	Raavi	20 years	8 mt	100 cm	GOOD			To be cut
Total Trees - 234 **Trees to be cut – 149** **Trees to be relocated - 26**									

Table 4: Kondaveeti Vagu right side Tree Survey Report

Total Length & Breadth: 10.3 km & 40 m

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
1	*Prosopis juliflora*	mulla tumma	9 yers	6 Mt	80 cm	GOOD	N 16o°27.66	E 80°30.05	To be cut
2	*Prosopis juliflora*	mulla tumma	7 years	7 mt	70 cm	GOOD	N 16o°27.66	E 80°30.05	To be cut
3	*Prosopis juliflora*	mulla tumma	7 years				N 16o°27.66	E 80°30.05	To be cut
4	*Senna auriculata*	Tangadu	Shrubs				N 16o°27.66	E 80°30.05	
5	*Tephrosia purpurea*	Vampali					N 16o°27.66	E 80°30.05	
6	*Mimosa pudica*	Attipatti	herbs						
7	*Enicostemma axillaraa*	Nealagolimidi					N 16°28.03	E 80°30	
8	*Anisomeles malabarica*	Malabar							
9	*Argemone mexicana*	Baluraccasi	Shrubs				N 16°28.03	E 80°30	
10	*Passiflora foetada*	Gaajudonda					N 16°28.03	E 80°30	
11	*Solanum virginianum*	Nealavakudu					N 16°28.03	E 80°30	
12	*Gomphrena celosioides*	Aluka uttareaani	Herbs				N 16°28.03	E 80°30	
13	*Acanthosperumhispidum*	Kukkamulla					N 16°28.03	E 80°30	
14	*Lantanax aculeata*	Belika chattu					N 16°28.03	E 80°30	
15	*Phyllanthus amarus*	Neala usari	Herbs				N 16°28.03	E 80°30	
16	*Xanthium strumarium*	Marulamatangi					N 16°28.03	E 80°30	
17	*Corallocarpus epigaeus*	Pamudonda					N 16°28.03	E 80°30	
18	*Diplocyclos palmatus*	Lingadonda					N 16°28.03	E 80°30	
19	*Acalypha indica*	Muripinda	Herbs						
20	*Euphorbia hirta*	Pachabottu					N 16°28.10	E 80°30	
21	*Euphorbia hetiriphylla*	Beadiaaku							
22	*Jetropha curcas*	Adavi aamudam	Shrub				N 16°28.10	E 80°30	
23	*Jetropha gossypifolia*	Vearri aamudam					N 16°28.10	E 80°30	
24	*prosopis juliflora*	mulla tumma	8 years	8 mt	90 cm	GOOD	N 16°28.10	E 80°30	To be cut

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
25	*Prosopis juliflora*	mulla tumma	9 years	10 mt	79 cm	GOOD	N 16°28.10	E 80°30	To be cut
26	*Prosopis juliflora*	mulla tumma	9 years	9 mt	60 cm	GOOD	N 16°28.10	E 80°30	To be cut
27	*Prosopis juliflora*	mulla tumma	8 years	10 mt	95 cm	GOOD	N 16°28.10	E 80°30	To be cut
28	*Crotan bonplandinum*	glai vana mokka	herbs				N 16°28.10	E 80°30	
29	*Abutilon indicum*	Tuttur benda	Shrubs				N 16°28.10	E 80°30	
30	*Abutilon indicum*	Tuttur benda					N 16°28.10	E 80°30	
31	*ZIZIPUS ZUZUBA*	REGU	Shrubs				N 16°28.10	E 80°30	
32	*Sida cordifolia*	chiru benda					N 16°28.10	E 80°30	
33	*Sida cordifolia*	chiru benda							
34	*calotropis gigantia*	jilledu	Shrubs				N 16°28.01	E 80°31.33	
35	*calotropis gigantia*	jilledu							
36	*coccinia indica*	picchi donda	Creeper				N 16°28.01	E 80°31.33	
37	*Abutilon indicum*	tuttur benda					N 16°28.01	E 80°31.33	
38	*Croton bonplandinum*	galivana mokka					N 16°28.01	E 80°31.33	
39	*Croton bonplandinum*	galivana mokka					N 16°28.01	E 80°31.33	
40	*Ipomea cairica*	rail road creeper	Shrubs				N 16°28.01	E 80°31.33	
41	*Ipomea cairica*	rail road creeper					N 16°28.01	E 80°31.33	
42	*Prosopis juliflora*	mulla tumma	6 Mt	80 cm	GOOD		N 16°28.01	E 80°31.33	To be cut
43	*Prosopis juliflora*	mulla tumma	7 mt	70 cm	GOOD		N 16°28.01	E 80°31.33	To be cut
44	*Prosopis juliflora*	mulla tumma	9 Mt	80 cm	GOOD		N 16°28.01	E 80°31.33	To be cut
45	*Ricinus communis*	aamudam	Shrubs				N 16°28.01	E 80°31.33	
46	*Crotan bonplandinum*	glai vana mokka							
47	*Trinanthema portulacastrum*	Galijeeru					N 16°28.01	E 80°31.38	
48	*Allmania nodiflora*	Yarra baddaku							
49	*Alternanthera ficoidea*	Adavi ponnaganti					N 16°28.01	E 80°31.38	
50	*Alternanthera sessilis*	Ponnagantikuura					N 16°28.01	E 80°31.38	
51	*Amaranthus spinosus*	Mundla totakuura	herbs				N 16°28.01	E 80°31.38	

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
52	*Amaranthus viridus*	Totakura					N 16°28.01	E 80°31.38	
53	*Cucurbita pepo*	Gummadi					N 16°28.01	E 80°31.38	
54	*Cucurbita pepo*	Gummadi	Creeper				N 16°28.01	E 80°31.38	
55	*Cucurbita pepo*	Gummadi					N 16°28.01	E 80°31.38	
56	*Occimum sanctum*	tulasi	2 months	40 cm	5 cm	GOOD	N 16°28.01	E 80°31.38	
57	*Achyranthus aspera*	uttareni	4 months	50 cm	5 cm	GOOD			
58	*calotropis gigantia*	jilledu	2 years	1mt	12 cm	GOOD	N 16°27.90	E 80°32.04	
59	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD			
60	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD	N 16°27.90	E 80°32.04	
61	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD	N 16°27.90	E 80°32.04	
62	*tridox procumbance*	gaddi chamanti	1 year	25 cm	10 cm	GOOD	N 16°27.90	E 80°32.04	
63	*Crotan bonplandinum*	glai vana mokka	3 months	40 cm	10 cm	GOOD	N 16°27.90	E 80°32.04	
64	*Tridox procumbance*	gaddi chamanti	3 months	20 cm	2 cm	GOOD	N 16°27.90	E 80°32.04	
65	*prosopis juliflora*	mulla tumma	5 years						To be cut
66	*Prosopis juliflora*	mulla tumma	5 years						To be cut
67	*Solanum virginianum*	Nealavakudu					N 16°27.87	80°32.33	
68	*Acanthosperumhispidum*	Kukkamulla					N 16°27.87	80°32.33	
69	*Lantanax aculeata*	Belika chattu					N 16°27.87	80°32.33	
70	*Trinanthema portulacastrum*	Galijeeru					N 16°27.87	80°32.33	
71	*Allmania nodiflora*	Yarra baddaku					N 16°27.87	80°32.33	
72	*Alternanthera ficoidea*	Adavi ponnaganti					N 16°27.87	80°32.33	
73	*prosopis juliflora*	mulla tumma	Shrubs				N 16°27.87	80°32.33	To be cut
74	*Prosopis juliflora*	mulla tumma					N 16°27.87	80°32.33	To be cut
75	*Amaranthus viridus*	Totakura	herbs				N 16°27.87	80°32.33	
76	*Marsilea quardifolia*	Chandamamakuura					N 16°27.87	80°32.33	
77	*Boerhavia diffusa*	Gudla malli					N 16°27.87	80°32.33	
78	*Indigofera tinctoia*	Neeli mandu					N 16°27.87	80°32.33	

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
79	*desmostchya bipinnata*	dharba					N 16°27.87	80°32.33	
80	*Heteropogan contortus*	Nallaginni gaddi							
81	*prosopis juliflora*	mulla tumma	7 years Shrubs				N 16°28.08	E 80°32.41	To be cut
82	*Prosopis juliflora*	mulla tumma	7 years				N 16°28.08	E 80°32.41	To be cut
83	*prosopis juliflora*	mulla tumma					N 16°28.08	E 80°32.41	To be cut
84	*Prosopis juliflora*	mulla tumma					N 16°28.08	E 80°32.41	To be cut
85	*Anisomeles malabarica*	Malabar					N 16°28.08	E 80°32.41	
86	*Marsilea quardifolia*	Chandamamakuura					N 16°28.08	E 80°32.41	
87	*Boerhavia diffusa*	Gudla malli					N 16°28.08	E 80°32.41	
88	*Indigofera tinctoia*	Neeli mandu					N 16°28.08	E 80°32.41	
89	*desmostchya bipinnata*	dharba					N 16°28.08	E 80°32.41	
90	*Heteropogan contortus*	Nallaginni gaddi					N 16°28.08	E 80°32.41	
91	*Imperata cylandrica*	dharba					N 16°28.08	E 80°32.41	
92	*Saccharum spontanuem*	Rellu	Grass				N 16°28.08	E 80°32.41	
93	*prosopis juliflora*	mulla tumma	Shrubs				N 16°28.08	E 80°32.41	To be cut
94	*Prosopis juliflora*	mulla tumma					N 16°28.08	E 80°32.41	To be cut
95	*Cassine glauca*	Buutankas					N 16°28.08	E 80°32.41	
96	*Cassia fistula*	Raala					N 16°28.08	E 80°32.41	
97	*Saccharum spontaneum*	Rellu gaddi	Grass						
98	*Corchorus*	Jute							
99	*Corchorus*	Jute					N 16°28.08	E 80°32.41	Field
100	*Corchorus*	Jute							
101	*Corchorus*	Jute					N 16°28.08	E 80°32.41	
102	*Hibiscus cannabinus*	Gogunara	Field				N 16°28.08	E 80°32.41	
103	*Hibiscus cannabinus*	Gogunara					N 16°28.08	E 80°32.41	
104	*Luffa cylindrica*	Beera	Field				N 16°28.08	E 80°32.41	
105	*Vigna mungo*	Minumulu	Field				N 16°28.08	E 80°32.41	

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
106	*Azadirachta indica*	vepa	2 years				N 16°28.08	E 80°32.41	To be cut
107	*Acacia nilotica*	tumma	15 years				N 16°28.08	E 80°32.41	To be cut
108	*prosopis juliflora*	mulla tumma					N 16°28.08	E 80°32.41	To be cut
109	*Prosopis juliflora*	mulla tumma					N 16°28.08	E 80°32.41	To be cut
110	*Calotropis gigantia*	jilledu	1 year Shrubs				N 16°28.08	E 80°32.41	
111	*Cicer arietinum*	sanaga	5 months crop field	20cm	2 cm	GOOD	N 16°28.08	E 80°32.41	
112	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD	N 16°28.08	E 80°32.41	
113	*Cicer arietinum*	sanaga	5 months	20cm	2 cm	GOOD	N 16°28.08	E 80°32.41	
114	*Azadirachta indica*	vepa	10 years				N 16°28.08	E 80°32.41	To be cut
115	*Dicliptera paniculata*	Kakanasa					N 16°28.30	E 80 32.51	
116	*Lepidagathis cristata*	Mulla banthi	Shrubs				N 16°28.30	E 80 32.51	
117	*Justicia adhatoda*	Adda rasam					N 16°28.30	E 80 32.51	
118	*Aerva lanata*	Kondapindi	Shrubs				N 16°28.30	E 80 32.51	
119	*Catharanthus roseus*	Billagannaru					N 16°28.30	E 80 32.51	
120	*Gymnema sylvestre*	Podapatri					N 16°28.30	E 80 32.51	
121	*Oxystelma esculentum*	Dudipala					N 16°28.30	E 80 32.51	
122	*Azadirachta indica*	vepa	15 years	25mt	1mt	GOOD	N 16°28.30	E 80 32.51	To be cut
123	*Abutilon indicum*	tuttur benda	2 years	1.5 mt	15 cm	GOOD	N 16°28.30	E 80 32.51	
124	*Acacia nilotica*	tumma	10 years				N 16 28.55	E 80 32.72	To be cut
125	*prosopis juliflora*	mulla tumma					N 16 28.55	E 80 32.72	To be cut
126	*prosopis juliflora*	mulla tumma					N 16 28.55	E 80 32.72	To be cut
127	*Azadirachta indica*	vepa	7 years	40 mt	2mt	GOOD	N 16 28.55	E 80 32.72	Relocated
128	*Azadirachta indica*	vepa	8 years	30mt	1mt	GOOD	N 16 28.55	E 80 32.72	Relocated
129	*Calotropis gigantia*	jilledu	1 year				N 16 28.55	E 80 32.72	
130	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
131	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
132	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
133	*Azadirachta indica*	vepa	7 years	20 mt	2mt	GOOD			Relocated
134	*Calotropis gigantia*	jilledu	1 year				N 16°28.74	E 80°33.20	
135	*prosopis juliflora*	mulla tumma					N 16°28.74	E 80°33.20	To be cut
136	*prosopis juliflora*	mulla tumma					N 16°28.74	E 80°33.20	To be cut
137	*Azadirachta indica*	vepa	7 years	15MT	2mt	GOOD	N 16°28.74	E 80°33.20	Relocated
138	*Coccas nucifera*	kobbari	10 years	5 mt	60 cm	GOOD	N 16°28.74	E 80°33.20	Relocated
139							N 16°28.74	E 80°33.20	
140							N 16°28.74	E 80°33.20	
141	*Pithacalobium dulci*	seema chinta	6 years	5 mt	40 cm	GOOD	N 16°28.74	E 80°33.20	To be cut
142	*S*	kobbari	10 years	5 mt	60 cm	GOOD	N 16°28.74	E 80°33.20	Relocated
143	*Coccas nucifera*	kobbari	10 years	5 mt	60 cm	GOOD	N 16°28.74	E 80°33.20	Relocated
144	*Borassus flabellifer*	tadi chettu	20 years	40 mt	200CM	GOOD	N 16°28.74	E 80°33.20	To be cut
145	*Azadirachta indica*	vepa	7 years	20 mt	2mt	GOOD	N 16°28.74	E 80°33.20	Relocated
146	*Typha angustata*	jammu gaddi					N 16°29.21	E 80°33.44	
147	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD	N 16°29.21	E 80°33.44	Relocated
148	*Azadirachta indica*	vepa	7 years	20 mt	2mt	GOOD	N 16°29.21	E 80°33.44	Relocated
149	*Jetropha curcas*	Adavi aamudam					N 16°29.21	E 80°33.44	
150	*Pithacalobium dulci*	seema chinta	10 YEARS	5 mt	100CM	GOOD	N 16°29.21	E 80°33.44	To be cut
151	*prosopis juliflora*	mulla tumma					N 16°29.21	E 80°33.44	75 plants are located & To be cut
152	*prosopis juliflora*	mulla tumma					N 16°29.21	E 80°33.44	To be cut
153	*Acanthosperumhispidum*	Kukkamulla					N 16°29.21	E 80°33.44	
154	*Typha angustata*	jammu gaddi	Grass				N 16°29.21	E 80°33.44	
155	*Phyllanthus amarus*	Neala usari	herbs				N 16°29.21	E 80°33.44	
156	*Euphorbia hirta*	Pachabottu	Creeper				N 16°29.21	E 80°33.44	

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
157	*Aerva lanata*	Kondapindi					N 16°29.21	E 80°33.44	
158	*Lepidagathis cristata*	Mulla banthi	herbs				N 16°29.21	E 80°33.44	
159	*Amaranthus spinosus*	Mundla totakuura					N 16°29.21	E 80°33.44	
160	*Trinanthema portulacastrum*	Galijeeru							
161	*Abutilon indicum*	Tuttur benda	3 years	2 mt	15 cm	GOOD	N 16°29.19	E 80°79	
162	*Abutilon indicum*	Tuttur benda	3 years	2 mt	15 cm	GOOD			
163	*Sida cordifolia*	chiru benda	2 years	1.5 mt	10 cm	GOOD			
164	*Sida cordifolia*	chiru benda	1 year	1.5 mt	8 cm	GOOD			
165	*calotropis zigantia*	Jilledu	2 years Shrubs	2 mt	15 cm	GOOD			
166	*calotropis zigantia*	Jilledu	2 years	2 mt	15 cm	GOOD			
167	*calotropis zigantia*	Jilledu	2 years	2 mt	15 cm	GOOD			
168	*Alternanthera sessilis*	Ponnagantikuura	herbs				N 16°29.19	E 80°79	
169	*Amaranthus spinosus*	Mundla totakuura							
170	*Typha angustata*	jammu gaddi							
171	*Saccharum spontaneum*	Rellu gaddi	Grass						
172	*calotropis zigantia*	Jilledu	2 years	2 mt	15 cm	GOOD			
173	*Trinanthema portulacastrum*	Galijeeru							
174	*Allmania nodiflora*	Yarra baddaku					N 16°29.25	E 80°33.93	
175	*Alternanthera ficoidea*	Adavi ponnaganti							
176	*Alternanthera sessilis*	Ponnagantikuura							
177	*Amaranthus spinosus*	Mundla totakuura	herbs						
178	*coccinia cordifolia*	donda	creeper	20 cm	2 cm	GOOD			
179	*Typha angustata*	jammu gaddi							
180	*Marsilea quardifolia*	Chandamamakuura							
181	*Boerhavia diffusa*	Gudla malli							

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
182	*Indigofera tinctoia*	Neeli mandu							
183	*desmostchya bipinnata*	dharba							
184	*Heteropogan contortus*	Nallaginni gaddi	grass				N 16°29.29	E 80°34.05	
185	*Imperata cylandrica*	dharba							
186	*Saccharum spontanuem*	Rellu							
187	*Azadirachta indica*	vepa	5 years						Relocated
188	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			5 plants to be cut
189	*Acacia nilotica*	Nalla Tumma	10 years	5 mt	60 cm	GOOD			7 plants & to be cut
190	*prosopis juliflora*	mulla tumma							To be cut
191	*Azadirachta indica*	vepa	6 years				N 16°29.42	E 80°34.12	Relocated
192	*Manjifera indica*	Mamidi	10 years	To be cut					2 plants
193	*Borassus flabellifer*	tadi chettu	23 years To be cut	15 mt	80 cm	GOOD			2PLANTS
194	*Mangifera indica*	Mamidi	To be cut						
195	*Moringa olieifera*	Mulaga							
196	*Azadirachta indica*	vepa	5 years	15 MT	80 CM	GOOD			Relocated
197	*Acacia nilotica*	Nalla Tumma	To be cut						
198	*Leucaena leucocephaala*	Subabul	7 years						To be cut
199	*Mangifera indica*	Mamidi	5 years						Relocated
200	*Alternanthera ficoidea*	Adavi ponnaganti							
201	*Alternanthera sessilis*	Ponnagantikuura							
202	*Amaranthus spinosus*	Mundla totakuura	7 Months	30 cm	5 cm	GOOD			
203	*Tephrosia purpurea*	Vampali	tree						
204	*Mimosa pudica*	Attipatti	herbs				N 16°29.58	E 80°34.17	
205	*Enicostemma axillaraa*	Nealagolimidi							
206	*Anisomeles malabarica*	Malabar							

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
207	*Argemone mexicana*	Baluraccasi							
208	*Passiflora foetada*	Gaajudonda					N 16°29.58	E 80°34.17	
209	*Solanum virginianum*	Nealavakudu							
210	*Gomphrena celosioides*	Aluka uttareaani	herbs						
211	*Acanthosperumhispidum*	Kukkamulla							
212	*Lantanax aculeata*	Belika chattu							
213	*Gymnema sylvestre*	Podapatri							
214	*Oxystelma esculentum*	Dudipala							
215	*Dicliptera paniculata*	Kakanasa							
216	*Lepidagathis cristata*	Mulla banthi	herbs						
217	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			
218	*Sanseviria roxburghiana*	Villutadu nara							
219	*Cassine glauca*	Buutankas					N 16°29.59	E 80°34.62	
220	*Cassia fistula*	Raala							
221	*Lepidagathis cristata*	Mulla banthi	herbs						
222	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
223	*Sanseviria roxburghiana*	Villutadu nara							
224	*Indigofera tinctoia*	Neeli mandu							To be cut
225	*desmostchya bipinnata*	dharba							
226	*Heteropogan contortus*	Nallaginni gaddi							
227	*Imperata cylandrica*	dharba							
228	*Allmania nodiflora*	Yarra baddaku							
229	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			30 plants
230	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
231	*Amaranthus spinosus*	Mundla totakuura							
232	*Typha angustata*	jammu gaddi	grass						
233	*Saccharum spontaneum*	Rellu gaddi							
234	*Mangifera indica*	Mamidi	7 years						Relocated

S.N0	Species name	Common name	Age	Height	DBH	Tree health	Latitude	Longitude	Remarks
235	*Coccas nucifera*	Kobbari					N 16°29.89	E 80°34.97	
236	*Tectona grandis*	teak	5 years	6 mt	30 cm	GOOD			Relocated
237	*Azadirachta indica*	vepa							Relocated
238	*Pithacalobium dulci*	seema chinta	10 years	20 mt	40 cm	GOOD			To be cut
239	*Leucaena leucocephaala*	Subabul							To be cut
240	*Typha angustata*	jammu gaddi	grass						
241	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
242	*Coccas nucifera*	Kobbari					N 16°29.91	E 80°35.18	10 plants recolated
243	*Pithacalobium dulci*	seema chinta	25 years	20 mt	40 cm	GOOD			To be cut
244	*Tamarendus indica*	Chinta chattu	10 years	25 mt	70 cm	GOOD			To be cut
245	*Bambusa vulgaris*	veduru chettu	30 years	20 mt	25 cm	GOOD			To be cut
246	*Bambusa vulgaris*	veduru chettu	15 years	10 mt	25 cm	GOOD			To be cut
247	*Pithacalobium dulci*	seema chinta	10 years	20 mt	40 cm	GOOD			
248	*Zizupus zuzuba*	REGU	3 years	2 mt	15 cm	GOOD			
249	*moringa oleracea*	mulaga	2 years	3 mt	30 cm	GOOD	N 16°29.84	E 80°35.49	Relocated
250	*Azadirachta indica*	vepa	10 years	40 mt	50 cm	GOOD			To be cut
251	*Borassus flabellifer*	tadi chettu	23 years	15 mt	80 cm	GOOD			To be cut
252	*Pithacalobium dulci*	seema chinta	10 years	20 mt	40 cm	GOOD			To be cut
253	*Ficus religiosa*	Raavi	20 years	40 mt	100 cm				To be cut
254	*Terminalia cataappa*	Badam	4 years	20mt	50 cm	GOOD			Relocated
255	*Albizia lebback*	Dirisena	10 years	40 mt	80 cm				To be cut

Total Trees - 255
Trees to be cut – 148
Trees to be relocated - 59

Annexure – XXV

Tree Survey – Photo Presentation

Annexure XXV

Photo presentation for Tree Survey

Photo 1*: Azadirachta Indica* at the project site

Photo 2: Shrubs and Trees

Photo 3: Bamboos plants

Photo 4: Tree with Bamboo plants

Photo 5: Trees and grass

Photo 6: Existing canal

Photo 7: Existing canal

Photo 8: Coconut and palm trees

Photo 9: Banana fields

Photo 10: Villagers in Banana field

Photo 11: Trees and Undavali caves in background

Photo 12: Exiting canal

Annexure – XXVI

This Annexure is left Blank intentionally

Annexure – XXVII

Project Implementation Unit – World Bank Funded Project

PROJECT IMPLEMENTATION UNIT – WORLD BANK FUNDED PROJECTS

PROJECT IMPLEMENTATION UNIT

The Government of Andhra Pradesh will be implementing the proposed project through Andhra Pradesh Capital Region Development Authority (APCRDA) and Amaravati Development Corporation (ADC). ADC has established a Project Implementation Unit (PIU) to implement Roads Infrastructure Component (Component A) and "Green/Climate Resilient" Flood Mitigation Component (Component B). The PIU will report to the Chairperson and Managing Director (CMD) of Amaravati Development Corporation. The Government of Andhra Pradesh has also established an Executive Committee to coordinate and monitor the project implementation with a focus on ensuring effective project implementation performance and achievement of results.

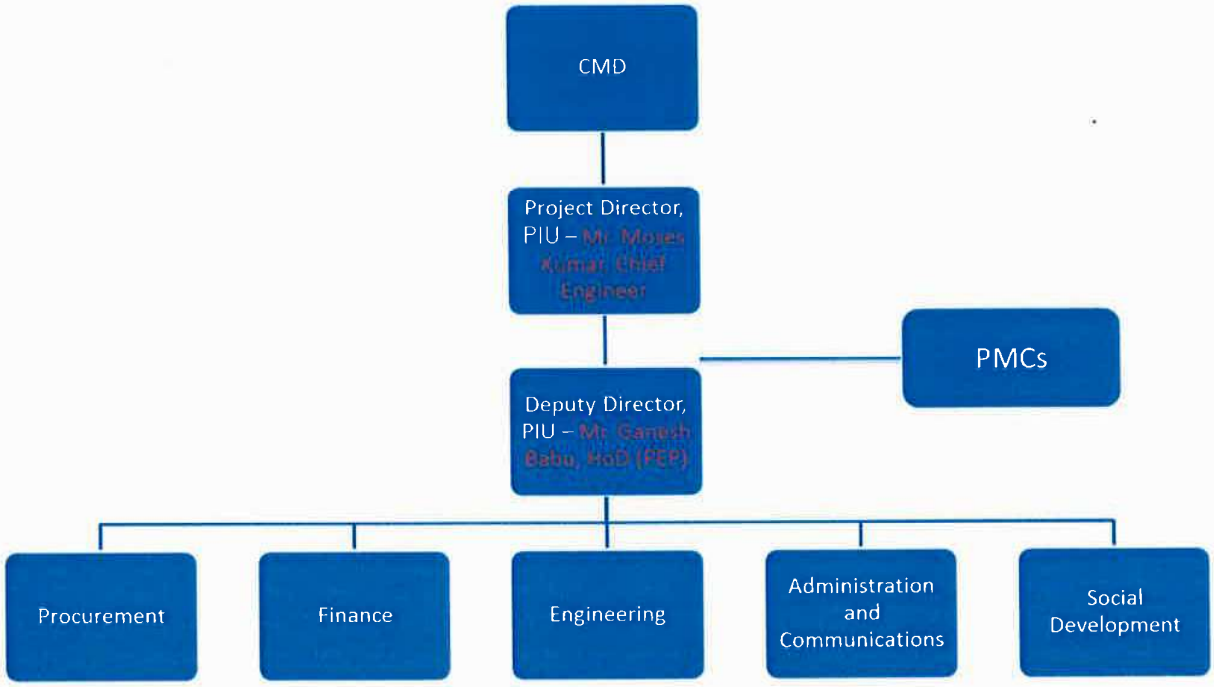
The PIU currently have the following key officers:

Name	Designation	Role in PIU
Mr. T Moses Kumar	Chief Engineer	Project Director
Mr. Venkateswara Rao	General Manager	Head – Administration
Mr. Ganesh Babu	HoD (PEP)	Deputy Project Director
Mr. Suresh Babu	HoD (PAL)	Social Development Specialist
Mr. Vidya Sagar	Accounts Officer	Accounts Officer
Mr. N Elangovan	Dy Executive Engineer	Senior Manager – Procurement
Mr. Venkata Ramana Gandham	Sr. Infrastructure Engineer	Senior Manager – Procurement
Mr. Jagan Koney	Sr. Infrastructure Engineer	Senior Manager – Procurement
Mr. Pavan Ankinapalli	Sr. Infrastructure Planner	Senior Manager – Procurement
Mr. Ashraful	Sr. Infrastructure Engineer	Environmental Specialist
Mr. Sudhakar	Dy Executive Engineer	Dy Executive Engineer
Mr. Krishnaiah	Dy Executive Engineer	Dy Executive Engineer

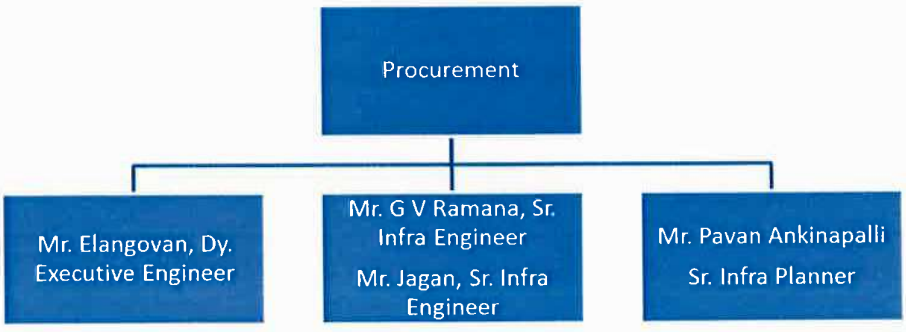
Several senior level engineers to manage planning, design and implementation of all project components

Several mid/junior level engineers, social and environmental staff, accountants and other support staff.

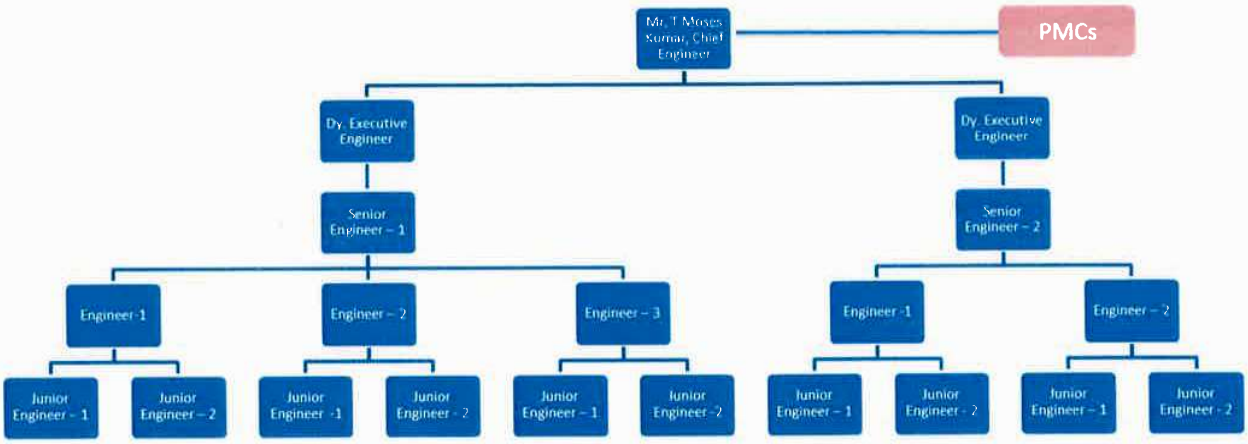
Organizational Structure of the PIU



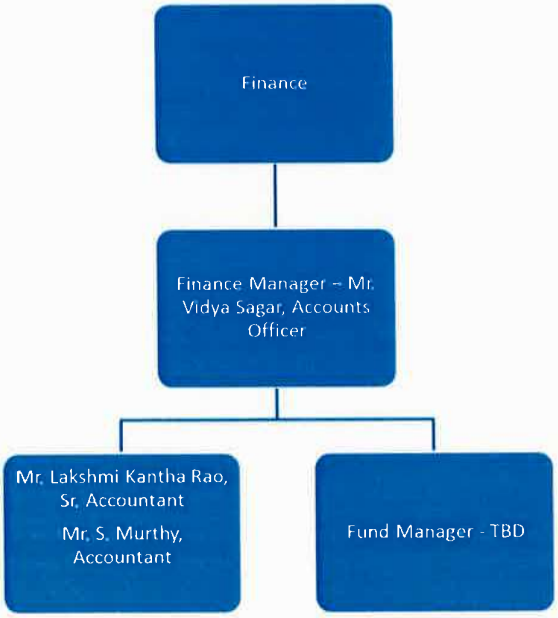
Procurement Division



Engineering Division



Finance Division



ANNEXURE-XXVIII

WALTA ACT

WALTA ACT

LAND CELL
AMR-APARD

ANDHRA PRADESH WATER, LAND AND TREES ACT – 2002 (APWALTA – 2002)

Objectives:

1. To promote water conservation and Tree cover.
2. For protection and Conservation of water sources ,land and matters connected there with
3. To regulate the exploitation and use of ground and surface water.

This Act came into force w.e.f. 19-4-2002. This Act contains 6 chapters 47 sections and 30 rules.

Chapter – 1	**:**	Preliminary containing 1 & 2 Sections.
Chapter – 2	**:**	Constitution of AP Water, Land and Trees Authority. (3-7 Sections). Section 7 deals with the delegation of powers.
Chapter – 3	**:**	Ground Water Protection measures, (8 – 19 Sections).
Chapter – 4	:	Surface water protective measures. (20-27 Sections)
Chapter – 5	:	Trees (28 – 32 Sections)
Chapter – 6	**:**	Miscellaneous (33 – 47 Sections)

As per Section 3 of the Act and rules 8,9, and 10, District Authority, Divisional and Mandal Authorities have been constituted. For Mandal authority, Tahsildar is the Chairman, Mandal Development Officer is the Vice-Chairman and Assistant Executive Engineer is the Secretary.

I Ground Water Protection Measures:

1. Registration of Wells (Section 8 , Rule 12)
2. Prohibition of water pumping in certain areas(Section 9)
3. Permission for well and permission for well sinking near drinking water source(Section 10 , Rule 13 and 14)
4. Over exploited areas(Section 11)
5. Protection of public drinking water sources(section 12)
6. Distance and depth for sinking wells(.Section 13)
7. Registration of drilling rigs(Section 14 , rule 17).
8. Closure of Wells (Section 15)
9. Taking-over of well to ensure drinking water.(Rule 15)

10. Compensation for closed wells (Section 16)
11. Rain water harvesting structures(section 17 , Rule 16)
12. Re-use of water(section 18)
13. Prohibition of water contamination.(Section 19)

1.Registration of Wells: Section 8 of the Act and Rule 8 deals with the Registration of the Wells.

- Every owner of the well shall register his / her application giving details in Form – 1 paying prescribed fees of Rs. 10/-
- The Village Revenue Officer of the Gram Panchayat facilitate registration of wells.

2.Prohibition of water pumping in certain areas :

When water pumping is likely to cause damage to the level of ground water or cause damage to natural resources or environment , the designated officer with the approval of the Authority may prohibit water pumping for a period of not more than six months at stretch.

3.Permission of wells sinking near drinking water source: Section 10 [Rules 13 & 14].

- No person shall sink any well in the vicinity of a public drinking water source within a distance of 250 mtrs. in areas other than the areas covered under Section – 9. Sinking of any well for drinking water purpose and hand pump for public or private drinking water purpose is exempted .
- Any person who intends to **sink a well for purpose of irrigation or drinking or for any other purpose within the vicinity of public drinkin**g **water source** shall apply for permission to the authority and that application shall be disposed off **with in 45 days** from receipt of application.
- Any person desiring to **take a new well** of any kind in their premises should obtain permission by submitting the authority through an application in Form 2 & 5 together with the prescribed fee to the Village Revenue Officer.
- The Village Secretary shall pass it on to the Mandal Authority within two days.
- Mandal Authority with the opinion of the Technical Officer shall dispose of the application **within 15 days**.
- Every order for permission shall be in Form 3 & 6.
- Feasibility report of APTRANSCO and D.D of Rs.1200/- towards insurance premium should be appended to the application for obtaining the permission.
- Prescribed Fee is Rs. 100/-.

4.Over Exploited areas(Section 11)

The Authority on the advice of the Technical expert, declare a particular ground water basin as over exploited area for a period of not more than six months .Quantum and pattern of rainfall , degree of extraction of ground water shall be taken into consideration for declaring a particular ground water basin as over exploited area.

5. Protection of public drinking water source (section 12)

The Authority on the advice of technical officer may prohibit the extraction of water for commercial , industrial , irrigation or any other purposes from such well for a period of not more than 6 months when any existing well is found to be adversely effecting any public drinking water source.

The Authority on the advice of Technical officer in any urban area issue an order

(a) prohibiting extraction of water for sale from an over exploited water source or acquirer or residential areas or in the recharge zones of residential areas depleting the public or private water sources and affecting the supply of water for domestic usage

(b) prohibiting the drawal of the ground water within the premises of multi-storied building for sale of water outside the premises of such multi-storied building.

6. **Distance and depth for sinking of wells:**

The Authority may issue directions specifying the distance for sinking of wells from the existing well and depth for such sinking to curb unhealthy competition to tap water from deeper layers of ground water and to maintain ground water.

7. Registration of drilling rigs: Section – 14 [Rule 17]

- Every rig owner shall register the rig with the authority by paying the prescribed fee Rs.1000/- which shall be renewable for every two years.
- The application shall be made in Form – 15 and the permission in Form – 16.
- The rig owners are required to display the Form – 16 at all times upon the rig.
- Failure to register the rig shall be an offence and shall be dealt in accordance with the rules.

8 & 9 .Closure of Wells and taking-over of well to ensure drinking water (Section 15, Rule 15)

- Authority by General order or by special order authorize the designated officer to identify such well as required to ensure supply of drinking water

to local population. On identification of such well the designated officer shall serve or cost to serve an order of requisition on the owner of the well specify the period of such requisition. (It should not exceed more than 6 months) – Rule 15.

- ❖ Wherever it appears to the authority with any well has been sunk or is being sunk or water has been extracted or is being extracted in contravention of any of the provisions of this act the sort of wells may be closed – Section 15.

10. Compensation for closed wells. (Section 16)

The Authority may on making such enquiry and requiring the owner to produce such evidence as he may deem necessary , make an order for payment of compensation which shall not be less than the market value of the well including the other expenditure incurred like energisation there on and structure thereon and standing crop at the time of making such an order and with regard to the determination of compensation for the well situated in a land acquired shall apply the provision of the Land Acquisition act, 1894 in determining the market value of the well under this section . Compensation shall not be paid in such cases of temporary or permanent closure of wells in pursuance of order passed under section 15.

11 Rain water harvesting structures : (Section 17 , Rule 16)

The Authority may issue guide lines for constructing appropriate Rain water harvesting structures in all residential, commercial and other premises and open spaces having an area of not less than 200 sq.mts in the manner prescribed with in stipulated period failing which the Authority may get such rain water harvesting structure constructed and recover the cost incurred along with a penalty as may be prescribed .

12. Re- use of water : (Section 18)

The Authority may formulate guidelines including suitable incentives for re-cycling and re-use of waste water by industrial , commercial users and local bodies and in the event of non- feasibility in the opinion of the Authority to install suitable recycling and reuse system , the Authority may levy appropriate charges.

13.Prohibition of water contamination (Section 19 , rule 18)

(a) No ground water resources shall be contaminated in any manner by any body including industrial , local bodies and acqua culture waste disposal.
(b) Direct disposal of waste waters into the acuifers , is prohibited.

The Authority shall restrict , regulate and prohibit storage and disposal of effluents by any person or industry , local body or acqua culture farm into any

stream or well or sewer or an land to prevent and control contamination of ground water

II Surface water protective measures:

1. Land use and water quality(section 20 , Rule 19)
2. Water use in water sheds (section 21
3. Optimum use of surface and ground water (Section 22)
4. Protection of lakes , ponds and tanks (section 23)
5. Ceiling on water usage (Section 24 , Rule 22)
6. Power to designate (Section 25)
7. Protection from breaches (Section 26)
8. Sand mining (Section 27)

1.Land use and water quality:

The Authority may direct the occupier of any land that land use shall be modified if the quality of the water coming from the land is not of applicable quality compared to the prescribed standards.

The authority may impose restrictions and prohibit any industry and carrying out of any process and operations in any area to protect water and soil quality in the area.

Power to issue orders under this rule includes power to order for ,-

(a) Shifting and closure of industry
(b) Prohibition or regulation of any process or operation .

2.Water use in water sheds :

The water shed committees shall adopt the measures as suggested by the officer concerned and the members of the water shed committees shall be trained by the officer concerned and the members so trained shall in turn train the other farmers prior to signing of the Memorandum of Understanding.

The officer concerned shall have the power to determine and recover investments made here after by fresh sanctions by the government in the watersheds and in the case of non-compliance with the provisions of the Memorandum of understanding , the amount due shall be recovered as if it were arrears of land revenue from the party found responsible.

3.Optimum use of surface and ground water :

Water users association shall ensure optimum use of surface and ground water and for this purpose the water users association shall adopt the measures suggested by the designated officer.

4.Protection of lakes, ponds and tanks :

The Authority may notify water bodies like lakes, village ponds and minor irrigation tanks along with the nalas as heritage bodies and conservation areas and take measures to permanently demarcate the boundaries and to evict and prevent encroachment .

5.Ceiling on water usage:

The designated officer may prescribe ceiling on the water usage per unit of production by any industry or commercial unit. Ceiling for a few industries is noted below:

Sl.No;	Name of the Industry	Ceiling
1	Jute processing industry	1.5 kilo ltr per ton of produce
2	Large paper & Pulp Industry	100 kilo ltr. Per Ton of paper produced
3	Small paper and pulp industry	150 kilo ltr. Per Ton of paper produced
4	Sugar Industry	100 litres per Ton of cane crushed.

Water Cess :

The Authority may levy a cess on consumption of water and discharge of effluent by an industry . water cess levied is 1.5 paise – 9.5 paise per kilo litre.

6.Power to designate :

The Authority shall have power to designate an officer incharge of water bodies to ensure proper protection and conservation of water bodies**.**

7. Protection from breaches :

To prevent and restore breaches to irrigation sources with in a specified time the Authority may direct the water users associations.

8. **Sand Mining - Section 27 [Rule – 23]**

- Transportation of sand shall be banned in notified over exploited ground water regions.
- Sand mining shall not be permitted in notified areas except for local use in villages or towns bordering streams.
- Sand lease holders shall not carryout quarrying within 500 meters of any existing structures such as bridges, dams etc.,

- ❖ The streams or rivers where the thickness of the sand is quite good ie., (more than 8 meters), the depth of removal may be extended to 2 meters, but in no case beyond 2 meters sand mining shall not be permitted in streams where the thickness of sand deposition is less than two meters.
- ❖ Sand mining shall not be permitted within 15 meters or 1/5th of the width of the stream bed from the bank.
- ❖ Sand mining

III Trees – Section 28 [Rule 24]

- ❖ In every Municipal Corporation or Municipality or other local area the number of trees to be planted as detailed below:

Residential Area	Commercial / Institutional Area
1. Below 100 Sq. Mtrs – 3 trees 2. 101 – 200 Sq. Mtrs – 5 trees 3. 201 – 300 Sq. Mtrs – 10 trees 4. 301 – and above Sq. Mtrs – 10 + 5 (for every increase of 100 Sq. mtrs)	1. Below 200 Sq. Mtrs – 2 trees 2. 201 – 500 Sq. Mtrs – 4 trees 3. 501 – 1000 Sq. Mtrs – 6 trees 4. above 1001 Sq. MTrs 6 trees + 2 trees for every increase of 100 Sq. Mtrs.

- ❖ If any owner desires to fell a tree, he shall apply in writing to the designated officer for permission in Form – 13 with a fee per tree as indicated below:
  - (i) For Urban residential and Institutional areas – Rs. 50/-
  - (ii) For Urban commercial areas – Rs. 100/-

- ❖ On receipt of such application the designated officer after inspecting the trees and holding such enquiry, as he deems necessary either grant or refuse the permission applied for in Form - 14. The application shall be disposed within 15 days.
- ❖ Permission will be granted subject to condition that another two trees of the same or suitable species to be planted on the same site or suitable place within 30 days.
- ❖ If number of trees in any premises or open area is not adequate according to the standard the owner or occupier may be ordered for planting additional trees. The owner or occupier of the land shall comply with the order within 90 days.
- ❖ Where any tree has fallen or destroyed by fire lightening or rain or other natural causes, the owner / occupier may be ordered to plant a tree in the place of the tree so felled. The owner or occupier shall comply with the order within 90 days.
- ❖ Government through the Memo no: 7175/-A /RD.IV/A2/2003 dt 11.6.2005 exempted felling of the following species
  - (a) Subabul
  - (b) Casuarina
  - (c) Eucalyptus

From taking permission under A.P.water, Land and trees Act.2002. this exemption is only for the paper mills.

IV **Penalties – Section 35 [Rule – 26]**

- Whoever violates any of the provisions of this act shall be punishable with a fine, which shall not be less than Rs. 1000/- but which may extend to Rs. 5000/-.
- For felling of trees without prior of permission shall be punishable with a fine which shall not be less than two times the value of such tree, but which may extend upto 5 times of the value of such tree.

V Compounding of offence: Section – 37 [Rule 27]

- A sum of money not less than Rs.1 lakh by way of compounding of the offence shall be levied in respect of contravention of Section 10, 14 and 27 (Permission for well sinking near drinking water source, registration of drilling rigs and sand mining).
- The order shall be communicated in Form – 10 appended to this rules and furnish a copy of the compounding order to the offender and submit another copy to the District Authority.
- When the compounding fees levied and paid by the offender a receipt in Form – 11 shall be issued to a person paying the compounding fee.

VI Confiscation of Property – Section 38 [Rule 28]

- Where the authorized officer based on the gravity of the offence do not agree for compounding of offence the authorized officer may order for confiscation of seizures produced before him.

VII Appeals – [Rule – 29]

- Any person aggrieved by any order made by the designated officer may appeal to the District Authority within a period of 30 days from the date of receipt of the order by him.
- Any person aggrieved by any order made by the district authority may appeal to the state authority within 30 days from the date of receipt of the order by him.
- The decision of the state Authority shall be final and binding.

STATEMENT SHOWING THE DESIGNATED OFFICERS NOMINATED BY VARIOUS DEPARTMENTS

Sl.No	Name of the Department	Mandal Level	District Level	State Level
1.	Agriculture	Mandal Agricultural Officer	Joint Director of Agriculture	Addl. Director of Agriculture – IV, O/o The Commissioner & Director of Agriculture.
2.	Panchayat Raj & Rural Employment	M.P.D.Os	C.E.Os & D.P.Os	Dy. Commissioner (P&T), O/o the commissioner (PR & RD)
3.	Ground Water Department	Asst. Directors (Hg, H, Gp), Assistant Hydrologist, Assistant Hydrologist, Asst. Geopbysicist.	Deputy Director	
4.	Forest Department	Forest Range Officer (Territorial) of the nearest range to the Mandal Headquarter.	Divisional Forest Officer (Territorial) at the District Headquarter.	Chief Conservator of Forests (FCA), O/o The PCCF, AP, Hyd.
5.	A.P. Pollution Control Board	Asst. Environmental Engineer	Environmental Engineer (Regional Officer)	Senior Environmental Engineer.
6.	Panchayat Raj Engineering Department	Dy. Executive Engineer (RWS)	Executive Engineer (RWS)	Chief Engineer (RWS)

The following departments are implementing agencies for the purpose of implementation of various provisions of the act.

(i) Ground water Department – for registration of machine by all rig owners, sand mining and classification of Ground water basin.

(ii) Municipal Administration & Urban Development – for construction of rain water harvesting structure, tree planting, permission for construction of new building subject to planting of prescribed number of trees.

(iii) Pollution Control Board – for prohibition of water contamination including prohibition of direct disposal of waste water into the water bodies, regulation of ceiling on water use by any industry or commercial unit.

(iv) Mines and Geology department & Panchayat Raj Department in consultation with ground water department, Revenue Department for monitoring of sand mining for water bodies.

(v) Forest Department – for granting permission of tree felling.

Functions of the Officers with regard to A.P.WALTA Act:

Sl.No	Name of the Officer	Functions	Fees
1.	Village Revenue Officer	1. Registration of existing wells and bores 2. Forwarding the application in Form No. 1 to the Tahsildar. 3. To safeguard water resources 4. Plantation and protection of trees.	Rs. 10/-
2.	Tahsildar	1. Giving permission for digging new wells. 2. To maintain register with regard to wells and bores. 3. To check sand mining with coordination of Mines, Geology and Panchayat Raj Department.	Rs. 100/-
3.	Deputy Director, Ground Water Department.	1. Registration of rigs (Registration of the rig machines will be done at the district level only) 2. Riving technical opinion with regard to digging new wells and bores. 3. To check and safeguard sand mining.	Rs. 1000/-
4.	A.P. TRANSCO, Assistant Engineer	1. Feasibility Certificate	
5.	A.P. Pollution Control Board, Asst. Environmental Engineer	1. To Check industrial pollution 2. To Check water contamination 3. To regulate the usage of water in industries / commercial purpose.	
6.	Mines & Geology Department, Assistant Director	1. Supervising and checking sand mining.	
7.	Forest Range Officer	1. To check felling of trees	

CONSTITUTION OF ANDHRA PRADESH WATER, LAND , TREES AUTHORITY

Minister, Panchayat Raj , Rural Development and Rural water supply	Ex- officio Chair person
Chief Secretary to the Government	Vice- chair person
Secretary to the Government in-charge of Agriculture	Ex-officio Member
Secretary to the Government in-charge of irrigation and Command area Development.	Ex-officio Member
Secretary to the Government in-charge of Muncipal Administration.	Ex-officio Member
Secretary to the Government in-charge ofRural water supply.	Ex-officio Member
Secretary to the Government in-charge of Environment, Forests , Science and technology Department	Ex-officio Member
Vice-Chancellor, Acharya N.G. ranga Agriculture university	Ex-officio Member
Three professors of whom one each from the faculties of Life Sciences, earth Sciences and Engineering and Technology from the universities in the State nominated by the Government for two year term by rotation	Members
Three experts in the field of water and soil conservation and economics nominated by the Government	Members
Such other non-Official persons not exceeding five in number who, in the opinion of the Government are interested in the conservation of natural resources of whom one each shall be from the Scheduled Tribes, Scheduled Castes and Woman respectively.	Members
Secretary to Government incharge of Rural Development.	Ex-Officio Member Secretary.

CONSTITUTION OF WATER, LAND, TREES AUTHORITY AT THE DISTRICT LEVEL IN THE STATE.

(a)	The District Collector	Ex-Officio Chairman
(b)	----------	------
(c)	Three Mandal PArishad Presidents and two Zilla PArishad Territorial Constituency Members to be nominated by the Ex-Officio Chairman of the District Authority.	Members
(d)	Joint Director, Agriculture	Ex-Officio Member

(e)	Superintending Engineer, Irrigation	Ex-Officio Member
(f)	Superintending Engineer, Rural Water Supply	Ex-Officio Member
(g)	Deputy Director, Ground Water Department	Ex-Officio Member
(h)	Deputy Director, Mines and Geology Department	Ex-Officio Member
(i)	Deputy Conservator of Forests (Planning and Extension) or Territorial Divisional Forest Officer	Ex-Officio Member
(j)	Project Officer, integrated Tribal Development Agency / MADA / PTG	Ex-Officio Member
(k)	Regional Officer, Andhra Pradesh Pollution Control Board	Ex-Officio Member
(l)	Chief Executive Officer, Zilla Parishad	Ex-Officio Member
(m)	An Official from Hyderabad Metroplitan Water Sewerage Board, in respect of Rangareddy and Hyderabad Districts.	Ex-Officio Member
(n)	One Official from Municipal Administration Department	Ex-Officio Member
(o)	Other Non-Official persons not exceeding five, who in the opinion of the Ex-Officio Chairman of the District Authority are interested in the conservation of natural resources of which one shall belong to Scheduled Caste, one to the Scheduled Tribe and one shall be a Woman	Memebrs
(P)	Director, Urban Forestry, HUDA in respect of Hyderabad and Rangareddy Districts.	Ex-Officio Member
(q)	Project Director, Drought Prone Area Programme / District Water Management Agency	Ex-Officio Member - Secretary

CONSTITUTION OF WATER, LAND, TREES AUTHORITY AT THE MANDAL LEVEL IN THE STATE.

(a)	Tahsildar of the concerned Mandal	Ex-Officio Chairman
(b)	Mandal Parishad Development Officer	Ex-Officio Vice-Chairman
(c)	Sarpanch of the Mandal Head Quarters Gram Panchayat	Member
(d)	Two Mandal PArishad Territorial Constituency Members of the concerned Mandal to be nominated by the Ex-Officio Chairman of the District Authority	Members
(e)	Assistant Executive Engineer, Irrigation Department	Ex-Officio Member

(f)	An Officer from Ground Water Department	Ex-Officio Member
(g)	Assistant Director, Agricultural Department	Ex-Officio Member
(i)	Forest Range Officer of the nearest Range.	Ex-Officio Member
(j)	Three Non-Official Members, of whom, one shall be a Woman, who in the opinion of the Ex-officio Chairman of Mandal Authority are interested in Conservation of Natural Resources or Presidents of the Water Users Association / Van Samrakhan Samithi / Watershed Association with the approval of the Ex-officio Chairman of the District Authority.	Ex-Officio Members
(k)	Assistant Executive Engineer, Rural Water Supply	Ex-Officio Member Secretary

ANNEXURE XXIX:

WORKERS SAFETY DURING CONSTRUCTION ACTIVITIES

ANNEXURE XXIX: WORKERS SAFETY DURING CONSTRUCTION ACTIVITIES

SAFE LAYOUT IN THE CONSTRUCTION PLANT, CAMP AND QUARRY AREAS

1. Arrange border to perimeter fencing
2. Ensure good visibility and safe access at site entrances
3. Provide adequate warning signs at the entrance and exit where necessary
4. Provide adequate space/area for loading and unloading, storage of materials, plant and machinery
5. Display emergency procedure and statutory notices at conspicuous location
6. Consider welfare facilities required
7. Provide areas for dumping garbage and other waste materials, and also arrange for their regular clearance.
8. Arrange storage, transport and use of fuel, other flammable materials and explosives in line with the license requirements to be obtained from appropriate authorities
9. Plan emergency assembly points, fire escape routes and locate fire-fighting equipment
10. Provide access roads and plant movement areas within the site.
11. Ensure the availability of first aid facilities and display notices at the various works to show the location of these facilities
12. Provide proper drainage and sewage & drainage facilities

HOUSE KEEPING PRACTICES

1. Maintain washrooms and canteens clean
2. Keep all walkways clear and unobstructed at all times
3. Ensure that spillages of oil and greasy
4. Stack raw materials and finished products clear of walkways or inside roads
5. Do not leave tools on the floor or in any location where they can be easily dislodged
6. Keep windows and light fitting clean
7. Maintain the workplace floors dry and in a non-slippery condition
8. Provide and maintain proper drainage system to prevent water ponding
9. Use metal bins for oily and greasy rags and store all flammable materials in appropriate bins, racks or cabinets. Ensure that the meal bins for storing oily and grease rags should be covered with lids.
10. Ensure that protruding nails in boards or walls are moved or bent over so that they do not constitute a hazard to people
11. Make sure that hazardous/dangerous chemicals are kept in the goods stores with the appropriate labeling, display of the material-safety-data-sheet (MSDS) and other precautionary measures
12. Display ‘no smoking’ signs in areas with high fire risks, e.g. paint stores, wood working area and others

TREE FELLING

- Use hard hats during tree felling
- Ensure tools such as the axes are in good condition

- Determine proper foot and body position when using the axe. Do not cut above your head
- Wear appropriate foot protection
- Carry a first aid kit to the site
- Determine possible hazards in the area, e.g. electrical or telephone or other utility lines
- Prior to felling, determine the safest direction for the fall
- Determine the proper hinge size before directing the tree fall.

NOISE HAZARDS AND ITS CONTROL

1. Note that indications of noise levels are:
    - You have to shout to be heard;
    - Your hearing is dulled just after work;
    - You get head noises or ringing in the ears after work;
    - You have difficulty hearing people while others are talking
2. Use sound level meters to measure. If the sound level exceeds 85 dB(A), then preventive measures should be taken
3. Make personnel aware of noisy areas by using suitable warning signs and insisting that ear protectors should necessarily be worn.
4. Reduce noise at source by improved maintenance, replacing noisy machines, screening with noise absorbing material, making changes to the process/equipment, controlling machine speeds, ensuring that two noise-generating machines are not running at the same time, using cutting oils and hydraulic breakers.
5. Appoint a competent person to carryout a detailed noise assessment of the site, designate ear protection zone, and give instructions on the necessary precautionary measures to be observed by site personnel, including the use of suitable type of ear protections.
6. Wear and maintain ear muffs and ear plugs as required
7. In construction or repair work, noise should be kept to a low-level bearing in mind the disturbance to local residents.

CANALA/RESERVOIR CONSTRUCTION WORKS

1. The use of signage is most important to caution the users of possible unsafe conditions due to the construction works
2. Use the appropriate signage devices as required by the site conditions/situation. The devices include regulatory signs, delineators, barricades, cones, pavement markings, lanterns and traffic control lights.
3. In using signs, make sure that they are (i) simple, easy-to-understand and convey only one message, (ii) luminescent and with reflective properties, and)iii) broad, prominent and of appropriate size.
4. In using barricades, make sure that you keep traffic away from work areas and you guide the drivers to keep along a safe, alternative path.
5. Ensure that proper personal protective equipment (PPE) is provided to all the workers.
6. Cover existing road signs and install new ones at appropriate locations taking into account the distances that would be required and reaction times.
7. Plan layout and traffic management so that hazard are not created.

8. Deploy flagmen, who control traffic at the work areas. The flag should be 600mm x 600mm fastened to a 1m length staff.
9. Flagmen should wear reflective safety vests along with hard hats
10. If required, use wireless devices for flagmen to co-ordinate from either ends of the project, where works are being carried out.

ELECTRICAL HAZARDS IN CONSTRUCTION AREAS

1. Treat all wires as live wires
2. Never touch dangling wires, but report them to your manager
3. Unless you are a qualified electrician, do not attempt electrical repairs
4. Never use electrical equipment if you hands are wet or you are standing in water
5. If electrical equipment is sparking or smoking, turn the power off and report the condition to your supervisor
6. Never use electrical wires that have physical damage
7. Never allow equipment or traffic to run over electrical wires.

USE AND STORAGE OF GAS/LPG

1. Store filled gas/LPG cylinder in the open area, i.e. outside of the building
2. Transport, store, use and secure cylinders in upright position
3. Ensure proper ventilation at the ground level in locations where gas/LPG is in use
4. Avoid physical damage to the cylinders
5. Never weld or cut on or near the cylinders
6. Store empty cylinders secured and upright
7. Make sure that the cylinder is closed immediately after use
8. Investigate immediately if there is the smell of LPG or gas
9. Never use destenched gas/LPG on site.
10. Make sure that there is no other unrelated fire in the vicinity of the cylinder

OPERATION OF EXCAVATORS

1. Ensure that excavators are operated by authorized persons who have been adequately trained.
2. Prevent unauthorized movement or use of the excavators
3. Check regularly and maintain the machine thoroughly
4. Ensure that all relevant information, including those related to instruction, training, supervision and safe system of work are provided to the operators.
5. Ensure that the operation and maintenance manuals, manufacturer's specifications, inspection and maintenance log books are provided for the use of the mechanics, service engineers or other safety personnel during periodic maintenance, inspection and examination.
6. During tipping or running alongside the trenches, excavators must be provided with stop blocks.
7. Excavators must be rested on firm ground during operation
8. Avoid operating the machine too close to an overhang, deep ditch or hope and be alter to potential carving edges, falling rocks and slides, rough terrain and obstacles.

9. Locate and identify underground services by checking with all utility companies before excavations.
10. Ensure that all excavations are supervised by experienced and competent persons.
11. When reversing or in caste the operator's view is restricted, adequate supervision and signaling should be provided.
12. Ensure that the type and capacity of the excavator are properly chosen for the intended purposes and site conditions. Never use a machine for any purposes other than it is designed for.
13. Check and report for excessive wear and any breakage of the bucket, blade, edge, tooth and other working tools of the excavator.
14. Check that all linkages/hinges are properly lubricated and ensure that the linkage pins are secured. Never use improper linkage pins.
15. Never dismount or mount a moving machine
16. Work only with adequate ventilation and lighting
17. Ensure that the protective front screen of the driving cabin is fixed in position during excavations to avoid eye injury to the operator.
18. Ensure switch-off of the unattended vehicle.

OPERATION OF TRUCKS AND DUMPERS

1. Ensure that only trained, authorized and licensed drivers operate the vehicles
2. Enlist the help of another worker before reversing the vehicle
3. Switch-off the engine of an unattended vehicle
4. Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall.
5. Wear safety boots or shoes to avoid injuries during loading and unloading.
6. Carryout periodic servicing to the manufacturer's requirements. All records of maintenance and repairs should be in writing or kept on site.
7. Keep the vehicle tidy and the cabin free from tools and material, which might obstruct the controls.
8. Keep to speed limits.
9. No passenger should be carried on a dumper except the driver
10. Never drive the vehicle across a slope
11. Provide stop blocks when the vehicle is tipping into or running alongside excavations
12. Do not overload the vehicle.
13. Carry only well secured loads
14. Park only on level ground, in neutral with the parking brake applied
15. Never mount of dismount from a moving vehicle

GAS WELDING

1. Use the following personal protective equipment during welding
    - Face or hand shield fitted with filters
    - Goggles, particularly when chipping slag
    - Gloves long enough to protect wrists and forearms against heats, sparks, molten metal and radiation

- High-top boots to prevent sparks from entering footwear.

2. Screen of the work area with sturdy opaque or translucent materials because glare can cause eye injury.
3. Key for opening the acetylene cylinder valve must be one the valve stem while the cylinder is in use so that the cylinder valve may be immediately shut-off in an emergency.
4. Ventilate the workplace using air blowers and exhaust fans to remove poisonous fumes and gases that are given off during welding
5. Take precautions against flying sparks and hot slag where welding is beign done near flammable materials and check the area before leaving.
6. Do not weld material degreased with solvents until completely dry.
7. Do not use gas cylinders for supporting work or as rollers
8. Do not use oil grease on oxygen cylinder fittings
9. Do not use cylinders with damaged valves.
10. Do not use too much force if valves are stuck.
11. Replace valve caps after use
12. Search for leaks in equipment by using a solution of soapy water.
13. Shut the cylinder valve if acetylene from a cylinder catches fire at the valve or regulator due to leakage at a connection.
14. Treat all gas cylinders as “full” unless you are sure otherwise.
15. Never attempt to transfer acetylene from one cylinder to another or attempt to refill an acetylene cylinder.
16. Place portable fire extinguishers near the welding area
17. Secure all cylinders against accidental displacement.
18. Always lift gas cylinders. Do not slide them along the ground or drop them from trucks.
19. Keep gas cylinders in vertical position both in storage and when in use
20. Keep the work place dry, secure, free from combustible materials and obstruction.
21. Store the acetylene and oxygen cylinders separately, and in a proper store.
22. Keep the gas cylinders from source of heat, flammable materials, corrosive chemicals and fumes.

MANUAL HANDLING AND LIFTING

1. Use mechanical equipment in lace of manual handling as far as possible.
2. Assess the manpower required to handle or life the load safety and arrange the manpower accordingly.
3. In handling hazardous materials, the workers shall be informed of the hazards and safety precautions.
4. All relevant persons shall be trained in the proper methods of lifting and carrying.
5. Where team work is required, select the persons whose ages and physical builds are compatible for teaming up. Coordinate the actions of the team members by giving necessary instructions.
6. Always lighten or suitably shape the load for manual handling as far as possible Keep a look out for splinters, sharp edges, loose banding and nails.
7. Clear path or obstruction and tripping hazards.

8. Stack and secure goods safety on trucks, otherwise they fall off and injure passers-by.
9. Use personal protective equipment such as gloves, safety shoes, etc.
10. Adopt the following procedure when you lift a load:
11. Stand close to the object. Have a firm footing with feet spread on either side of the road.
12. Bend the knees and keep your back as straight as you can
13. Grasp object firmly. Be sure grip will not slip
14. Breath in and throw the shoulder back wards.
15. Straighten the legs, continuing to keep the back as straight as you can.
16. Hold object firmly close to the body
17. Always lift smoothly. Avoid jerky motions. Turn with feet instead of twisting the back.

HANDLING CHEMICALS AND HAZARDOUS SUBSTANCES

1. Always substitute hazardous chemicals with harmless or less hazardous ones wherever possible.
2. Enclose the process using chemicals or provide other engineering controls such as local exhaust ventilation, a fume cupboard or a safety cabinet.
3. Exercise great care in the storage and use of chemicals because they may be explosive, poisonous, corrosive or combustible.
4. Separate different chemicals physically
5. Store chemicals classified as dangerous goods in a properly constructed and approved goods store. Keep proper records of all chemicals and hazardous substances delivered, stored and used on site.
6. Consider unknown substances and liquids as dangerous until proven otherwise.
7. All containers should be clearly labeled to indicate contents. Never use a wrongly labeled container for chemicals.
8. Prohibit smoking in the vicinity of dangerous chemicals
9. Ensure that you are wearing the correct personal protective equipment before you handle chemicals
10. Maintain the Material Safety Data Sheet of all chemicals for reference on safety precautions to be taken and the use of suitable PPE.
11. When opening containers, hold a rag over the cap or lid, as some volatile liquids tend to spurt up when released.
12. Wash before you eat and do not eat at the work place.
13. If the skin is splashed with a chemical, rinse it immediately with plenty of clean water. Eye should be flushed thoroughly with water followed by immediate medical attention.
14. Eye fountain, emergency shower and breathing apparatus should be available in the vicinity of the workplace.
15. Safety instructions for handling emergency situations should be displayed prominently at both the storage and use locations.

FIRST AID

1. Provide first aid boxes at every site
2. Ensure that training on the use of the first aid box is provided to a handful of staff working in the site.

3. Display the list of persons who are trained on providing first aid.
4. Ensure that every first aid box is marked plainly “First Aid” in English and local language.
5. The responsible person or first aider should replenish the contents of the first aid box as necessary.

PERSONAL PROTECTIVE EQUIPMENT

General

1. Consider the provision of personal protective equipment only after all measures for removing or controlling safety hazards have been provided reasonably impractical.
2. Ensure that sufficient personal protective equipment are provided and that they are readily available for every person who may need to use them.
3. The management should ensure that all persons make full and proper use of the personal protective equipment provided.
4. Provide instruction and training in the proper use and care of any specific protective equipment where necessary
5. Do not willfully misuse, interfere with or ill-treat any protective clothing and equipment provided.
6. Ensure that the personal protective equipment are in good condition. Report immediately any damage to the management for replacement. Always keep the personal protective equipment as clean as possible.

Eye protection

1. Issue eye protection equipment where there is a foreseeable risk of eye injury
2. Ensure an adequate supply of goggles/shields is available.
3. Keep the goggles clean and make sure they are good fit.
4. Do not watch welding operations unless your eyes are protected from the damaging effect of flash.

Head Protection

1. No person shall enter a construction site unless he is wearing a suitable safety helmet
2. Wear a safety helmet:
    - When there is the risk of being hit by falling objects
    - While on or near a construction site
    - During adverse weather conditions
    - When in any area designated as a “hard hat” area.
3. Provide identification labels to all helmets in some way to prevent random exchange among wearers, with one helmet exclusive to each person.
4. Inspect helmets for cracks of sign of impact or rough treatment before each usage. Destroy, remove and replace all worn, defective or damaged helmets.

Hearing Protection

1. Provide ear plugs or ear muffs as required. Use re-usable ear plugs when the reduction required (15-25 dBA) is not excessive. Use ear muffs where a large attenuation of upto 40 dBA is demanded.
2. Do not use dry cotton wool for hearing protection because it cannot provide any.
3. Provide disposable ear plugs for infrequent visitors and ensure that they are never re-used.

4. Provide re-usable ear plugs for those who need to work continuously for a long period in a high noise area.
5. Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
6. Avoid wearing spectacles with ear muffs.
7. Use soap and water or the recommended solvent for cleaning ear muffs.
8. Provide ear muffs for those who may need to get in and out of a high noise area frequently.

RESPIRATORY PROTECTIVE EQUIPMENT

1. Wear suitable respirable for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags.
2. Ensure that he explanators can provide adequate protection.
3. Provide training to all persons using the respirators for their correct fitting, use, limitations and symptoms of exposure.
4. Clean and inspect all respirators before and after use.
5. Store respirators properly when not in use.

Safety Footwear

1. Wear suitable footwear for work
2. Use safety footwear on site or in other dangerous areas
3. Wear suitable safety shoes or ankle boots when working anywhere where there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects, etc.
4. All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
5. Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury.
6. Keep shoe lace knots tight.

Hand Protection

1. Wear suitable gloves for selected activities such as welding & cutting and manual handling of materials & equipment.
2. Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery
3. wash hands properly with disinfectant soap and clean water before drinking, eating or smoking. Wash hands immediately after each operation on site when the situation warrants.

FIRE PREVENTION, FIGHTING AND EQUIPMENT

Before fire breaks cut

1. Store flammable material in proper areas having adequate fire protection systems.
2. Display sufficient warning signs.
3. Train selected personnel to use these fire extinguishers
4. Inspect fire extinguishers regularly and replace as necessary
5. Fire escape route should be kept clear at all times and clearly indicated.
6. Know the escape route and assembly point.
7. Display escape route maps prominently on each floor

8. Carryout fire drill regularly. Designate fire officers
9. Install fire alarm wherever required and test regularly.
10. Provide sufficient exit signs at prominent locations for directing people to the escape staircases and routes.

When fire breaks out.

1. Alert all persons
2. Put off the fire with appropriate fire extinguishers only when you are sure that you are safe to do so.
3. Escape if you are in danger through the fire escape route to assembly point
4. Fire officers to carryout head count at the assembly point.

Incident and accident investigations

1. Carryout the investigation as quickly as possible.
2. Conduct interviews with as many witnesses as necessary
3. Do not rely on any one sole source of evidence
4. Use the following tools:

   Checklists for obtaining basic and typical information for accidents

   - Notebook
   - Tape records
   - Camera
   - Measuring tape
   - Special equipment for the particular investigation
5. Obtain answers to the following questions:
   - When did the accident occur?
   - Where did it occur?
   - Who was injured and what was damaged?
   - What caused the accident?
   - Why did it occur?
   - How could it have been prevented?
   - How can a recurrence be prevented?
6. Prepare a short but sufficient investigation report that contains the following:
   - A summary of what had happened
   - A summary of events prior to the accident
   - Information gathered during the investigation
   - Details of witnesses
   - Information on injury or loss sustained
   - Conclusions and possible causes of the accident
   - Recommendations to prevent recurrence
   - Supporting materials (photos, diagrams, etc.)

WORKERS SAFETY DURING CONSTRUCTION

Sl No.	Stage and Nature of Construction Hazard	Safety measures expected to be taken by the Contractors and Site Engineers
1	Excavation in soft loose & slushy soil above 2.00 m depth sliding of earth or collapsing of sides.	The Excavation beyond 1.5 m to 2.00 m to be done in steps of minimum 500 mm offsets as shown in Clause 2.18.2(b) and also planking and strutting should be done as in Clause 2.19.1.
2	Excavation in slippery area (water logged) – The labour may fall or machinery on site may slip.	Try to dewater the area and spread minimum 150 mm thick sand layer to avoid slipping
3	Excavation in Rock where chiseling is involved – The fall of hammer may injure the hand, small rock pieces may injure the eyes and legs.	For hammer work, only experienced and skilled labour should be employed. Chisel should not be allowed to be held by hand, while hammering but chisel holding clamp should be provided. The labour should be provided with goggles and leg cover to protect eyes and legs, from injuries due to small rock pieces.
4	Excavation in Rock where blasting is involved - Careless handling may lead to injury to main worker or a passer by.	The work of blasting should be entrusted to only experienced persons. Provide sufficient length of fuse to give ample margin of time from the time of lighting to the time of explosion. A danger zone at least 180m diameter is to be flagged off 10 minutes before actual firing. All workmen should be sent away from danger zone except the firing man, who should be provided with a whistle.
6	During Excavation or some times even while concreting – Snake bites or Scorpion stings –	In places where the movement of snakes are more the contractor should provide the labour with gum boots, gloves etc. and also make snake antidotes available on site. A particular care that has to be taken on such site is to always keep a vehicle available on site to rush the patient to a doctor. This applies to snake stinged patients as well.
7	Centring (form-work) and scaffolding –Form-work collapse while concreting or just before concreting especially when wooden ballies are used.	Many a times ballies joined together give way due to weak joint. Hence the use of joined ballies should be restricted. Only 2 joined ballies out of 8 ballies should be allowed. In case of double staging for a Slab at a height, utmost care should be taken to see that the top balli rests on the bottom balli. A particular care that should be taken during each concreting operating of slabs and beams is that, one carpenter and two helpers with spare ballies, nails etc. should be deputed below the slab/beam that is being concreted to watch any disturbance in the supports of the form-work below during concreting and in case of any doubt the concreting should be stopped immediately and the form work strengthened. Never allow bricks below a balli to make up the required height. This is most dangerous.
8	Form-work for beams and slabs: The bottom of beam collapses and many a times brings down the slab	This case is noticed when slender ballies are used without bracing. In fact, no concreting should be allowed without bracing at 300 mm

Sl No.	Stage and Nature of Construction Hazard	Safety measures expected to be taken by the Contractors and Site Engineers
	as well, injuring the labour and supervision staff.	above ground, and at mid way, in normal beams & slabs. The bracings should be for the support of beams as well as slabs.
9	Form-work for sides of a slab–The labour just rests his foot on the plank and looses balance and falls resulting a fatal accident.	This is noticed when the carpenter fixes the side shuttering of a slab with a plank just tied by binding wire to the steel reinforcements and by wooden pieces nailed in wall and plank. This is so weak a portion that with little pressure the plank gives way. Hence side shuttering should be done with a direct balli support from ground or floor, and the practice of tying planks with binding wire to the steel reinforcement should be totally avoided. A temporary railing along the periphery of slab will guard the life of labour and supervision staff.
10	Form-work for beams and slabs–Opening the form- work–Accident due to fall of materials during removing the forms.	In fact, this is a most dangerous work. One should be very careful while form-work is removed. Only trained carpenters should be deputed for the work. A safe resting place outside the area of slab as a temporary measure should be constructed from where the Slab can be removed safely. Removal of form-work during night should not be permitted under any circumstances.
11	Scaffolding–Fall of work-man, Supervision Staff, Standing on Chalis not tied properly or tied only at one end. (Chalis mainly made of Bamboos).	This is a very common negligence on the part of labour who do scaffolding work. The Chalis on which they work either span over it's complete length or is tied loosely and many a times at one end only. Hence, care must be taken that the Chali do not span over the full length but some middle support should be provided and also the same is tied properly on both ends.
12	Ladders–Balli or bamboo ladders – The horizontal member breaks and the person falls. Some times the top face just rests on wall and the whole ladder tilts causing an accident.	The ladders should be strong enough to bear the weight of a labour with materials on head. As far as possible a hand rail should be provided at one end. The horizontal member should be preferably fixed with. bolt & nuts or strong nails. When the ladder is placed across a wall the top portion should be tied firmly to a strong support so that the ladder does not move laterally.
13	Column Reinforcements–Column reinforcements mainly in independent footings collapses – Injury to persons working nearby.	The tendency of bar-benders is to tie the vertical steel with coir rope or 8 mm steel rods as ties on all four sides of the column reinforcement. This method of supporting the column reinforcements results in a weak support. Hence, the column reinforcements should be supported by strong ballies on all four sides of reinforcements and as far as possible a combined platform should be constructed out of ballies over which the reinforcements can be supported.

Sl No.	Stage and Nature of Construction Hazard	Safety measures expected to be taken by the Contractors and Site Engineers
14	Concreting chajjas – When chajjas are concreted with out care and on opening the form-work the chajja would collapse, causing injury to labour on top or bottom of chajja.	While concreting chajjas care must be taken that the labour do not stand on the reinforcement and disturb the position. Separate scaffolding must be tied over which the labour can stand and work without disturbing the reinforcements. The main reason is in chajja the steel is placed on top face but if the labour stands on the steel, it will bend and come to bottom face and hence the chajja will fall when form-work is removed, thus, causing injury to labour working on top, or bottom.
15	Dismantling–Dismantled materials may fall on passer by or the person engaged in dismantling work may fall due to slipping. The dismantled materials may fall on persons working below.	When work of demolition is to be taken up the area should be closed for all outsiders. No one should be allowed up to 50 m. from the place of demolition. The workers engaged in demolition should be asked to wear safety belts. Helmets must be worn by all the workers engaged in dismantling work. The place should be strictly guarded at night with red lights at prominent places, and watchman should be posted.
16	Electric-Connections/Cables etc. – High tension/L.T. Electric wire passing near the slab structure-while bending, lifting or tying reinforcements the bar benders may sustain the Electric Shock, causing fatal injury.	The work in such places, should not be allowed to the workers themselves, but in such position the work must be executed under the strict supervision of a responsible Foreman or a Supervisor.
17	Electric Connections/Cables etc. – Cables below ground may get punctured during excavation & thus electrocute the labour working. Similarly when concreting is in progress the punctured cable may prone to be fatal to the labour.	Before taking up the work all available drawings should be studied, local enquiry to be made to know the position of cables and work in such area should be got executed under strict supervision of an experienced Foreman or a Supervisor.
18	Electric Connections/Cables etc. – Temporary Electric lines near damp walls, near joinery stretched on a considerable length – There is every chance that the wire may get cut due to usage and may develop short circuits/leakages etc. and may electrocute the person touching the wire accidentally.	The Electric wires should be maintained by an electrician who should regularly check up the insulation of wires especially placed near steel items & damp areas. The temporary wiring should be supported properly. As far as possible a good quality wire should be used which may not get damaged easily.
19	Electric and gas welding work – Drilling, polishing work – Done by temporary cables used on a number of works – Due to the fact that the wires are old & when they come in contact with water even in the process of curing the surrounding area may get affected due to leakage in the electric current thus	All wiring works to be inspected by experienced electrician. All wires to be properly insulated and fixed at height on temporary poles. No welding work should be permitted near damp area. The welders to be provided with welder's goggles & gloves. As far as possible machine in good condition should be used.

Sl No.	Stage and Nature of Construction Hazard	Safety measures expected to be taken by the Contractors and Site Engineers
	causing damage to the workers & supervision staff.	
20	Construction Machinery & Lifts – Concrete Mixers – Safety precautions. A mixer with hopper tried to be operated by an helper could not release brake in time thus causing injury to the person near hopper- some times fatal one.	The Mixers with hopper should be operated by an experienced mixer operator and such mixers should not be allowed to be handled by a helper or a labour.
21	Construction Machinery & Lifts - Lifts - Safety precautions. (1) The lift pit if left unguarded the children of workers may fall in the pit resulting in fatal accident	(1) A brick protection wall of minimum 1.00 m height should be constructed around the Lift Pit, thus, preventing the children going near the pit. A special care should be taken to see that the children are not allowed to come near the machinery.
	(2) The manually operated brakes of the lift failed or the communication between the labour at the top and the liftman failed and thus, the lift was not controlled and resulted in fatal accident.	(2) The condition of the lift must be maintained properly. The lift operator should be well trained. The labour receiving the bucket at top should be smart and active enough to convey the message of stopping & releasing the lift-to-lift operator properly.
22	Water Storage Tank for general use & curing - chances of children of workers falling in the tank with fatal accident.	The water tanks constructed on site should be protected by at least 1.00 m high walls on four sides, so that the children do not fall.
23	Misuse of lift by labour and some times supervision staff The lifts that are meant for lifting materials used by labour to go to upper floors – The labour thus traveling many a times get injured.	No person should be allowed to go to upper floors by lifts that are mainly meant for conveying the building materials. Fatal accidents have taken place due to above action of workers.
24	Site Cleaning–Cleaning top floors of buildings – Upper portion of any structure – Throwing waste materials broken concrete pieces, brick bats, sand etc. straightway from top to ground injuring person below or even a passerby.	This dangerous practice should not be allowed at all. The materials should be brought to the ground with the help of lift or the use of rope over pully with a bucket, thus bringing down materials safely.
25	Bar bending work-Helpers of bar benders to follow short cut method, throw surplus steel pieces from top floors to ground and may cause fatal injuries.	This is a very bad practice. The helpers should bring the rods to ground with the help of lift or rope & pulley.