



**STANDARD OPERATING PROCEDURE
FOR
HYDROMET OPERATIONS AND INFRASTRUCTURE DIVISION**

**National Center for Hydrology and Meteorology
Royal Government of Bhutan
2020**



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Acronyms

12 FYP	Twelfth Five Year Plan
AWS	Automatic Weather Station
EWS	Early Warning System
FMCR	Flood Monitoring and Command Room
FWS	Flood Warning Section
GLOF	Glacier Lake Outburst Flood
GoI	Government of India
HOID	Hydro-met Operation and Infrastructure Division
HQ	Headquarter
HWRSD	Hydrology and Water Resources Services Division
ICT	Information Communication Technology
NCHM	National Center for Hydrology and Meteorology
NWFWC	National Weather Flood and Warning Centre
RGoB	Royal Government of Bhutan
SOP	Standard Operating Procedures
WCSD	Weather and Climate Services Division
WFCR	Weather Forecasting and Command Room
WMO	World Meteorological Organization

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Standard Operating Procedure for HOID

1 Title

Standard Operating Procedure for HOID

2 Objective

A consolidated guide line to achieve the mandate and function of HOID

3 Effective

1st August 2020

4 Mandate of HOID

Hydro-met Operations and Infrastructure Division (HOID) is mandated with planning, establishment and operation of national hydrological and meteorological observation network, related instrumentation, observational technique, calibration and telemetry systems for monitoring and data collection.

5 Functions

The following are functions of HOID:

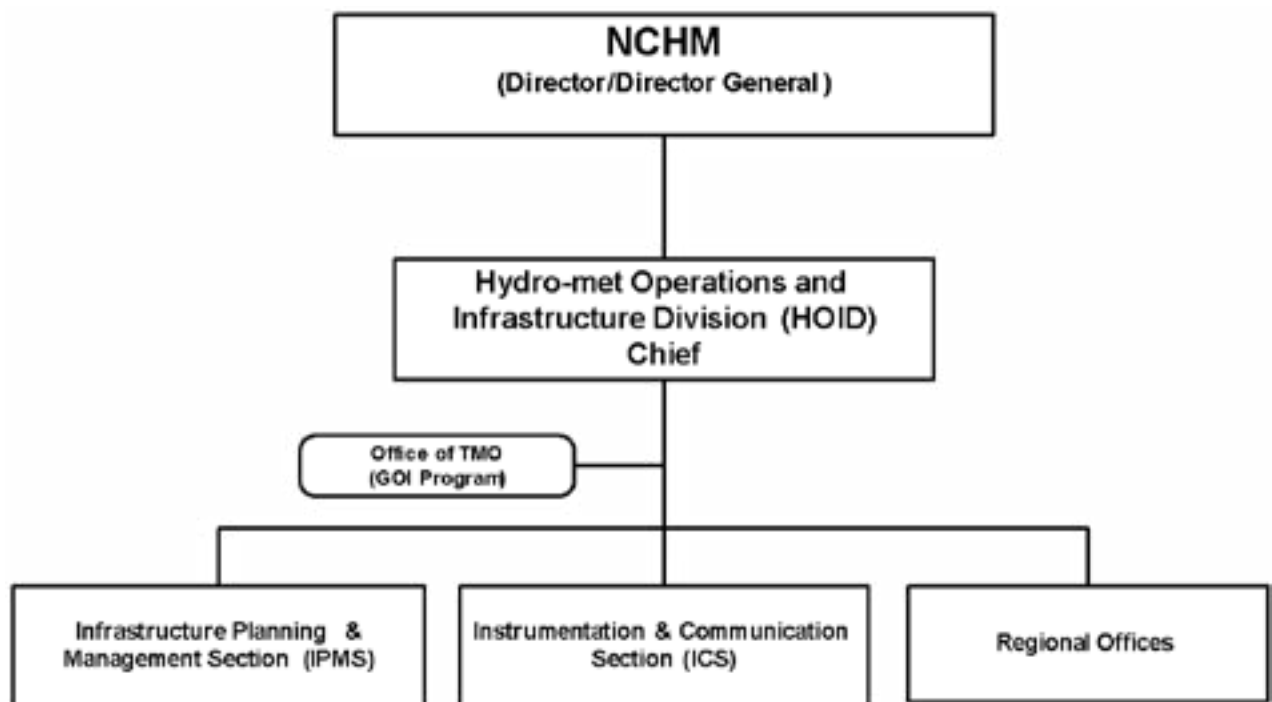
- a. Planning and installation of a national hydrological and meteorological observational network including upper air atmospheric and ground water studies stations.
- b. Planning and establishment of related hydromet infrastructure including telemetry systems, site office, regional offices, hydraulic structure, etc.;
- c. Administer and implement the hydro-meteorological observation network plans and programmes;
- d. Maintain and operate national hydro-meteorological observations, telemetry systems and related facilities;
- e. Establish and operate water quality and sediment sampling station networks including laboratories and related facilities;
- f. Operate and maintain communication and early warning facilities installed in different river basins;
- g. Modernize and upgrade hydro-meteorological network stations, telemetry systems, and hydrometric techniques in tandem with changing technologies;
- h. Collection and transmission of hydrological and meteorological data from remote monitoring stations to the Central Database system, HQ.
- i. Establish calibration facilities, development of proper technical specifications for hydro-met instrument and hydrometric technique;
- j. Training and capacity building of officials and technicians;
- k. Technical backstopping services to other specialized agencies in hydrometry and operational hydrology and meteorology services

6 HOID Structure

Hydro-met Operations and Infrastructure Division (HOID) has four Sections as follows:

- a. Infrastructure Planning and Management Section (IPMS)
- b. Instrumentation and Communication Section (ICS)

- c. Regional Offices in the East, Central and West
- d. Office of Technical Maintenance Officer (TMO)- GoI Program



6.1 Infrastructure Planning and Management Section (IPMS)

The following are the functions of IPMS:

- a. Review hydro-meteorological network and infrastructure development plans for implementation
- b. Provide Technical Sanction to implement the works;
- c. Monitoring and Evaluation of technical works implemented by the division/sections
- d. Prepare annual plans and budget in consultation with the division
- e. Prepare drawing, cost estimate of works related to establishment and construction of hydro-met stations and related infrastructures and installation
- f. Tendering of works related to establishment and construction of hydro-met stations and related infrastructures and installation;
- g. Construction and supervision of hydro-met stations and field offices and related infrastructure;
- h. Establish hydro-meteorological, snow & glacier monitoring stations,
- i. Inventory of hydro-meteorological network stations and infrastructures
- j. Maintenance of stations and infrastructures
- k. Technical assistant related to civil works and infrastructure planning and development and planning
- l. Technical backstopping services to other agencies in hydro-metery- establishment of hydro-meteorological stations and data collection;
- m. Carryout low flow spot measurements
- n. Identification of new hydro-meteorological sites
- o. River cross section survey of hydrological stations
- p. Topographical and bathymetric survey of water bodies (river)

- q. GIS mapping of hydro-met network stations and infrastructures
- r. Inspection and monitoring of hydro-meteorological stations

6.1.1 Operation Hydro-met Observation Network and Infrastructures

6.1.1.1 General Planning, Monitoring and Evaluation

Action	Time Frame	Operator	Outcome/result
1. Prepare budget proposals in coordination with the Division upon instruction from the management.	1-2 weeks	Budget focal	<ul style="list-style-type: none"> - Proposed budget for the Division through: - Activity description. - Period of performance. - Estimation of cost. - Justification and write up.
2. Report budget balance statement, prepare mid-term budget report and submit as per the template.	1-2 weeks	Budget focal in collaboration with accounts section.	<ul style="list-style-type: none"> - Submitted budget utilization report, mid-term report and re-appropriation depending on the need of the Division.
3. Prepare APT in coordination with Head and NCHM APT focal for HOID and keep track of division activities in line with APT.	1-2 weeks	APT focal	<ul style="list-style-type: none"> - APT submitted
4. Prepare and update (planned) five-year plan activities pertaining to the Division.	2-3 weeks	FYP focal	<ul style="list-style-type: none"> - Update Division timely to keep Divisional activities on track with FYP.
5. Monitoring and Evaluation of Activities/Project/Program	Biannual/Annually (Midterm and end of FY)	Division Chief	<ul style="list-style-type: none"> - IWP rating/ APT Score

6.1.1.2 Planning & Design of hydro-meteorological network Infrastructure¹

Action	Time Frame	Operator	Output/ Result
1. Plan & design of hydro-met networks as per targeted activities, budget and schedule	2 weeks	HOID/HWRSD/W CSD/CSD Engineer/Surveyor/ Field Team	- Desk studies carried out. - collect field data & information
2. Identify the networks requirements based on the discussion with services divisions.	1 month	HOID/HWRSD/W CSD/CSD Engineer/Surveyor/ Field Team	- Field visits; - Budget mobilized. - Collect field data & information - Produce reports
3. Review the network concentration.	2 weeks	HOID/HWRSD/W CSD/CSD Engineer/Surveyor/ Field Team	- Detailed assessment of existing network - Generate report with recommendation.
4. Carry out field survey for site selections	1 month	Engineer/Surveyor/ Field Team	- Field visit & site survey carried out; - Collect geo-coordinates - Land follow up
5. Cost estimates for installation & maintaining the networks	1 week	Engineer/Surveyor/ Field Team	- Prepare tentative cost analysis for setting up station/related infrastructures
6. Prepare implementation plans	3 days	Engineer/Surveyor/ Field Team	- Prepare work plan

6.1.1.3 Planning of Tendering of Works

Action	Time Frame	Operator	Output/ Result
1. Site visit according to planned work	5-10 days	Field Team	- Survey carried out - Prepare report
2. Consulting with relevant officials of services divisions	2 days	Field Team/HoD	- Incorporate recommendations.

¹ Planning and designing of hydro-met observational network shall be done in close consultation with services divisions (WCSD/HWRSD/CSD) based on the need of the sectors and other requirement.

3. Design and prepare Drawing	2 weeks	Engineer	<ul style="list-style-type: none"> - Analysis of structure using relevant software's; - Drawings of structure using relevant software's
4. Prepare estimates from drawings	1 week	Engineer	<ul style="list-style-type: none"> - Prepare estimates using BSR/LMC
5. Technical Sanction	3 days	Engineers	<ul style="list-style-type: none"> - Review the proposal received from the end user. - Incorporate recommendations - Accord or redirect the technical sanctions

6.1.1.4 Technical Sanction and Administrative Approval

Action	Time Frame	Operator	Output/ Result
1. Receive estimate and proposal from Divisions for Technical Sanction	3 days	Engineers	<ul style="list-style-type: none"> - Review the proposal, - Incorporate recommendations - Accord or redirect the technical sanctions

6.1.1.5 Tendering of Works and Goods

Action	Time Frame	Operator	Outputs/Results
1. Submitting estimates and drawings for approval	1 week	Engineers/Relevant Heads	<ul style="list-style-type: none"> - Submit to Technical Planning Unit
2. Prepare bidding Documents and advertise in media	3 days	Engineer	<ul style="list-style-type: none"> - Prepare Bid Documents using SBD and relevant rules - Advertise in the media
3. Bid Opening and Evaluation of tenders	1 week	Engineer/BOC/BEC	<ul style="list-style-type: none"> - Opening of submitted bid documents - Evaluate bidders using SBD and PRR
4. Award of work to the contractor, signing of contract, issuing work order	One month	Engineer/HoD/Contractor	<ul style="list-style-type: none"> - Present the Evaluation report - Award the work to contractor - Sign the contract and issue work order

6.1.1.6 Construction of Hydro-met Stations (Civil) and Infrastructure:

Action	Time Frame	Operator	Outputs/Results
1. Possession of sites to initiate construction	14 days	Field Team/Contractor	- Hand over site to contractor
2. Monitor and supervise on-going construction	2 days	Site staffs/Engineer	- Monitor construction from Head Office - Ask nearest Site office Technician to monitor
3. Review the activity implementation as per work plan & tender specifications	5-10 days	Engineers	- Review the progress report, - Inspection visits & monitor at sites; - Corrective measures provided
4. Take joint-measurement and takeover of sites	2 weeks	Engineer/Contractor	- Measurement of construction with contractor; - Takeover of the sites by Agency
5. Verification and passing of bills	1 week	Engineer/AFS	- Verification of submitted bills; - Clear the bills and make payment

6.2 Maintenance of Observational Network Infrastructure

6.2.1 Maintenance of Observational Network

Action	Time Frame	Operator	Outputs/Results
1. Planning maintenance work after consultation with site staffs	7 days	Engineer/Site Staffs/HoD	- Correspond with site officials for maintenance work - Budget mobilized
2. Arranging logistics to carry out maintenance	2 days	Engineer	- Arranging equipment - Procurement of equipment
3. Field visit to carry out maintenance	2 weeks	Field Team	- Field visit

6.2.2 Maintenance of Infrastructure (Major)

Activities of Section	Time Frame	Operator	Outputs/Results
1. Planning maintenance work after consultation with site staffs	7 days	Field Team/Site staffs	- Plan maintenance and logistics arranged

2. Field visit	2 days	Field Team	- Field visit to prepare drawings and estimates
3. Prepare estimates	2 weeks	Engineer	- Prepare estimates using BSR/LMC
4. Submit for Technical Approval	1 week	Engineer	- Submit to Technical Planning Unit
5. Prepare tender documents and advertise tender	7 days	Engineer	- Prepare Bid Documents using SBD and relevant rules - Advertise in the media
6. Open Tender and Evaluate	2 days	Engineer/BOC/BE	- Opening of submitted bid documents - Evaluate bidders using SBD and PRR - Present the Evaluation report
7. Award Tender and initiate maintenance	2 weeks	Engineer	- Award the work to contractor - Sign the contract and issue a work order. - Hand over site to contractor
8. Supervise and monitor the work	1 week	Site Staff/Engineer	- Monitor construction from Head Office - Ask nearest Site office Technician to monitor
9. Take a joint measurement and takeover of site	7 days	Engineer/Contractor	- Measurement of construction with contractor - Takeover of the sites by Agency
10. Verification and passing of bills	2 days	Engineer/FAS	- Verification of submitted bills - Clear the bills and make payment

6.2.3 Annual Lean Flow Measurements

Action	Time Frame	Operato	Outputs/Results
1.Planning of spot measurement work	7 days	Field Team	- Budget mobilized - Logistics arranged - Approval sought

2.Field visit to carry out measurement	2 days per site	Field Team	- Measurement of river discharge using Current meter/wading/electromagnetic methods
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6.2.4 Annual Maintenance of Hydrological Network

Action	Time Frame	Operator	Outputs/Results
1.Planning of the Cross-Sectional survey	1 day	Field Team	- Budget mobilized - Logistics arranged - Approval sought
2.Field visit	2 days per site	Field Team	- Review the proposal received; - Carry out survey using ADCP/Cableway measurements - River survey and Cross Section with total Station/Wading/Dumpy level - Repair and maintenance of equipment - Install new staff gauges
3.Prepare reports and submit to relevant officials	2 weeks	Field Team/Engineer	- Prepare reports - Submit to heads - Archive for reference

6.3 Instrumentation and Communication Section (ICS)

Functions of ICS are:

- a. Installation of hydro-meteorological instruments and communication systems
- b. Operation and maintenance of Hydro-met instrument/equipment and telecommunication system networks, telemetry gauging instruments/equipment and other electronic and electro-mechanical facilities, for real-time hydrological and meteorological data acquisition.
- c. Improve the method and procedures in the operation and maintenance telecommunication system;
- d. Ensuring timely transmission of data;
- e. Formulation of technical specification of hydrometeorological and communication equipment/instrument;
- f. Maintenance and upkeep of Communication Network and telemetry system related to observation systems;
- g. Maintenance of real-time hydrological and flood Early Warning System,
- h. Repairs of hydrological and meteorological instruments.
- i. Testing of instruments/equipment before installation
- j. Calibration of field instrument as per the required standard

k. Instrument evaluations and comparisons.

6.3.1 Technical Specification of Hydro-meteorological Instrument and Communication equipment

Action	Time Frame	Operators	Output/ Result
1. Compare different technology available	2 weeks	Engineer	- Desk studies carried out. - comparison of various equipment - communicate with manufacturer
2. Design/select most appropriate communication network (GPRS, Wireless, Satellite etc)	1 day per station + actual travel time	Engineer	- Site visit - Network coverage information - Communication type selection
3. Seeking rates/Price	1 month	Engineer	- Seek budgetary quotation - prepare comparative price statement
4. Review technology and price	2 weeks	Engineer	- Generate report with recommendation.

6.3.2 Procurement of Goods (Equipment)

Action	Time Frame	Operator	Output/ Result
1. Consulting with relevant officials of services divisions	2 days	Field Team/HoD	- Incorporate recommendations.
2. Prepare estimates	1 week	Engineer	- Budget estimate and drawings
3. Technical Sanction (Submit estimate and drawings)	3 days	Engineers	- Review the proposal received from the end user. - Incorporate recommendations - Accord or redirect the technical sanctions
5. Prepare bidding Documents and advertise in media	3 days	Engineer	- Prepare Bid Documents using SBD and relevant rules - Advertise in the media

6. Bid Opening and Evaluation of tenders	1 week	Engineer/BOC/BE C	<ul style="list-style-type: none"> - Opening of submitted bid documents - Evaluate bidders using SBD and PRR
7. Award of work to the contractor, signing of contract, issuing supply order	One month	Engineer/HoD/Contractor	<ul style="list-style-type: none"> - Present the Evaluation report - Sign the contract and issue supply order for good

6.3.3 Installation of hydro-meteorological network Station²

Action	Time Frame	Operator	Outputs/Results
1. Mobilize the team	7 days	Field Team	<ul style="list-style-type: none"> - Budget mobilized; - Logistics arranged - Approval sought
2. Field visit	2 days installation + actual travel time	Field Team	<ul style="list-style-type: none"> - Installation of Hydro-Met instruments as per Regional and WMO standards

6.3.4 Maintenance Hydro-met Observation network

Action	Time Frame	Operators	Output/ Result
1. Routine maintenance	Daily/ Monthly/ Quarterly	Technician	<ul style="list-style-type: none"> - Check for functionality of the system. - Carry out minor maintenance. - Clearing of vegetation.
2. Break down maintenance	Two weeks	Maintenance team/ Technician	<ul style="list-style-type: none"> - Breakdown and inspection report submitted to HOID. - Follow up on maintenance of the station - Replacement of damaged equipment with available spares. - Repair of equipment.

² includes snow & glacier monitoring stations, sediment network, water quality network, upper air atmosphere network, etc.,

6.3.5 Maintenance of Automatic Hydro-met Network and Communication System

Action	Time Frame	Operators	Outputs/Results
1. Planning break down/ annual maintenance work for AWLS, AWS, ASS, GLOF-EWS,	7 days	Engineer/Site Staffs/HoD	- Correspond with site officials for maintenance work - Budget mobilized
2. Arranging logistics to carry out maintenance.	2 days	Engineer	- Arranging equipment - Procurement of equipment
3. Field visit to carry out maintenance	2 days per site + travelling time	Field Team	- Field visit

6.4 Regional Offices in the East, Central and West.

The main functions of the regional offices are:

- a. Administer hydrological, meteorological, sediment sampling/Lab analysis and GLOF-EWS monitoring stations and personnel in the region;
- b. Carry out sediment sampling and laboratory analysis data archival and transmitting to head office
- c. Carry out timely repair and maintenance of stations under the region;
- d. Ensure timely transmission of data to HQ in a desired format at predetermined time;
- e. Transmit real time data from flood monitoring stations to National Weather and Flood Warning Center (NFWFC) for weather and flood forecasting and warning.
- f. Provide hydro-meteorological services and products to other agencies of the region in consultation HQ.
- g. Represent Center in local level organization meetings, workshops etc.
- h. Operation and maintenance of GLOF EWS control room and field office
- i. Prepare plan/program/activities related to water quality and sediment sampling and laboratory services
- j. Cross check field data, compilation and filing;
- k. Perform basic maintenance of the equipment and report any problems.
- l. Prepare plan/program/activities related to surface water quality monitoring and to establish monitoring stations along with hydro-meteorological stations.

6.4.1 Observation of Meteorological Network Stations:

Action	Time Frame	Operators	Output/ Result
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1. Weather data collection from Class A Manual Station	Hourly/Daily	Technician	Collect data from the observation site as per schedule/predetermine time and format (Log Book)
			a. Monsoon Weather data (June-September) - Class A: Hourly
			b. Weather data (October- May): - Class A: 0900 and 1500 - Class C: 0900 Report emergency conditions to Chief, HOID.
2. Weather data collection from Class C Manual Station	Hourly/Daily	Technician	c. Monsoon Weather data (June-September) - Class C: 0900 - Hourly data based on need
			d. Weather data (October- May): - Class C: 0900 - Hourly data based on need

6.4.2 Observation of Hydrological Network Stations

Action	Time Frame	Operators	Output/ Result
A. <u>Water Level</u>			
1. Water level Observation and data collection from Principal Hydrological manual Observation Site	Hourly/Daily	Technician	Collect data from the observation site as per schedule/Predetermined time in the prescribed format at: - 0900 and 1500 hours and - hourly during the monsoon <i>Lean Water level:</i> Principal: 0900 and 1500 Secondary:0900 and 1500 FWS:0900, 1300, 1500
2. Water level Observation and data collection from Secondary Hydrological manual Observation Site	Hourly/Daily	Technician	
3. Water level Observation and data	Hourly/Daily	Technician	

collection from Flood Warning Station (GoI)			
B. <u>River Discharge/Flow Measurement</u>			
1. River discharge/Flow measurement for Principal Hydrological Sites	Weekly	Technician	Collect river flow data from the observation site as per schedule/Predetermined time in the prescribed format at once in a week using the Bank Operated Cableway system.
2. River discharge/Flow measurement for Secondary Hydrological Sites	Daily	Technician	Collect river flow data from the observation site as per schedule/Predetermined time in the prescribed format daily using the traditional float method.
3. River discharge/Flow measurement for Flood Warning Site(GoI)	Daily	Technician	Collect river flow data from the observation site as per schedule/Predetermined time in the prescribed format daily using the traditional float method.
C. <u>Sediment Sampling</u>			
1. Sediment data collection from Hydrological Observation site	Daily	Technician	Sediment Sampling collected per schedule/Predetermined time in the prescribed format using the cableway system.
2. Sediment data collection from Flood Warning Site (GoI)	Daily	Technician	Sediment Sampling collected per schedule/Predetermined time in the prescribed format using the cableway system.
D. SNOW DATA			
1. Snow Data collection from Manual Station	Daily	Technician	Snow data and related information to be collected as per the scheduled/predetermined time in the prescribed format

6.4.3 Data Transmission

Action	Time Frame	Operators	Output/ Result
A. CLIMATE DATA			
1. Transmission of weather data from the sites (Class A) to Weather Forecasting and Command Room (WFCR), NWFWC	Daily/ Based on need	Technician	<p>Transmit computed data of Precipitation, Temperature, RH, wind speed and Evaporation by 1500 hours daily.</p> <p><i>[Instantaneous and hourly data will be transmitted directly to NWFWC based on need with copy with Chief, HOID]</i></p>
2. Transmission monthly Climate data from Class A and Class C sites to HOID, HQ	Monthly by post	Technician	<p>Transmit computed monthly climate data of the sites to the HOID through post.</p> <p>Report emergency conditions to Chief, HOID.</p>
B. WATER LEVEL DATA			
1. Transmission of River Water level data from sites	Hourly/Daily	Technician	<p>Hydrological River level Data to Flood Monitoring and Command Room (FMCR), NWFWC</p> <p><i>Monsoon Period (May-October):</i></p> <ul style="list-style-type: none"> - Principal: Hourly data to NWFWC - Secondary: - Hourly data to NWFWC - FWS: As per the schedule <p><i>[Instantaneous and hourly water level data shall be transmitted directly to NWFWC based on need with copy with Chief, HOID]</i></p> <p><i>Non-Monsoon Period (Nov-April):</i></p> <ul style="list-style-type: none"> - Principal: 0900 and 1500 - Secondary: 0900 and 1500 - FWS: 0900, 1300 and 1500 <p>Report emergency conditions to Chief, HOID.</p>

C. RIVER DISCHARGE/FLOW DATA			
1. River discharge data transmission from Principal and Secondary Hydrological Station	Monthly	Technician	<p>Computed discharge data in prescribed format is transmitted to HOID, HQ monthly by post:</p> <p><i>[Instantaneous and hourly discharge, velocity data shall be transmitted directly to NFWFC based on need with copy with Chief, HOID]</i></p> <p>FWS: 0900</p> <p>Monthly report submitted to HOID through post.</p> <p>Report emergency conditions to Chief, HOID.</p>
2. River discharge data transmission from Flood Warning Site (GoI)	daily	Technician	<p>Computed discharge data in prescribed format is transmitted to FWC, HQ by HF wireless at 0900 daily:</p> <p><i>[Instantaneous and hourly discharge, velocity data shall be transmitted directly to NFWFC based on need with copy with Chief, HOID]</i></p> <p>Report emergency conditions to Chief, HOID.</p>
D. SEDIMENT SAMPLES ANALYSIS DATA			
1. Sediment transmission	Monthly	Technician	Monthly report of computed sediment samples analysis data transmitted to HOID through post
E. SNOW DATA			
1. Snow data transmission	Monthly	Technician/ HOID HQ	Monthly computed data Transmitted to CSD

6.4.4 Flood Warning Data Transmission

Action	Time Frame	Operators	Output/ Result
1. Flood Warning Data Transmission from Sites to designated sites to Indian States of Assam and West Bengal	Daily/As per the agreed scheduled	FWS Technicians	<ul style="list-style-type: none"> - Observed FWS data from the sites are transmitted as per the scheduled to designated CWC office in Indian States of Assam and West Bengal and TMO Office, HOID, NCHM, HQ, Thimphu - If transmission of data by HF wireless failed, then data is sent to TMO Office, HOID by other communication

6.4.5 Monitoring of Flood/GLOF Early Warning System

Action	Time Frame	Operators	Output/ Result
A. <u>GLOF EWS Control Room, Wangdi</u>			
1. Operation of GLOF-EWS Control Room Wangdi	24/7	Engineer/ Technician	<ul style="list-style-type: none"> a. Monitor status of Flood/GLOF level monitoring stations along Punatshangchu basin. b. Monitor Status of Sirens along the Punatshangchu basin. c. Monitor Status of communication for GLOF EWS d. Communicate and liaise with Thanza Flood Warning Office (Lunana) and NFWFC, Thimphu. e. Communicate and disseminate flood information with PPHA-I and II. f. Liaise and communicate with relevant agencies during emergency as per the SOP manual.
2. Maintenance of GLOF EWS Stations	Monthly/Based on need	Engineer/ Technician	<ul style="list-style-type: none"> a. Repair and maintenance of GLOF EWS Stations in lower valley based on need
B. <u>GLOF EWS Control Room, Trongsa</u>			

1. Operation of GLOF-EWS Control Room, Mangdechhu, MHPA Dam Colony, Trongsa	24/7	Engineer/ Technician	<ul style="list-style-type: none"> a. Monitor status of Flood/GLOF level monitoring stations along Mangdechhu basin. b. Monitor Status of Sirens along the Mangdechhu basin. c. Monitor Status of communication for GLOF EWS; d. Communicate and liaise with Mangdephug and Bjizam Hydrological Station, Kurjey Control room and NFWFC, Thimphu. e. Communicate and disseminate flood information with MHPA Dam f. Liaise and communicate with relevant agencies during emergency as per the SOP manual.
2. Maintenance of GLOF EWS Stations	Monthly/Based on need	Engineer/ Technician	<ul style="list-style-type: none"> b. Repair and maintenance of GLOF EWS Stations based on need.
<u>C. GLOF EWS Control Room, Bumthang</u>			
1. Operation of GLOF-EWS Control Room, Kurjey, Bumthang	24/7	Engineer/ Technician	<ul style="list-style-type: none"> a. Monitor status of Flood/GLOF level monitoring stations along Chamkarchhu basin. b. Monitor Status of Sirens along the Chamkharchhu basin. c. Monitor Status of communication for GLOF EWS; d. Communicate and liaise with Mangdechhu Control room, and NFWFC, Thimphu e. Liaise and communicate with relevant agencies during emergency as per the SOP manual.
2. Maintenance of GLOF EWS Stations	Monthly/Based on need	Engineer/ Technician	<ul style="list-style-type: none"> c. Repair and maintenance of GLOF EWS Stations based on need.

6.5 Office of Technical Maintenance Officer (TMO) (GoI Program)

The following are the function of TMO Office:

- a. Overall Administration and Management of the office of TMO (GoI Program)- funded by GoI;
- b. Accurate collection of Hydro-meteorological data at Flood Warning Stations and its timely transmission to the respective Central Water Commission (CWC) offices in India and HQ. in Thimphu;
- c. Up-gradation and modernization of Flood Warning Stations for data collection, storage and transmission in consultation with CWC GoI & National Centre for Hydrology and Meteorology (NCHM), Royal Government of Bhutan (RGoB);
- d. Regular maintenance of observation sites and existing infrastructures at Flood Warning Stations;
- e. Construction of Flood Warning Station and Renovation of existing stations will be carried out with the help of division, as per approval of JET;
- f. Management of GoI budget as per the RGoB's Financial Rules and Regulations;
- g. Coordinate Joint Expert Team (JET) meetings between GoI and RGoB to oversee and review the comprehensive scheme for establishment of Hydro-meteorological and Flood Forecasting Network on rivers common to India and Bhutan.

6.6 Administrative and Management functions:

<i>Action</i>	<i>Time Frame</i>	<i>Operators</i>	<i>Output/ Result</i>
Administrative and Management related works.	Yearly	TMO/ Engineer/ Technician	<ul style="list-style-type: none"> - Organize Joint Expert Team (JET) meeting between GoI and RGoB to monitor, review activities, approve new projects and recommend release of funds; - Preparation and submission of yearly budget proposal to CWC based the JET approval; - Preparation and submission of yearly budget proposal to NCHM for approval from Ministry of Finance, RGoB; - Timely release of funds from GoI to RGoB to carryout proposed planned activities; - Management of funds and submission of utilization certificate, as per approved budget; - Timely implementation of projects approved by JET

6.7 Technical Backstopping Services (Hydrometry)

Actions of CMS	Time Frame	Operator	Output/Result
a. Installation of Hydro-met Station - Field work/design - Installation - Training in data observation	The report will be delivered within a month of field work completion.	Assigned team	- Station operational - Trained Observer <i>Note*: Result to be based on client's specific request.</i>
b. Hydrologic Survey and discharge measurements	The report will be delivered within a month of field work completion.	Assigned team	Report including: - Field survey report - Discharge - DEM and Flood hazard maps. <i>Note*: Result to be based on client's specific request</i>

6.8 Common Services under the Division

6.8.1 Inventory of Stock/Equipment³

Action	Time Frame	Operator	Output/Result
a. Maintain stock ledger for consumable & fixed assets for delivered stocks and issue good receipt notes for further payments(s).	Routine work	Store in-charge	Stock ledger and good receipt note maintained up to date.
b. Maintain inventory for HOID equipment, gear, survey tools and machineries.	Routine work	Store in-charge	Maintained inventories up to date.
c. Issue requested equipment with proper handing-taking upon approval for hiring of equipment.	As and when required	Store in-charge	Equipment issued with proper hand-taking.
d. Surrender unserviceable equipment to DNP, MoF	As and when required	Store in-charge	Update Inventory
e. Regular checkup of field	Regularly	Assigned	Kept batteries healthy.

³ Inventory of stock/equipment shall be carried out in close coordination with Procurment/Store

equipment		officer	
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