



THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

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GOVERNMENT OF ASSAM
ORDERS BY THE GOVERNOR
WATER RESOURCES DEPARTMENT

NOTIFICATION

The 29th June, 2024

No. E-419285/28.- In the interest of enhancing the efficiency of water resources management, flood forecasting, and integrated flood risk management, the Governor of Assam is pleased to set forth guidelines for installation and maintenance of Real-Time Data Acquisition System (RTDAS) for Collection of Hydro-Meteorological Data in the State of Assam with immediate effect.

Guidelines for installation and Maintenance of Real-Time Data Acquisition Systems (RTDAS), 2023

Whereas, it is well acknowledged that good quality accurate and reliable data is a key factor for the success of different models developed for effective and integrated water resources management, and whereas, permissions are required for installation of such systems in the campuses of different state government field offices in the remote parts of the state, and whereas, it is noticed that due to a lack of understanding and clear cut guidelines in this matter, permissions for installation of such systems are not easily accorded and referred to state secretariat for decision, leading to unreasonable delays in obtaining clearances and thereby leading to cost and time overruns and sometimes, disputes with the agency contracted for installation of such systems, defeating the purpose behind data collection.

Hence, it is expedient to establish clear guidelines relating to processes concerning installation and operation of the Real-Time Data Acquisition System (RTDAS) and delegation of authority to the appropriate levels authorizing district level officers to give permission for installation of RTDAS within the campus of Government establishments. The guidelines also address land leasing challenges, ensure efficient operation & outline responsibilities for asset maintenance and supervision. With well-defined guidelines in place, the State of Assam will significantly improve its water resource management capabilities, contributing towards sustainable development and building resilience against water-related challenges posed by climate change. The aim is to enhance the accuracy and availability of weather data, improve forecasting capabilities, and facilitate effective decision-making in various sectors.

1. Short Title, Extent and Commencement

- a) These set of instructions may be called as “Guidelines for installation and Maintenance of Real-Time Data Acquisition Systems (RTDAS), 2023”.
- b) It shall extend to the whole state of Assam.

2. Introduction

Flood control activities in Assam started after announcement of National Policy for Flood in 1954 by the Govt. of India. Though there was short term and long-term measures in National Flood Policy of 1954, to get the immediate relief to the flood ravaged state, construction of embankments as short-term measures had been widely adopted because this could be constructed quickly with local resources and abundant manpower to protect large area with comparatively smaller outlays.

The Water Resources Department has been taking up various floods & erosion management works as well as infrastructure development schemes under different funding sources since its inception.

The Government of Assam (GoA) focus on strengthening institutions, fill critical knowledge gaps, and implement integrated solutions to tackle the current challenges of floods and erosion, amongst others, and to seize opportunities for climate resilient growth and sustainable livelihoods is in alignment with other international, national and sub-national best practices and is an integral component of Water Resources Management in contemporary times.

The floods in Assam pose substantial risks to human lives, belongings, and the environment. Precise and timely information about weather conditions and river water levels is essential for effective flood forecasting and early warning systems. The installation of Real-Time Data Acquisition System (RTDAS) (Automatic Weather Stations, Automatic Rain Gauges, Automatic Water Level Recorders, Automatic Water Discharge Recorder, etc.) enables near real-time monitoring of weather conditions and water levels of various rivers in Assam, improving flood forecasting capabilities.

3. Background

RTDAS is a state-of-the-art technology that involves the deployment of automated weather stations, hydrological gauges, and water level sensors across strategic locations within a river basin. These stations continuously collect and transmit hydro-meteorological data in real-time to a central data management system.

The importance of RTDAS in Water Resource Management is as follows:

- a) **Flood Forecasting and Management:** Real-time data from RTDAS stations provides crucial information on rainfall intensity, river flow, and water levels, enabling timely flood forecasting and management strategies. This helps in minimizing damages to infrastructure and safeguarding lives and properties during flood events.
- b) **Water Resource Planning:** The accurate and continuous data collected by RTDAS stations support informed decision-making for water allocation and irrigation planning, etc.
- c) **Climate Change Adaptation:** RTDAS data assists in understanding changing climate patterns and their impacts on water resources, thereby supporting climate change adaptation strategies.
- d) **Disaster Risk Reduction:** By providing real-time data, RTDAS enhances disaster risk reduction efforts, allowing for timely and effective responses to potential natural disasters.

The successful implementation of Integrated Water Resources Management hinges on the availability of accurate and reliable hydro-meteorological data. To achieve this, the installation of RTDAS systems is imperative.

3. Real-Time Data Acquisition System (RTDAS)

3.1 Definition

A Real-Time Data Acquisition System (RTDAS) is a sophisticated and automated technology used for the continuous and instantaneous collection, transmission, and processing of hydro-meteorological data from various environmental monitoring sensors. It is designed to provide real-time and accurate information on weather conditions, water levels, precipitation, river flow, groundwater levels, and other relevant parameters crucial for effective water resource management, flood forecasting, drought monitoring, and disaster risk reduction. Various types of RTDAS popularly available are Automatic Weather Station (AWS), Automatic Rain Gauge (ARG), Automatic Water Level Recorder (AWLR), Automatic Water Discharge Recorder (AWDR), etc.

3.2 Components of RTDAS

A real-time data acquisition system (RTDAS) for hydrological and meteorological parameters is a system that collects, processes, transmits and stores hydrological and meteorological data in near real-time. Typically, it consists of various sensors and instruments to measure hydrological and meteorological parameters such as temperature, humidity, precipitation intensity, accumulated precipitation, wind speed, wind direction, atmospheric pressure, solar radiation, water level, soil moisture, and many more. It also consists of metallic or concrete structures to mount all the necessary sensors along with batteries, solar panels, transmission systems and charging systems. Normally a fencing mechanism is used to stop the unauthorized use or operation of the instruments.

The key components of a real-time data acquisition system: (Described briefly in Annexure)

- a) Sensors and Instruments
- b) Data Logger
- c) Communication Interface
- d) Power and backup

3.3 Area required for Real-Time Data Acquisition System (Automatic Weather Station, Automatic Rain Gauge and Automatic Water Level Recorder)

The sensors are normally mounted on a metallic mast/tower at a certain height from the ground. The data logger, battery, charges controller and transmission unit are normally kept inside a metallic box mounted on the mast/tower to protect it from weather events. A solar panel is also mounted on the tower. The surface area required for installation of Automatic Weather Station (AWS), Automatic Rain Gauge (ARG) and Automatic Water Level Recorder (AWLR) are different and is discussed in the section below: (Described briefly in Annexure)

- a) **Automatic Weather Station (AWS)** consists of various sensors to measure different parameters of weather. The sensors are normally mounted on a metallic tower of around 10 meters in height. The tower has an underground concrete base of around 1m³ with three guy wires for its strengthening. The tower holds sensors, a data logger, a transmission unit, a charging unit, a battery and a solar panel. The solar panel and the sensors are exposed to outside weather while the other instruments are kept in a protective box. The tower is protected by **10 meters by 10 meters chain link fencing** from external interfaces like animals or any unauthorized entry.
- b) **Automatic Rain Gauge (ARG)** consists of a single tipping bucket rain gauge with a data logger, transmission unit, charging unit, battery and a solar panel. The solar panel and the rain gauge are kept outside while the other instruments are kept in a protective enclosure. The whole system is protected by **5 meters by 5 meters chain link fencing** from external interfaces like animals or any unauthorized entry.
- c) **Automatic Water Level Recorder (AWLR):** Unlike the other two instruments, an AWLR is installed at the side of bridges or on the banks of rivers, lakes, etc. It is used to measure the water level and this water level data is transmitted to the data processing centre. The sensor of AWLR is mounted over the water body with the help of a cantilever-based setup and the cantilever is **mounted from a road bridge or from a permanent structure erected at the bank of the water body**. The AWLR consists of a water level sensor with a data logger, transmission unit, charging unit, battery and a solar panel. The solar panel and the sensor are kept outside while the other instruments are kept in a protective enclosure. The protective enclosure and the solar panel are kept at a suitable distance from the sensor inside a chain-link fencing.

4. Health and Safety Concerns

The Real-Time Data Acquisition System (RTDAS) is designed to collect meteorological data solely from its designated installation location and subsequently relay this information to a remote server via GSM/GPRS networks. It is imperative to note that the RTDAS generates no ionizing or deleterious radiation of any nature. This system operates exclusively on a 12-volt direct current (DC) power supply sourced from a combination of batteries and solar panels, thus obviating any risk of electrical shock to human individuals. Furthermore, it is essential to emphasize that the entirety of the RTDAS is situated within a securely enclosed perimeter, employing a lock and key mechanism to effectively forestall any unauthorized access.

5. RTDAS Guidelines

5.1. Authorisation of concerned Divisional/District Heads for providing permissions for installation of RTDAS on government-owned lands under their respective jurisdiction

- a) To facilitate the installation of the RTDAS in the river basins, including in the catchment areas, the Divisional/district Heads of all pertinent departments are duly authorized to issue No Objection Certificates (NOCs)/permissions, as the case maybe (refer Table 1), to the Department of Water Resources or any other department concerned with such data collection, thereby granting approval for the installation of RTDAS on government-owned lands under their respective jurisdiction.

- b) Water Resource department or any other department concerned with hydrological data collection, shall seek permission from such authorities of the land owning departments as mentioned in para (a) above, for the installation of RTDAS systems as per the prescribed format (Annexure B).

5.2. Land Agreement for Installation in Private Land

- a) The Government of Assam acknowledges the significance of private lands for the strategic placement of RTDAS stations to ensure comprehensive data collection. The concerned department involved in data collection, shall engage in negotiations with landowners for the leasing of private land for the installation of RTDAS stations.
- b) To this lease amount, the negotiated nominal amount for maintenance of site, safety and security of the RTDAS station by the land owner at its own risk and expense may be added. The nominal maintenance includes cleaning the station from dust and leaves covering the station and equipment.
- c) A District level committee is constituted, comprising of (i) Additional District Commissioner (Revenue) (ii) Circle Officer of the concerned Revenue circle & (iii) Executive Engineer of Water Resources department or of the concerned administrative department responsible for installation of RTDAS. The primary objective of this committee is to ascertain the monthly lease or rent quantum and lease period for the designated land parcel.
- d) All such lease proposals shall be approved by the competent authority in the concerned administrative department before registering the lease agreement.
- e) While leasing the private land the registration fee and stamp duty shall be payable in accordance with article 35(23) of the schedules of Registration Act, 1906 and Indian Stamp Act, 1899 respectively.

5.3 Operation and Maintenance of RTDAS Assets

- a) The successful installation of RTDAS systems shall be accompanied by a comprehensive operation and maintenance plan to ensure their continuous functionality.
- b) The Department is encouraged to enter into all inclusive- five (5) year operation and maintenance contracts for ensuring seamless operation of RTDAS.
- c) Throughout the contractual period and beyond, strict oversight of the RTDAS assets shall be maintained by concerned divisional engineers of the Water Resources Department/any other department overseeing data collection. Regular and systematic monitoring, coupled with periodic inspections, shall be conducted to ensure the accurate functioning and data integrity of the RTDAS systems.
- d) There shall be a robust monitoring framework designed to evaluate the performance and efficacy of the contractors responsible for maintaining the RTDAS assets. This monitoring system aims to assess the contractors' adherence to operational standards and effectiveness in preserving the functionality of the RTDAS systems.

6. Delegation of authority for issue of NOC for installation of RTDAS equipment

To enable the seamless installation of Real-Time Data Acquisition System (RTDAS) stations on government-owned lands, the delegation of authority to district level officials of the concerned department for granting the

necessary NOC (No Objection Certificate)/permission is mentioned in the table below. This delegation of authority is intended to streamline the approval process for the establishment of RTDAS stations.

Table 1 : Delegation of authority for issue of NOC for installation of RTDAS stations

Sr. No.	Name of the Department	NOC Issuing Authority	Jurisdiction
1	Elementary Education Department	District Elementary Education Officer	Concerned District
2	Secondary Education Department	Inspector of Schools	Concerned District
3	Higher Education Department	Inspector of Schools	Concerned District
4	General Administration Department	District Commissioner	Concerned District
5	Transport Department	District Transport Officer	Concerned District
6	Health & Family Welfare Department	Joint Director of Health Services	Concerned District
7	Forest Department	Divisional Forest Officer (Territorial or Wildlife, as the case maybe)	Concerned District
8	Public Works (Roads) Department	Executive Engineer	Concerned Division
9	Public Works Department (NH Division)	Executive Engineer	Concerned Division
10	Irrigation Department	Executive Engineer	Concerned Division
11	Public Health Engineering Department	Executive Engineer	Concerned Division
12	Home department	Superintendent of Police	Concerned District
13	Agriculture Department	District Agriculture Officer	Concerned District
14	Soil Conservation Department	Divisional Soil Conservation Officer	Concerned Division

Note:

1. In accordance with established guidelines, No Objection Certificates (NOCs) for departments not expressly indicated herein shall be issued by the District Head of the concerned department.
2. This provision extends to the aforementioned departments as well as any others affected by mergers or demergers.

7. Applications of RTDAS

RTDAS has applications in various sectors including:

- a) **Integrated Water Resources Management:** Enables efficient allocation and utilization of water resources.
- b) **Agricultural Sector:** Facilitates precision agriculture by providing real-time soil moisture data for irrigation planning.
- c) **Disaster Management:** Enhances flood forecasting, enabling timely evacuation and resource mobilization during floods.

d) Infrastructure Planning: Supports infrastructure projects by providing crucial hydrological data for design and construction.

8. Ownership and Maintenance Responsibility:

In case of Water Resource department, the ownership of the RTDAS infrastructure shall be vested in the Hydro-Informatics Unit (HIU) or its successor agency. The day-to-day maintenance activities shall be the responsibility of the respective field offices/ Divisional counterparts of the Water Resources Department to ensure the continuous and reliable functioning of the system.

9. Road Map and Installation Targets:

A 10 year tentative roadmap to install 800 RTDAS units for data collection across the state of Assam is detailed as below;

Table 2: Installation targets and timelines

Sl. No.	Time Line	Number of RTDAS to be installed (Tentative)	Target Major Tributaries for integrated flood risk management strategy
1	2024-2028	200	Beki, Buridehing, Jiadhal, Subansiri, Jiabharali, Bhogdoi, Gai, Jatinga, Singla, Aie, Dhansiri, Pagladia and other Category B and C rivers.
2	2029-2032	350	
3	2033-2034	250	

10. Future Scope: Incorporating Future Technologies:

This initiative maintains a flexible framework, permitting the assimilation of forthcoming technologies contingent upon comprehensive research and the requisite authorization from relevant governing bodies. The active pursuit of advanced technologies will be a central objective to augment the effectiveness and precision of the RTDAS.

11. Authority to make minor modifications to the guidelines

Water resources department is authorized to make minor amendments to these guidelines based on operational experience and necessitated by technological change, without substantially impacting the essence of the delegation of authority for issuing NoC/permissions for installation of RTDAS.

SYEDAIN ABBASI,

Special Chief Secretary to the Govt. of Assam,
Water Resources Department.

Real-Time Data Acquisition System (RTDAS)**Definition**

A Real-Time Data Acquisition System (RTDAS) is a sophisticated and automated technology used for the continuous and instantaneous collection, transmission, and processing of hydro-meteorological data from various environmental monitoring sensors. It is designed to provide real-time and accurate information on weather conditions, water levels, precipitation, river flow, groundwater levels, and other relevant parameters crucial for effective water resource management, flood forecasting, drought monitoring, and disaster risk reduction.

RTDAS typically consists of a network of strategically deployed automated weather stations, hydrological gauges, water level sensors, and other environmental monitoring instruments. These sensors are distributed across a river basin, watershed, or other geographical areas of interest, ensuring comprehensive coverage of the region under study.

The data collected by the RTDAS sensors are transmitted in real-time to a central data management system, where it is processed, analyzed, and made available for immediate access to relevant authorities, researchers, and the public. This allows decision-makers to receive up-to-date information about the prevailing hydro-meteorological conditions, enabling them to make informed and timely decisions related to water resource management, flood forecasting, drought response, and disaster preparedness.

Components of RTDAS

A real-time data acquisition system (RTDAS) for hydrological and meteorological parameters is a system that collects, processes, transmits and stores hydrological and meteorological data in near real-time. Typically, it consists of various sensors and instruments to measure hydrological and meteorological parameters such as temperature, humidity, precipitation intensity, accumulated precipitation, wind speed, wind direction, atmospheric pressure, solar radiation, water level, soil moisture, and many more. It also consists of metallic or concrete structures to mount all the necessary sensors along with batteries, solar panels, transmission systems and charging systems. Normally a fencing mechanism is used to stop the unauthorized use or operation of the instruments.

The key components and features of a real-time data acquisition system are described briefly:

- a) **Sensors and Instruments:** Automatic Weather Station (AWS), Automatic Rain Gauge (ARG) and Automatic Water Level Recorder (AWLR) are equipped with a variety of sensors and instruments to measure different parameters. The sensors in an AWS system include thermometers, hygrometers, anemometers, barometers, rain gauges, pyranometers, and more. The AWS is normally installed on plain grass-covered land with fencing of 10 m by 10 m dimension. The ARG has only one sensor to measure rainfall intensity and accumulated rainfall and is normally installed on plain grass-covered land with fencing of 5 m by 5 m dimension. The AWLR is used to measure river water levels using radar technology. It is normally mounted on the side of river bridges with the help of an expansion rod or cantilever-based structure. A suitable fencing mechanism is used to protect the instruments from external interference.
- b) **Data Logger:** The data logger is a device that collects and stores data from the various sensors connected to it. The data logger typically includes analog-to-digital converters (ADC) to convert the

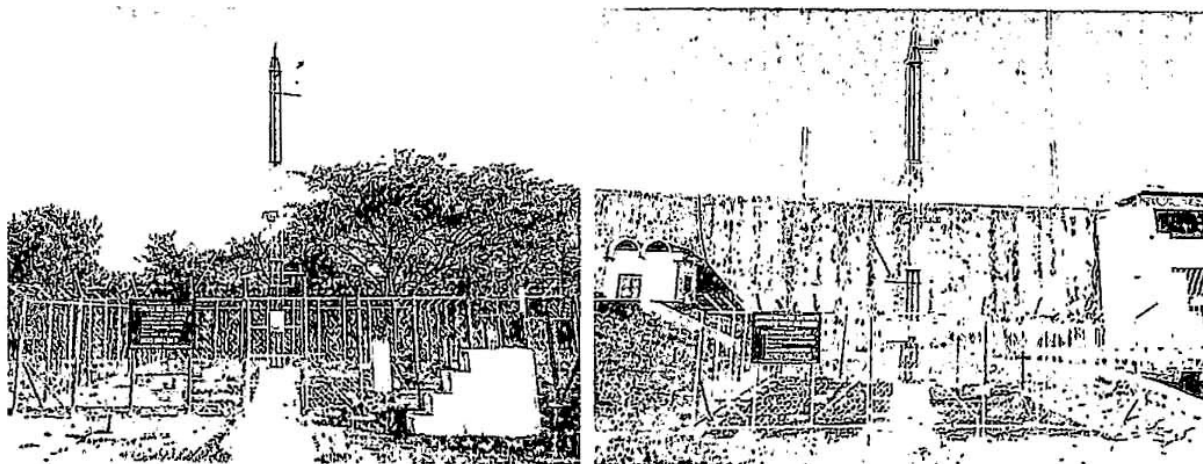
sensor readings into digital format for further processing and storage. the data logger includes a local display system to show past weather measurements and to perform various setting-related tasks. The data logger has a provision for connecting to an external programmable unit for its upgradation of firmware and a USB data transfer module.

- c) **Communication Interface:** The data logger is equipped with communication interfaces such as GSM/GPRS or satellite-based connectivity to transmit the collected data to a central server or a data processing centre. This enables real-time or near-real-time monitoring of weather conditions.
- d) **Power and backup:** A weather station should function independently without any external power supply. Weather stations are normally installed at very remote locations where getting a conventional external electrical supply is not possible and so weather stations are normally equipped with a solar panel, battery and a charge controlling unit. The solar panel generates electricity to charge the battery and the battery provides continuous power to all the electrical needs of the weather station. The battery stores sufficient energy to power all the electrical needs for up to a few couple of weeks without any solar radiation.

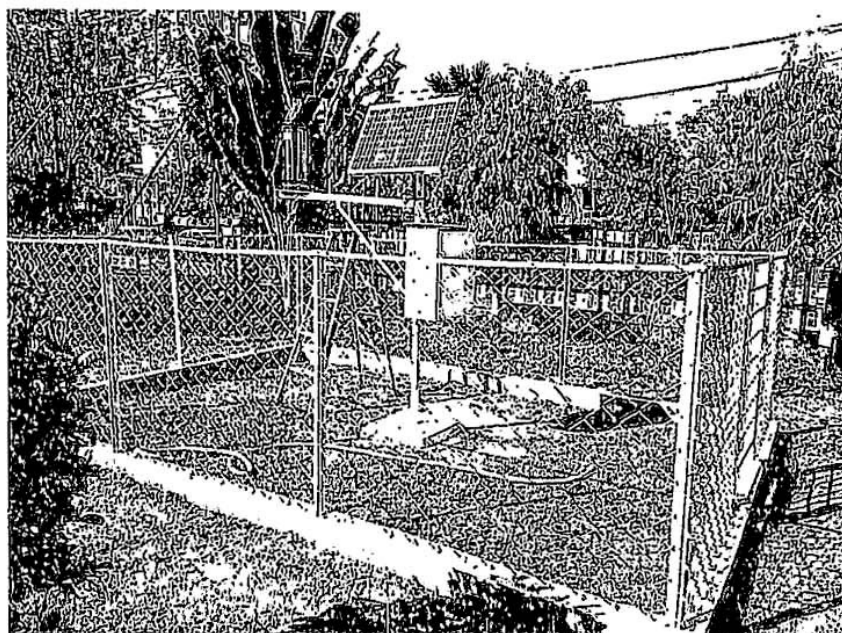
Area required for AWS, ARG and AWLR

The sensors are normally mounted on a metallic mast/tower at a certain height from the ground. The data logger, battery, charges controller and transmission unit are normally kept inside a metallic box mounted on the mast/tower to protect it from weather events. A solar panel is also mounted on the tower. The surface area required for installation of AWS, ARG and AWLR are different and is discussed in the section below:

- a) **AWS (Automatic Weather Stations)** are equipped with various sensors designed to measure diverse weather parameters. These sensors are typically mounted on a metallic tower standing at a height of approximately 10 meters. The tower is anchored in an underground concrete base measuring around 1m³ and reinforced with three guy wires for stability. The structure houses sensors, a data logger, a transmission unit, a charging unit, a battery, and a solar panel. While the solar panel and sensors are exposed to external weather conditions, other sensitive instruments are securely stored within a protective enclosure. The entire tower is safeguarded by a 10 meters by 10 meters chain-link fencing to prevent interference from animals or unauthorized access. A representative visual representation of an AWS system is depicted below.



- b) The Automatic Rain Gauge (ARG) comprises a single tipping bucket rain gauge accompanied by a data logger, transmission unit, charging unit, battery, and a solar panel. The rain gauge and solar panel are positioned externally, while the remaining components are housed within a protective enclosure. To ensure security, the entire system is enclosed within a 5 meters by 5 meters chain-link fencing, shielding it from external elements and unauthorized access. An illustrative depiction of an ARG system is presented below.



- c) The AWLR (Automatic Water Level Recording System), unlike the aforementioned instruments, is installed beside bridges or on the banks of rivers, lakes, etc. Its primary function is to measure water levels, with the recorded data transmitted to a central data processing center. The AWLR sensor is mounted over the water body utilizing a cantilever-based setup, which is affixed to a road bridge or a permanent structure constructed at the water body's bank. The AWLR system comprises a water level sensor, a data logger, a transmission unit, a charging unit, a battery, and a solar panel. While the solar panel and sensor are positioned outdoors, other components are securely housed within a protective enclosure. Both the protective enclosure and the solar panel are strategically placed at a suitable

distance from the sensor, enclosed within a chain-link fencing for added security. Visual representations of AWLR systems are depicted in the figures below.

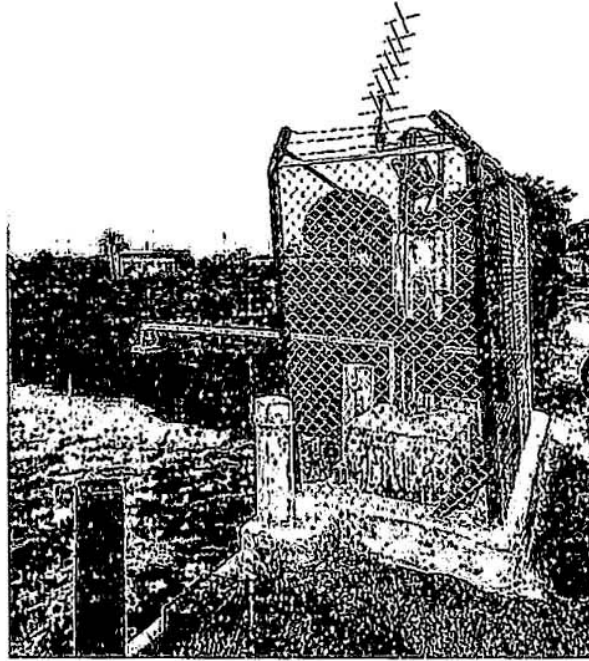


Figure 1: Complete AWLR setup installed on a bridge

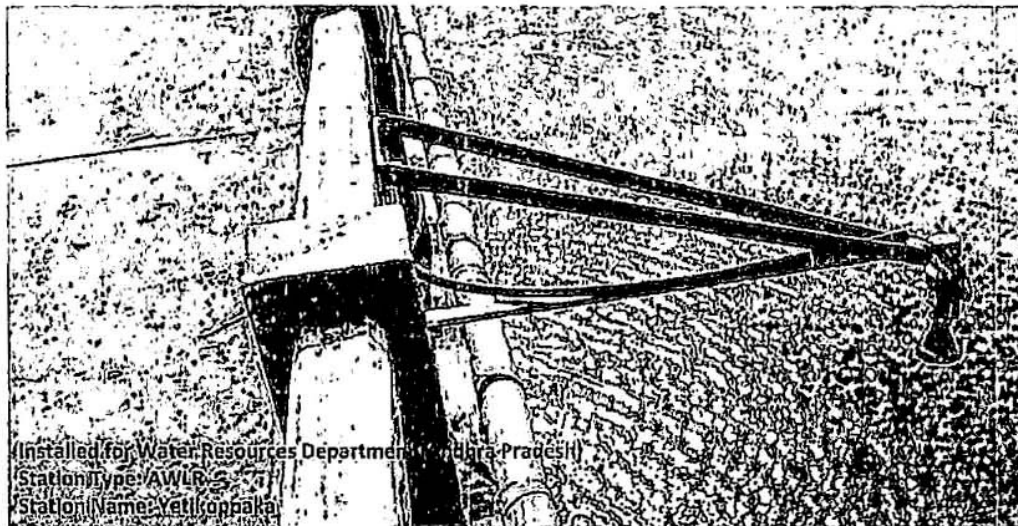


Figure 2: AWLR sensor mounted at the side of a bridge

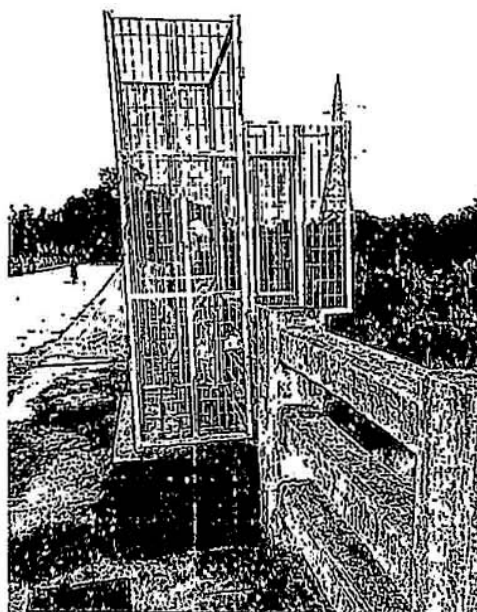


Figure 3: Fencing to keep data logger, transmission unit, charging unit, battery and solar panel

Site Selection Criteria Points considered while surveying the site for installation

- a) 10M X 10M area should be available for AWS site.
- b) 5M X 5M area should be available for ARG site.
- c) 2M X 2M area should be available for AWLR site.
- d) There should not be any high-tension wire near the sensor.
- e) There should not be any tall buildings, big trees with in 25Mts. especially in the E-W direction.
- f) There should not be any Mobile transmission tower within 25Mts. Radius of the sensor.
- g) Water level sensor to data logger Enclosure cabin distance should not be more than 100M.
- h) Water level sensor to riverbed height should be with sensor range (35Mts.).
- i) Site should not be in Flood prone area.
- j) Site should not be accident prone area.
- k) Mobile network connectivity should be good.
- l) Site is approachable with four-wheeler (for transporting material to the site)

Annexure-B

FORM OF APPLICATION FOR "NO OBJECTION CERTIFICATE (NOC)" FOR INSTALLATION OF RTDAS IN ASSAM

To,

[Issuing Authority's Designation, Department, Address (District head of land-owning department/agency)].

Sub: Request for issue of No Objection Certificate (NOC) for Installation of RTDAS Stations.

Sir/Madam,

In accordance to the Government Notification No..... dated....., I, [Name and Designation of the Applicant Authority] on behalf of[Name of the Applicant Authority's Department] would like to request you to kindly issue No Objection Certificate (NOC) for the installation of Real-Time Data Acquisition System (RTDAS) in the state of Assam. Details /information as per format furnished below:

1. Purpose for which installation is required :
2. Details of the RTDAS Station :

Sr.No.	District Name	Name of the Location	Type of RTDAS	Type of Data	Area Required	Coordinates (Lat & Long)	Remarks

I assure you that the installation process will be carried out without any disruption to the area. The operations and maintenance of the RTDAS station will be carried out by the department responsible for installation of RTDAS in accordance with the aforementioned government notification.

Signature of the Applicant Authority of the Rank of Executive Engineer/ District Head and above

Name in full with designation :

Name of the Department :

Address of the Office **ALONG WITH OFFICE SEAL**

Contact Number :

Dated :

Annexure C

SAMPLE FORMAT FOR PROVIDING "NO OBJECTION CERTIFICATE (NOC)" FOR INSTALLATION OF RTDAS IN ASSAM

To,

[Applicant Authority's Designation, Department, Address (District head of land-owning department/agency)].

Sub: Regarding issue of No Objection Certificate (NOC) for Installation of RTDAS Stations.

Ref: [Applicant Authority's letter No. and date]

Sir/Madam,

With reference to the letter above, it is to inform you that the..... [Name of the Issuing Authority's Department] has no objection towards installation of RTDAS Stations at proposed locations mentioned below under this Department as proposed by your end vide letter mentioned under reference subject to due supervision of[Issuing Authority's designation and department] and compliance of following conditions by..... [Applicant Authority's department].

1. Applicant Authority (Department & Division): :
2. Office Address of the Applicant Authority :
3. Details of the RTDAS Station :

Sr.No.	District Name	Name of the Location	Type of RTDAS	Area Required	Coordinates (Lat & Long)	Remarks

Conditions (If Any):

1.
2.

This is for favour of your kind information and necessary action.

Signature of the Issuing Authority of the Rank of Executive Engineer/ District Head and above

Name in full with designation :
 Name of the Department :
 Address of the Office :
 Dated :