Technical Assistance
HYDROLOGY PROJECT

DHV CONSULTANTS & DELFT HYDRAULICS with HALCROW, TAHAL, CES, ORG & JPS

VOLUME 4
HYDROMETRY

FIELD MANUAL - PART VII

FIELD INSPECTION AND AUDITS

Table of Contents

GENERAL

The Field Manual on Hydrometry, comprises the procedures to be carried out to ensure proper execution of design of the hydrometric network, and operation and maintenance of water level and streamflow gauging stations. The operational procedures are tuned to the task descriptions prepared for each Hydrological Information System (HIS) function. The task description for each HIS-function is presented in Volume 1 of the Field Manual.

It is essential, that the procedures, described in the Manual, are closely followed to create uniformity in the field operations, which is the first step to arrive at comparable hydrological data of high quality. Further, reference is made to the other volumes of the manual where hydro-meteorology, sediment transport measurements and water quality sampling and analysis is described. It is stressed that hydrometry cannot be seen in isolation; in the HIS integration of networks and of activities is a must.

This Volume of the Field Manual consists of 8 parts:

- Part I deals with the steps to be taken for network design and optimisation. Furthermore, site selection procedures are included, tuned to the suitability of a site for specific measurement procedures.

- Part II comprises operation of water level gauging stations equipped with staff gauges, autographic chart recorders or digital water level recorders.

- Part III comprises the preparatory activities and execution of float measurements, including selection of float type, reach preparation, observation practice and discharge computation

- Part IV comprises the preparatory activities and execution of current meter measurements by wading, and from cableways, bridges and boats. The procedure for discharge computation is included.

- Part V deals with the field application of the Acoustic Doppler Current Profiler (ADCP). It covers operating modes and site conditions, deployment, operating set-up and measurement runs as well as the data handling and recording.

- Part VI presents the required activities for the execution of the Slope-Area Method and the procedure to be applied to arrive at a discharge.

- Part VII comprises Field Inspections and Audits, with required check lists and standard forms.

- Part VIII, finally, deals with routine maintenance of gauging stations and calibration of equipment.

The procedures as listed out in this manual are in concurrence with the ISO standards as far as available for the various techniques and applicable to the conditions in peninsular India.

1 INTRODUCTION

In order to ensure the continuing good quality of data it is essential that regular inspections and audits of gauging stations are undertaken by suitably senior and experienced personnel. It is necessary that the findings of these inspections are recorded and retained in order to assist with any future data validation and quality control queries.

All stations are permanently manned, or at least during the critical monsoon months. Stable stage-discharge relationships might only be visited by field staff periodically, to change charts or download loggers and/or undertake current meter gauging. However, irrespective of whether a station is manned or unmanned it is of fundamental importance that station logs are maintained for all stations. These not only record data but also any important actions or other observations, which are made at a station on each day someone is on site.

No matter how well a gauging station might appear to be run and irrespective of the quality of the staff it is essential that stations, particularly primary network stations are inspected on a regular basis. These inspections shall be undertaken by S5, S6 and S9 staff category. These inspections fulfil a variety of functions, including, but not limited to:

- Check on the performance and the discipline of the field staff;
- Staff motivation and encouragement - one of the keys to good quality data is to ensure that the staff recognise the importance of what they are doing;
- Identify existing or potential instrumentation and/or equipment problems;
- Identify any observation procedure errors;
- Identify structural problems e.g. collapse of gauge posts, wear of cableways;
- Undertake independent level, flow, rainfall and other measurement checks.

The checks to be undertaken will depend on the type of station, the field staff involved and the physical characteristics of the site. However, the following general guidelines have been prepared to assist with the formulation of audit and inspection procedures.

2 FREQUENCY OF INSPECTIONS

State border and other key stations:

S9, S6 and S5 staff category:	Once every three months.
S5 staff category:	Once every month.

Other primary network and special investigation stations:

S9, S6 and S5:	Once every twelve months.
S5:	Once every two months, preferably more frequently during the critical monsoon months.

3 STATION LOG SHEETS OR LOGBOOK

Every station should have station log sheets or a logbook. Even for permanently manned sites where it might be necessary to fill in several other forms on a daily basis e.g. stage record form, current meter gauging sheet, rainfall amount etc. it is good practice to maintain a daily log sheet/book.

The function of the station log sheet or book is to maintain an on-site record of key data, checks and any maintenance undertaken during any day when the station is manned or visited. This should

include routine inspections by S5 staff category and other supervising officers. The maintenance of the log sheet is particularly important for unmanned sites since a record of actions undertaken during previous visits can be maintained on site. Also, it is an extremely important link in the data quality audit chain (trail).

The design of the log sheet or book will depend on the type of station and the parameters monitored. A typical page from a Station Field Record Book for a stage station has already been referred to in Part II of the Field Manual. This form is intended for completion by an inspecting officer as a check on the performance of the stage observer. A typical station log sheet or page from a log book for a stage-discharge station might be of the form indicated in Figure 1.

Part 1 of the form contains spaces to enter the name of the operating authority, the basin, river, station name and station number.

Part 2 of the form is for entering the gauge zeros relative to GTS (or in exceptional circumstances site arbitrary datum) of the gauge posts installed at the site. At many stations only a set of primary gauges will be installed. However, at other sites one or two secondary gauges might be installed for slope area method estimations. Alternatively two or even three pairs of gauges might be installed i.e. two or three opposite each other on each bank.

Part 3 of the form contains space to enter details about the instruments and equipment, other than gauge posts, installed at the site as follows:

- **Column 1**: This contains types of equipment AWLR/DWLR, Cableway/bridge outfit, Standard raingauge (SRG), tipping bucket (TBR) or autographic raingauge (ARG), full climate station (FCS) and other to be specified.
- **Column 2**: Yes or No is entered in this column. e.g. Yes if an AWLR or DWLR is installed, No if it is gauge posts only.
- **Column 3**: Type of instrument e.g. chart recorder drum type
- **Column 4**: Make of instrument or equipment i.e. manufacturer's name
- **Column 5**: Serial number of instrument or equipment
- **Column 6**: Date installed or taken to site.

Parts 1 - 3 of the form contain standard information, which unless there are changes in datum or equipment will remain at the top of every page. Part 4 contains the variable information, which is logged on the days when the site is manned or inspected.

For manned sites it is recommended that the form is completed at a fixed time every day e.g. first thing in the morning after the first gauge reading or after the first flow measurement.

For unmanned sites the form should be completed as the information is collected or observed throughout the duration of the visit.

The recommended columns in the log sheet are described as follows:

Column No.	Purpose
1.	Date of entry into log book
2.	Time - take time of primary gauge reading, according to reliable independent watch or clock
3.	Primary (main) stage gauge reading
4.	AWLR or DWLR reading, if one of these is installed
5.	Stilling well level if one is installed i.e. the water level inside the stilling well relative to datum of primary gauge zero, this could be obtained using an internal staff gauge or diptone
6.	Water level difference between primary gauge and DWLR or AWLR, if greater than 5 - 10 mm difference has to be explained
7.	Water level difference between primary gauge and inside stilling well, if greater than 5 - 10 mm difference has to be explained, stilling well might need de-silting
8.	Time according to AWLR or DWLR
9.	Difference between watch time and AWLR/DWLR time. Significant differences have to be explained.
10.	Secondary gauge 1 reading
11.	Secondary gauge 2 reading
12.	Secondary gauge 3 reading
13.	Measured flow if current meter or float gauging undertaken
14.	Time of start of flow measurement
15.	Time of finish of flow measurement
16.	Conditions - river and weather e.g. river in flood, intense rainfall
17.	Actions taken - e.g. changed chart, downloaded logger, re-set AWLR to agree with staff gauge, cleaned gauge posts
18.	Remarks - this column can be used to make general observations about problems encountered if necessary a supplementary sheet clearly referenced and dated can be filled in which should be attached to the relevant page of the log book. Remarks might include information on absence of observers, gauge post damage, stilling well blockage clearance
19.	Signature of officer responsible or most senior officer on site on day of entry

4 FIELD INSPECTIONS AND AUDITS - CHECK LIST / STANDARD FORM

The nature of site inspections and audits will be dependent on the type of station, its importance and the policies of the authority concerned. Appendix.1 contains an example of a Field Inspection and Audit form. This has been prepared to provide a checklist of the items to be inspected and the actions to be taken during a gauging station audit. It is recommended that all organisations responsible for streamflow measurement and data collection design and adopt such a form.

The top of the form contains spaces for entry of details of the site and watercourse. The remainder of the form is divided into nine main sections which are summarised as follows:

Section No.	Details required
1.	Details of inspection - date, inspecting officer etc.
2.	Site conditions - physical conditions encountered
3.	Staffing - mainly appropriate for manned sites to provide a record of those present
4.	Stage measurement: 4.1 - Measuring equipment: staff gauges, bench marks, key level checks, instruments installed; 4.2 - Instrument performance and quality checks; 4.3 - checks on observer; 4.4 - Quality checks on data record sheets; 4.5 - general observations
5.	Flow measurement: 5.1 Equipment: current meter, revs counter, assoc. equipment - wading, bridge, bank operated cableway, manned cableway, boat; 5.2 - Quality checks on data record sheets; Flow measurement structures; 5.4 - general observations.
6.	Other equipment - e.g. SRG, ARG, TBR, FCS, Sediment sampling equipment
7.	Buildings and instrument housing - weather tight, security, other
8.	Action items - actions required, target date for completion, action officer, completion date.
9.	Final observations - overall comments, urgent actions, signature of inspecting officer, data

The inspecting officer should complete all sections of the form.

Note that additional information not specifically covered by the form can be entered in the spaces left for general comments. Conversely, for some sites some of the sections will not be appropriate, in such circumstances it is recommended that not applicable or N/A is entered in the sections which are not relevant. Otherwise each section should be completed.

Follow Up-Actions

The Inspecting Officer should identify all remedial works or actions which are required in order to ensure that faults are rectified and good quality data is collected. However, there is a tendency in many hydrometric organisations to identify problems at gauging stations then forget about them. There is no point undertaking quality audits if no follow-up actions are taken. Therefore, the form allows for the identification of actions, target dates for completion and the officer allocated responsibility for these actions. It is imperative that the inspecting officer monitors and supervises the progress of all the necessary follow-up actions. If the follow up actions are not undertaken by the target date or in a reasonable time, consideration should be given to taking disciplinary action against the officer concerned.

5 FIELD CHECKING AND PRIMARY VALIDATION

5.1 INTRODUCTION

Whilst sophisticated statistical techniques of validation may be implemented on the computer, the process of checking and validation must commence at a much earlier stage - in the field itself - to establish the reliability and accuracy of the observations and the circumstances under which they were made. Answers to simple questions such as: “Can the gauge observer read the staff gauge accurately?”, “Does the gauge observer consistently attend for observations or does he fabricate readings”, can only be obtained by careful checking and observation in the field.

5.2 OBSERVERS ABILITY

The observer is the basic functionary for recording observations. However, observers often have limited education and it is not uncommon to find faults in the level record caused by limitations in the observer’s skills. Initial training is therefore essential and must be given and checks by visiting engineers should be made at frequent intervals or on suspicion of inaccurate readings.

A common problem to note is the misplacement of decimal point for readings in the range .01 to .10. For example a sequence in chronological order of level readings on the falling limb of a hydrograph:

4.12, 4.10, 4.9, 4.6, 4.3, 4.1, 3.99,

should clearly be interpreted as:

4.12, 4.10, 4.09, 4.06, 4.03, 4.01, 3.99.

5.3 OBSERVERS RELIABILITY

Experience with streamflow networks in many parts of the world suggests that where observers are left unsupervised for extended periods of time, they will fabricate readings without visiting the station to a greater or lesser extent. The frequency of fabrication can be expected to increase if checks are absent or infrequent or if faulty readings are never challenged.

Suspicions concerning the reliability of observations are usually aroused by the occurrence of observations, which are hydrologically inconsistent. In natural rivers, levels often rise quickly and irregularly to a peak in response to rainfall but fall more slowly and smoothly (exponentially) in response to declining channel and catchment storages. Inconsistency can more easily be identified during periods of recession. Typical indicators of fabrication are:

- Abrupt falls or a sudden change in slope of a recession curve.

- Long periods of uniform level followed by a distinct fall.
- Uniform mathematical sequences of observations, for example, where the level falls regularly by 0.05 or 0.10 between readings for extended periods. Natural hydrographs have slightly irregular differences between successive readings and the differences decline as the recession progresses.
- Where daytime observations only are taken, similarity between the last reading of one day and the first reading of the next, during a period of recession (resulting in a stepped hydrograph) may indicate that only a single daily reading has been taken and the remainder interpolated.

Fabrication is more difficult to identify on heavily regulated rivers where rapid rise and fall in level may result from operation of gates, valves and pumps.

As an additional means of checking on observer ability and reliability, it is recommended that the gauging team or engineer making periodic visits to the site should note the following information in a Station Field Record Book in a standard column format (Figure 2). Some of these visits can be without advance intimation to the observer.

1. Date/time of visit
2. Was the Observer present on arrival? Tick
3. Current Staff gauge level
4. Last staff gauge reading in the observer's book
5. Time of the last observer's reading

Persistent absence of the Observer at the arrival of the team, or discrepancies between current level and the last observation by the Observer, strongly suggests fabrication of readings, and the Engineer should take what corrective or disciplinary steps that are appropriate.

Preferably a separate Station Field Record Book be held for each station as a pocket-sized hard-back notebook which is carried by the engineer on every visit to the station. Persistent good or poor performance by the Observer will be readily identified by reference to this book.

Following field checking by the Hydrometric Supervisor, additional manual validation should be carried out in the Sub-divisional office prior to entry of data to the computer. This would for example identify missing data, confirm that the correct number of data per day or per month has been entered and that there is no discontinuity between batches. Anomalies should be referred back to the Hydrometric Supervisor.

5.4 CHECKING AWLR'S (CHART RECORDERS)

Chart recorders are long-established and popular instruments for the measurement of water level. They eliminate data uncertainty arising from the ability and reliability of the observer, but they too are subject to errors resulting from malfunction of the instrument or the stilling well in which it is located. Many of these errors can be identified by reference to the chart trace and this should be examined carefully in the field.

The primary measurement remains the staff gauge placed directly in the river against which the chart level is set and checked. On each visit to the station the Hydrometric Supervisor must check the current level on the chart with the reference staff gauge(s) and enter the readings in the Station Field Record Book. Where discrepancies are noted between staff gauge and chart, these must be investigated immediately on site and corrected if possible. The following are typical malfunctions noted on charts and possible sources of the problems.

1. Chart trace goes up when the river goes down
    - Float and counterweight reversed on float pulley

2. Stepped or flat trace rather than smooth hydrograph
   - Tangling of float and counterweight wires
   - Backlash or friction in the gearing
   - Blockage of the intake pipe by silt or float resting on silt
3. Flood hydrograph truncated
   - Well top of insufficient height for flood flows and float sticks on floorboards of gauging hut or recorder box.
   - Insufficient damping of waves causing float tape to jump or slip on pulley.
4. Hydrograph appears OK but the staff gauge and chart level disagree. There are many possible sources including operator setting problems, float system, recorder mechanism or the operation of the stilling well, in addition to those noted above. The following may be considered.

   Operator Problems
   - Chart originally set at the wrong level

   Float system problems
   - Submergence of the float and counterweight line (in floods)
   - Inadequate float diameter and badly matched float and counterweight
   - Kinks in float suspension cables
   - Build up of silt on the float pulley affecting the fit of the float tape perforations in the sprockets

   Recorder problems
   - Improper setting of the chart on the recorder drum
   - Distortion and/or movement of the chart paper (humidity)
   - Distortion or misalignment of the chart drum
   - Faulty operation of the pen or pen carriage

   Stilling well problems
   - Blockage of intake pipe by silt.
   - Lag of water level in the stilling well behind that in the river due to insufficient diameter of the intake pipe in relation to well diameter.
5. Chart time and clock time disagree
   - Chart clock in error and should be adjusted
   - Wrong paper time scale
   - Wrong gearing

Particular attention must be paid to the intake pipe and stilling well to ensure that they are not obstructed and to the float, to check that it is not stuck, damaged or have debris lodged in it.

Following the return of the chart to the office further checks are performed. The water level by staff gauge and chart recorder are again compared by annotating the chart with observer's readings. Comparisons are made routinely for one reading per day and more frequently in the peaks and troughs of flood events which tend to show up more readily the effects of stilling well lag or blockage. However, discrepancies may be from either source and, where the irregularities are not systematic the gauge observer's readings may be suspected and the observer reminded or reprimanded. Missing or faulty records from the recorder may be substituted by the observer's readings.

Before chart data can be entered to the computer and archived, they must be digitised. This may be done by manual extraction of levels from the chart or by using a digitising table which converts the chart trace to a digitised record at the selected interval. Another recent technique is based on scanning of the chart line and tracing/vectorising it on a computer display, assisted by appropriate software. However, in both cases any time or level errors at take off have got to be considered and adjustments made. In the case of manual extraction, if it is assumed that the drift is linear, this consists of distributing a stage adjustment on a daily basis through the chart period and then adding this value to each level extracted from the chart.

Where the chart is digitised manually, the records are entered to a paper file and it may be convenient to use the same hourly form as is used for manual staff gauge observations . Where the chart is digitised using a digitising table the result is a computer file which can be entered directly to a database or hydrological archive package.

5.5 CHECKING DWLR'S

Digital water level recorders provide a more versatile means of measuring water level at a gauging station. Like the chart recorder many DWLR's are still based on a float operated sensor operating in a stilling well. The mechanically operated pulley system is replaced by a shaft encoder which eliminates the errors created by mechanical linkages and the imprecision of a pen trace. However, measurement is still subject to the errors caused by the float system and by the operation of the stilling well. Therefore for float operated DWLR's many of the same or equivalent checks are necessary to ensure the continuity and accuracy of records. In this regard the pressure sensor type DWLR's have an advantage since they have no moving mechanical parts.

However, irrespective of what DWLR is installed similar checks are required to those undertaken for chart recorders. In particular the comparison and noting of staff gauge and logger water levels (and clock time and logger time) at take off and resetting, in the Station Field Record Book are essential for the interpretation of the record in the office.

Procedures in the office for checking the reliability of the record since the previous data download will depend on the associated logger software but should include a graphical inspection of the hydrograph for indications of malfunction (e.g. flat, stepped or truncated trace). Comparisons as for the chart recorder should be made with the observer's readings and bad or missing data replaced by manual observations

..... STATE SURFACE WATER

STATION LOG BOOK

1. Basin:..... River:..... Station Name:..... Station No.:.....

2. Gauges:

	Primary (PG)	Secondary (1) (SG1)	Secondary (2) (SG2)	Secondary (3) (SG3)
Gauge zero:				

3. Equipment:

Equipment	Yes/No	Type	Make(s)	Serial Nos.	Date installed
AWLR/DWLR					
Current meters					
Cableway/bridge outfit etc.					
SRG					
TBR/ARG					
FCS					
Other.....					

4. Station Log:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Date	Time	PG level	AWLR/ DWLR level	Stilling well level	Level Diff. (3) - (4)	Level Diff. (3) - (5)	AWLR/ DWLR time	Time Diff. (2) - (8)	SG1 Level	SG2 Level	SG3 Level	Measured flow (fm)	Time start fm	Time finish fm	Conditions (river & weather)	Actions taken	Remarks	Signature

Figure 1: Example of a Gauging Station Log Sheet/Book

..... STATE SURFACE WATER SECTOR

STATION FIELD RECORD BOOK

Basin .... River ..... Station..... Code No .....

Date	Time	Gauge observer present on arrival (Tick)	Staff gauge level	AWLR Level	Last Observer Level	Time of last Observer Level	Remarks (including damage, adjustment, replacement of staff gauges or equipment,stilling well malfunction, erosion and scouring, construction of bunds, sand extraction, debris blockage etc)

Signature ..... **Designation.....**

Figure 2: Format of Station Field Record Book

.APPENDIX 1

STATE SURFACE WATER
FIELD INSPECTION & QUALITY AUDIT SITE REPORT
RIVER LEVEL (STAGE) & FLOW STATION

Division:.....

Station No:..... Station name:.....

River:..... Basin:.....

1. INSPECTION/AUDIT GENERAL DETAILS

Date of inspection:.....

Inspected by:..... Designation:.....

Assisted by:..... Designation:.....

Time of start:..... Time of completion:.....

2. SITE CONDITIONS:

Weather conditions:.....

River conditions.....

3. STAFFING (manned sites only)

(1) **No.**	(2) **Name**	(3) **Position**	(4) **Present (Yes/No)**	(5) **If answer to column (4) is No give reason**	(6) **Remarks**

4. STAGE MEASUREMENT

4.1 Measuring Equipment

Staff Gauges:

	Primary (PG)	Secondary (1) (SG1)	Secondary (2) (SG2)	Secondary (3) (SG3)
Gauge zero (most recent values)				
Staff gauge reading				
Condition of gauges (G/F/P)				
Condition of river bank/gauge foundations/fixings				
Actions required				

Bench Marks:

Condition of primary site bench mark (BM1): Good/Fair/Poor

Condition of secondary site bench mark (BM2): Good/Fair/Poor

Key level checks:

Undertake a comparison of bench mark levels and visible gauge posts and compare with previous readings.

Comments on level differences/discrepancies (if any) including actions required:

.....

Instruments installed:

Equipment	**Yes/No**	**Type**	**Make(s)**	**Serial Nos.**	**Date installed**
AWLR					
DWLR					
Diptone or other device to measure water level in stilling well					

4.2 Instrument performance and quality checks:

Instrument/method	**Level**	**Time**	**Level Diff.**	**Time Diff.**	**State of instrument Good/Fair/Poor**	**Comments/ Actions required**
Primary staff gauge						
AWLR						
DWLR						
Level in stilling well						

If stilling well installed does it need de-silting: Yes/No

4.3 Checks on Observer

Observer(s) to read gauge at same time as inspecting officer :

Gauge	Observer reading	Inspecting Officer reading	Reading difference (if any)	Comments
Primary				
Secondary gauge (1)				
Secondary gauge (2)				
Secondary gauge (3)				
Well gauge/diptone reading				

Additional comments on observer performance:
.....
.....
.....

4.4 Quality Checks on Data Record Sheets

Item	Good/Fair/Poor	Remarks
Neatness		
Completeness		
Accuracy		
Other..... .		

4.5 General Observations on Stage Monitoring

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.....
.....

5. FLOW MEASUREMENT

5.1 Equipment

Current Meters

Serial/Ref. No.	Meter type	Make	Date of last calibration	Spin test OK? Yes/No	Remarks

Revolution counters

Serial/Ref. No.	Counter type	Make	Timer (if fitted) OK? Yes/No	Pulse counts OK? Yes/No	Remarks

Associated Equipment

a) Wading equipment? Yes/No

If 'Yes', answer the following:

Wading rods Condition Good/Fair/Poor

Replace? Yes/No

Distance measurement equipment e.g. tapes, tag lines

Condition Good/Fair/Poor

Check distance marks against reliable tape:

.....

Replace? Yes/No

b) Bridge outfit? Yes/No

If 'Yes', answer the following:

Suspension derrick/bridge outfit Condition? Good/Fair/Poor

Depth measurement: Winch counter installed? Yes/No

If 'Yes' Check against known reference.....

If 'No' check method of determining depth and position in vertical

.....

Horizontal distance measurement:

Are bridge markings at frequent enough interval? Yes/No

Are bridge markings clearly visible? Yes/No

Pulse Counting:

Condition of connecting cable Good/Fair/Poor

Check performance of counter/meter in situ, OK? Yes/No

c) Bank operated cableway? Yes/No

If 'Yes' answer the following:

Date of last service/maintenance:.....

Condition of cables and winches: Good/Fair/Poor

Condition of support stanchions: Good/Fair/Poor

Comments:.....

Check horizontal distance counter: OK? Yes/No

Check depth counter: OK? Yes/No

Pulse Counting:

Condition of connecting cable Good/Fair/Poor

Check performance of counter/meter in situ, OK? Yes/No

d) Manned cableway? Yes/No

If 'Yes' answer the following:

Date of last service/maintenance:.....

Condition of cableway and winches: Good/Fair/Poor

Condition of towers: Good/Fair/Poor

Condition of carriage: Good/Fair/Poor

Comments with particular reference to operator safety:

.....

e) Boat gauging? Yes/No

Condition of suspension equipment Good/Fair/Poor

Condition of distance measuring equipment

e.g. pivot points, tag lines/cables Good/Fair/Poor

Condition of boat Good/Fair/Poor

Condition of outboard engine Good/Fair/Poor

Number of life jackets: .....

Condition of life jackets Good/Fair/Poor

Pulse Counting:

Condition of connecting cable Good/Fair/Poor

Check performance of counter/meter in situ, OK? Yes/No

5.2 Quality Checks on Maintenance of Current Meter Gauging Forms

Item	Good/Fair/Poor	Remarks
Neatness		
Completeness		
Accuracy		
Other.....		

5.3 Flow Measurement Structures

Note: This section should only be completed if there is a structure is used for flow measurement purposes.

Type of structure (e.g. Crump weir, gated spillway etc.):.....

.....

Condition

Item	Condition	Remarks
Crest		
Approach		
Exit/downstream channel		
Divide walls		
Gates		
Gate opening measurement device		
HEP off-take		
Other:.....		

5.4 General Observations on Flow Measurement

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.....

6. OTHER EQUIPMENT

Item	Please ✓ the appropriate box(es)	Type and make	Serial No.	Condition	Remarks/Actions Required
SRG					
ARG					
TBR					
FCS:					
Thermometers					
Sunshine recorder					
Radiometer					
Net Radiometer					
Anemometer					
Wind direction					
Evaporation pan					
Suspended solids					
Bed load					

7. BUILDINGS AND INSTRUMENT HOUSINGS

Item	Please ✓ the appropriate box(es)	Watertight Yes/No	Secure Yes/No	General condition	Action/remarks
AWLR/DWLR housing					
Office					
Stores					
Other e.g. sleeping quarters					

Check furniture and other equipment inventory.

Comments on general state of buildings and surrounds:

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.....
.....

8. ACTION ITEMS

No.	Task/Action Required	Additional Comments	Action officer	Target date for completion	Actual completion date	Action approved by

9. FINAL OBSERVATIONS

9.1 Overall comments.....

.....

9.2 Urgent actions.....

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..... **.....**

Signature of inspecting officer **Date**