STANDARD OPERATING PROCEDURE
"Well Inventory and Water Level Measurement Procedures"

Prepared by:
Technical Support Agency
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For
State Project Management Unit
Atal Bhujal Yojana
Irrigation and Water resources Department
Govt of Haryana

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1. Introduction

The primary objective of Atal Bhujal Yojana is "to improve the sustainable management of groundwater resources in the water stressed areas of the selected States" through community engagement at Gram Panchayat level. The present scheme also aims at community engagement and inculcates behavioral changes for judicious ground water management at Gram Panchayat level. One of the critical steps in the implementation of the Atal Jal program is preparation of water budget at GP level and prepare community- led water Security Plan for sustainable ground water management through a combination of demand side / supply side measures.

Understanding the ground water regime as well as ground water dynamics in terms of recharge and discharge is prerequisite, to work out the water budget and decide the management interventions. This would essentially require data on all aspect of water in time and space.

It is in this context; it is reiterated that monitoring of ground water in terms of quantity and quality is one of the key activities under Atal Bhujal Yojana. It is also pertinent to mention that out of the five Disbursement Linked Indicators (DLIs) identified under the Incentive component, DLI#1 and DLI#5 has direct relevance with regular monitoring of ground water. The DLI #1 incentivizes for strengthening the ground water monitoring network and disclosure of data on year-on-year basis, whereas the DLI#5 talks about the ultimate goal of the scheme i.e., improvement in ground water to be measured in terms of long-term rise in ground water level.

In view of the importance and utility of ground water monitoring under Atal Jal, attempt has been made to prepare a guideline to standardize the procedures and methodology for data collection, collation and integrating with the common database. Generally, the ground water monitoring can be defined as an effort to obtain information on ground water levels and chemical quality through representative sampling. In the present SOP, under the ambit of ground water monitoring two aspects have been covered which includes Well Inventory and Regular groundwater level measurement. The water quality monitoring has been presented in the SOP of Water Testing Kit. Both these aspects are discussed briefly in following paragraphs to define the purpose and modalities for undertaking these activities.

This Standard Operating Procedure (SOP) has been prepared to direct field personnel for identify wells and conducting water level measurements in the monitoring wells during field investigations at GP level. This SOP is designed to help District Implementation Partners (DIPs), District Project Management Unit (DPMU) and other field staff or staff in-charge for routine observation of groundwater level and data collection.

2. Well Inventory

The first and foremost task is to assess the present groundwater regime scenario at Gram Panchayat level, which would essentially require mapping /survey or inventory all the groundwater abstraction structures which is used to draw ground water for various usage through well inventory. The objective of Well inventory is to capture GW related data to understand the spatial and temporal variations in GW regime at GP level and help in preparing the water budget and WSP. Ideally this should be one time activity to be undertaken at each Gram Panchayat. The parameters to be captured under this exercise are already inbuilt in the Mobile Application developed for the purpose. Specific training has already been provided for use of Mobile App. However, DPMU shall undertake/organize regular refresher training courses for the users. As guiding principle, the steps to be followed and methodology to be adopted to bring the data in common format the points listed below may be followed strictly while doing.

- The Well Inventory is to be carried out by the District Implementation Partners or any other representative authorized by DPMU using the Mobile App. Preferably, a register can also be maintained by the DIP.
- As a first step, the person responsible for well Inventory should contact the Sarpanch /Panchayat Secretary or Karmachari or any resource person in the GP to get an idea about the total number of wells available within the boundary of said Gram Panchayat.
- After getting an idea about the total number of wells drawing ground water for various purposes in the GP, Ideally, the inventory is to be done for as many ground water abstraction structures (wells) as possible, available in the study area or GP.
- However, within the constraints of time / manpower and logistics at least 50% of the total number of wells (GW abstraction structures) present in the GP should be covered under well inventory.
- However, while selecting the 50% wells care should be taken to ensure that the wells inventoried
    - are evenly distributed in space and represents the entire Gram panchayat.
    - are tapping different aquifers (depth ranges), especially the aquifer being tapped commonly in current scenario.
    - cover wells used for various purposes (Drinking & domestic, Irrigation, Industries etc.)
    - includes wells with poor ground water quality.

2.1 Utility of Well Inventory Data:

The data so generated through Well Inventory needs to be collated and organized in specific manner before the analysis, it has multipurpose utility, and some of the key usage is mentioned as below;

- A base map of the GP, preferably on A3 size paper or bigger may be prepared with key locations, boundaries and drainage with tentative location of key wells. (For those not using GIS, toposheet or any published map, even map not as per scale can be prepared in absence of any option)
- The data of wells captured under well inventory is georeferenced (with Lat/Long) and hence location of wells inventoried shall be shown on the base map along with GP/Village Boundary.
- The data of well inventory shall be classified based on the type / depth of wells to get an idea about the aquifer disposition and also the zone being tapped presently for ground water withdrawal. It may not be very accurate but will give an understanding about aquifer system of the area.
- The water level data of wells falling under similar range shall to be posted along with the location on. Suitable size map (A3 Size) to be prepared a depth to water level map to understand the ground water regime.
- Wherever possible the water level data may be converted in reference to Mean Sea Level (MSL) to prepare water table map to understand the general ground water flow direction, recharge zone and discharge zone.
- The location of existing Recharge / water harvesting structures captured through mobile app shall be posted on the base map
- Based on the data, the area may be identified where the ground water is not potable.
- In addition, the data captured in respect of type of pumps will give an idea about amount of withdrawal. Once the above map is prepared with well inventory data, this should form the base and used for identification of new supply side Interventions in the water security Plan.

2.2 Water Level Monitoring at Gram Panchayat level

Changes in ground water level with time and space is resultant of all the inputs and outputs to the ground water reservoir, it acts as thermometer to gauge the health of underlying aquifer. Water levels vary significantly even at short distances due to heterogeneities in the aquifers, geomorphological settings etc. Monitoring / measurement of seasonal changes in ground water level at close intervals in time and space at Gram Panchayat / local level is essential to control and regulate ground water withdrawal, which will eventually help in preparing realistic Water Budget and Water Security plan as well as updating year on year basis. This necessitates aquation of time series data at the level of Gram Panchayat. Keeping this in view it has been proposed to select ten

(10) ground water monitoring well in each Gram Panchayat for monthly groundwater level measurement. The mobile app can be used for the purpose. However, a separate numbering protocol may be used for these wells selected at GP level. Selection of ground water monitoring wells at GP level is quite challenging and may require basic hydro-geological skill and hence DPMU expert may be consulted while doing this exercise. A list of possible criteria has been framed to guide the selection; however, the local hydro-geological set up of the area may be given adequate importance.

2.3 Criteria for Identification of monitoring well for water level measurements

- Water levels vary significantly even at short distances due to heterogeneities in the aquifers, geomorphological settings etc.
- Optimally, at least 10 ground water monitoring wells / Piezometers / Tube wells should be identified among the existing wells in every Gram Panchayat for Ground water level monitoring purpose to get time series and a realistic picture of water table and seasonal changes.
- If the numbers of villages are more than 10 in a Gram Panchayat, then one well in every village should be identified. Even distribution of wells must be ensured.
- Ideally the Piezometer constructed under Atal Jal and fitted with DWLR could be one of the ten wells.
- Regular monitoring of groundwater level shall be done using the water level sounders procured under Atal Jal or through or any other suitable arrangements for this purpose.
- Wells tapping different aquifers (depth ranges) shall be selected for monitoring.
- Wells fitted with pump may be avoided to the extent possible. In case such wells are to be selected, pre-pumping water levels shall be monitored.
- The measurement of water level in Piezometer/monitoring well should be taken, only after the pumping from the surrounding tube wells has been stopped.
- Approachability in all weather conditions must be ensured.

3. Equipment Need for Monitoring Groundwater Level

The following list of equipment may be utilized during water level measurements.

- Water level indicators
- Atal Jal Mobile App
- Tool kit to unlock tube well/bore well

4. Procedures of Groundwater Level Measurement

The following procedures should be followed during water level measurements.

1. Record the condition of the well (protective casing, concrete collar, lock in place etc.).
2. Check that the water level indicator tape has no obvious kinks or damage.
3. Stand upwind of the well; unlock tube well/bore well.
4. Identify the previous measuring point marking or notch on the riser or casing (if present). Record this location in the field logbook or on the water level monitoring form.
5. Turn on the water level indicator, check the audibility of indicator, reel the electronic probe into the well riser (with the increments visible) slowly until the meter sounds.
6. Grasp the tape with hand, withdraw the tape and lower it again slowly until the sound is again audible.
7. Check the depth to water on the tape and make a note of the depth to within 5 mm precision.
8. Lower the probe again slowly and repeat the measurement for accuracy. Be sure to read the depth correctly on the tape.
9. Ensure all the groundwater level measured from the ground surface.
10. Fix the measuring point to measure groundwater level.
11. Record the depth to water level from the same measuring point every time.
12. In case of measuring groundwater level is carried out from the top of the casing of tube well/bore well, then the actual groundwater level can be measure as:

    Actual groundwater level (m) = Groundwater level from the top of the casing (m) – length of the casing outside the ground surface (m)
13. Enter the actual groundwater level in the mobile app.

4.1 Mobile Application for Capturing Data of Well Inventory and Monitoring

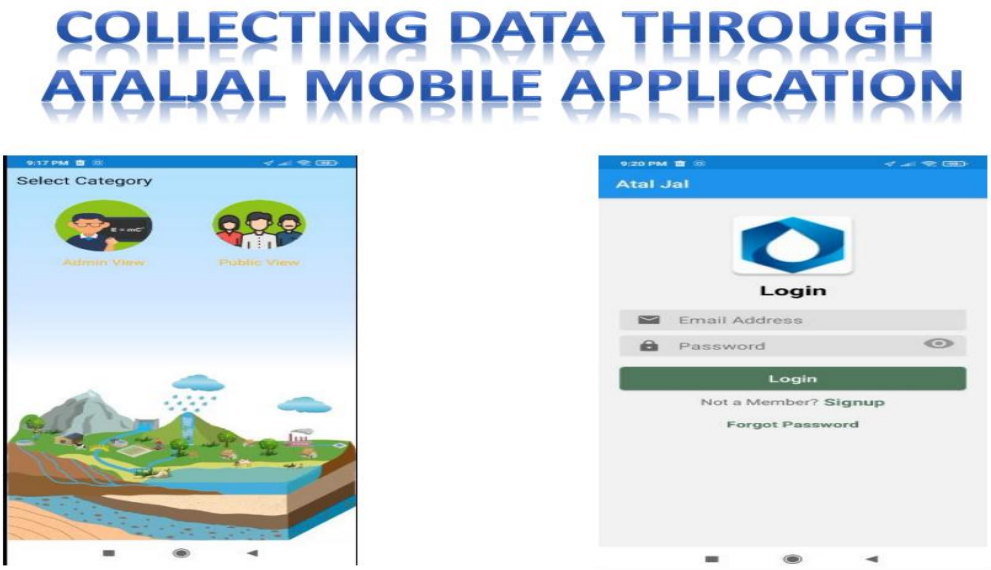
The mobile App developed under the Atal Bhujal Yojana can be downloaded in the Android Mobile apps by downloading the Mobile APK available on the Atal Jal portal. The process is on for bringing the App on Google App Store and also for the IOS. Credentials are to be generated for data entry in the Mobile App, hence only authorized user can enter/edit the data. However, the mobile app can also be used by the common public without any authorization to view the data under public view option of the App.

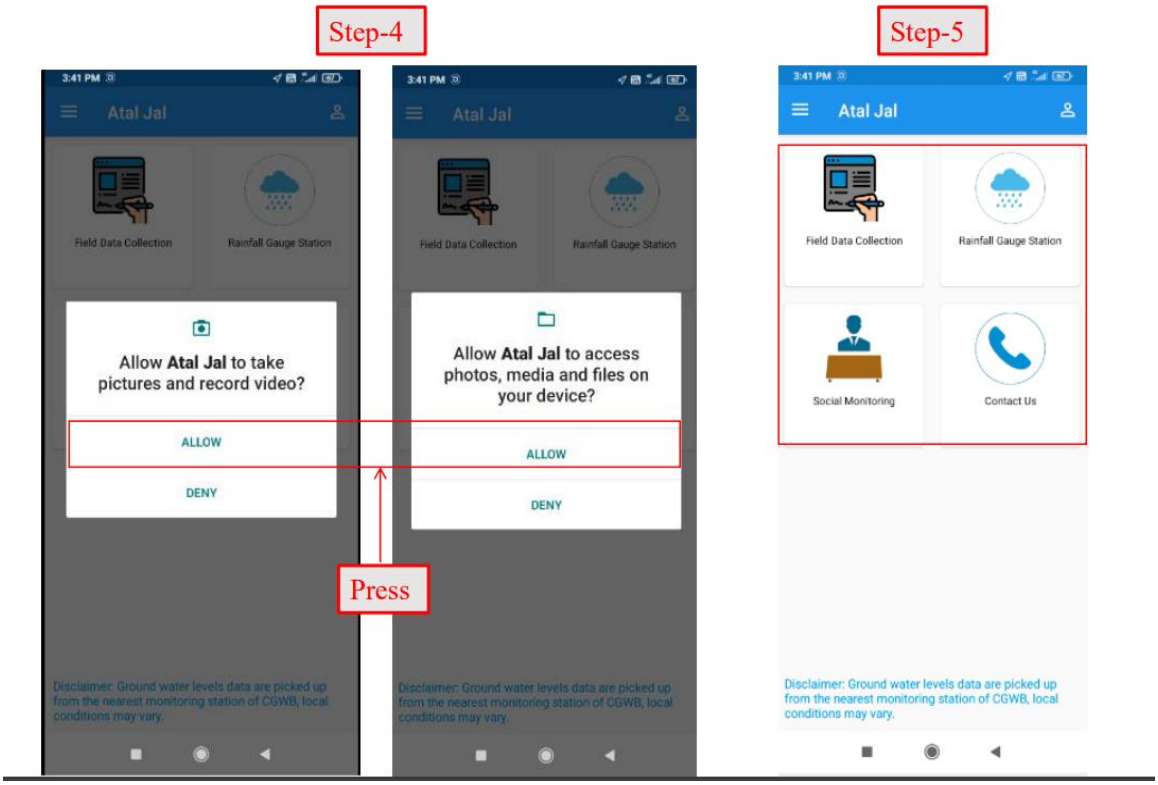
The data being captured under well inventory through the mobile App is stored in the central database of Atal Jal Portal hosted on the NIC cloud. The data can be accessed through the MIS (for authorized persons) and can also be seen and downloaded in the Map View, which is accessible in public domain through Atal Jal Portal (ataljal.mowr.gov.in).

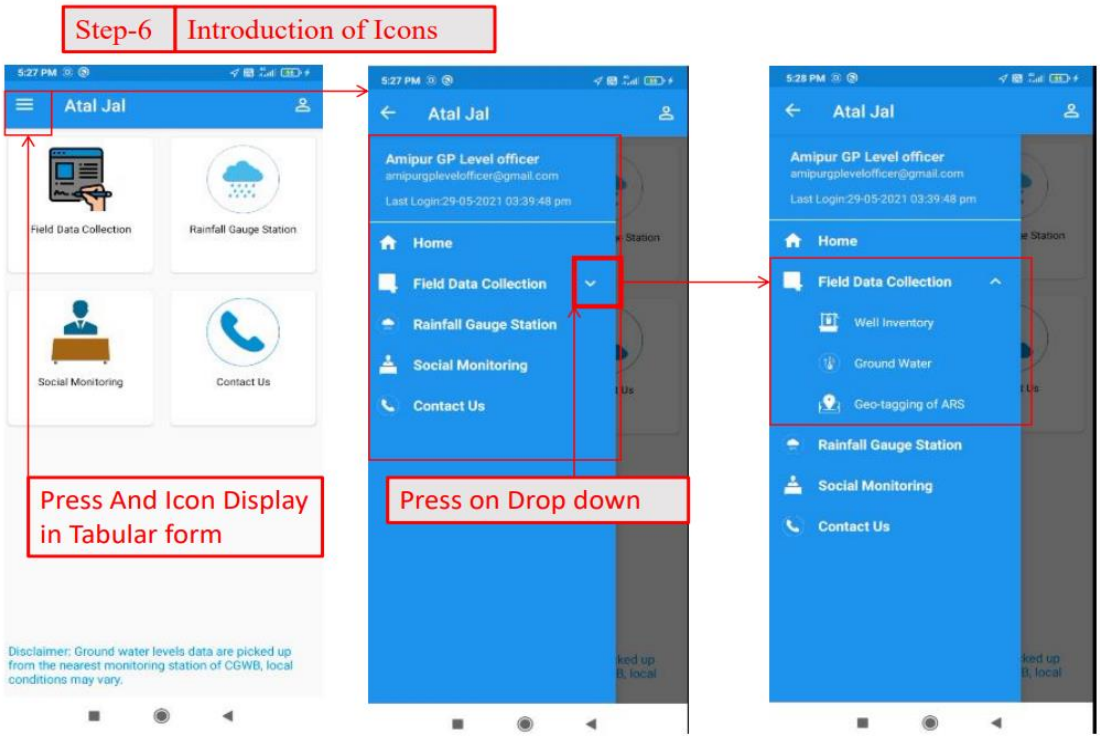
4.2Data recording through Atal Jal Mobile Application

In Ground water monitoring module, user can see the ground water monitoring stations in a particular GP. Each location shows the details of well id, latitude, longitude, state, district, block, site name, source, type of well, pre monsoon, post monsoon and shows an option to update the water level.

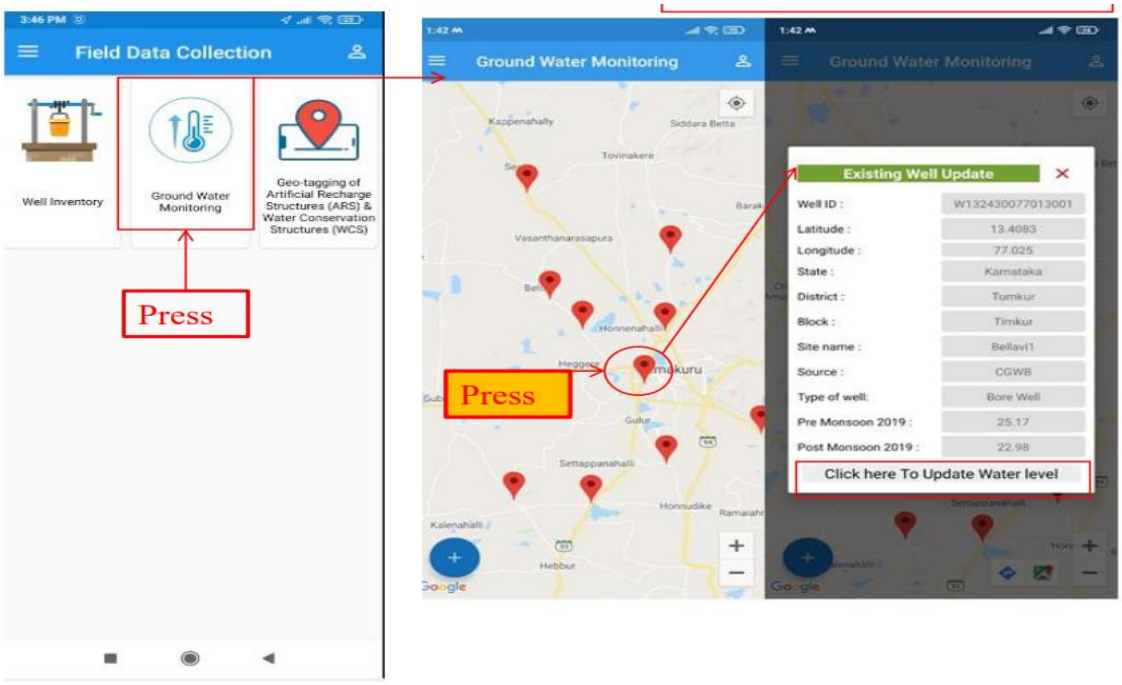
Steps of collecting data through Atal Jal Mobile Application



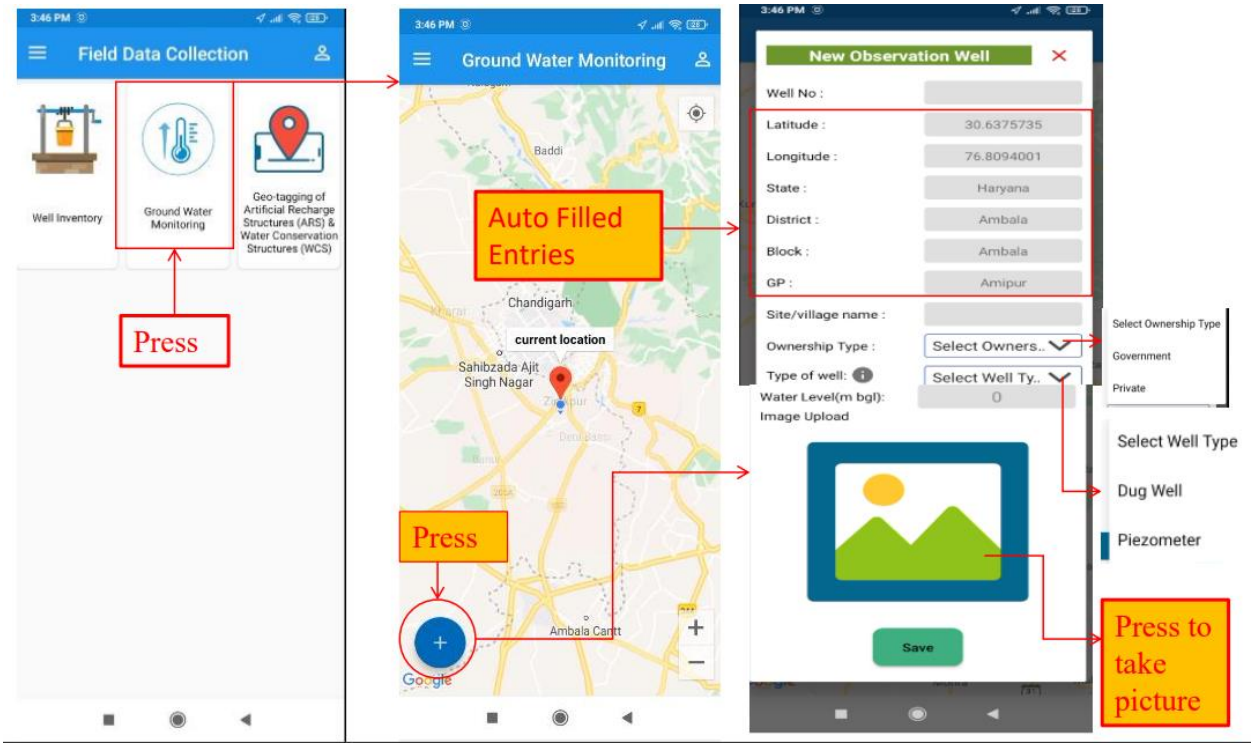

Step-4
Step-5
Atal Jal
Field Data Collection
Rainfall Gauge Station
Allow Atal Jal to take pictures and record video?
ALLOW
DENY
Allow Atal Jal to access photos, media and files on your device?
ALLOW
DENY
Press
Social Monitoring
Contact Us
Disclaimer: Ground water levels data are picked up from the nearest monitoring station of CGWB, local conditions may vary.


Step-6
Introduction of Icons
Atal Jal
Field Data Collection
Rainfall Gauge Station
Social Monitoring
Contact Us
Press And Icon Display in Tabular form
Amipur GP Level officer
amipurgpleveloficer@gmail.com
Last Login:29-05-2021 03:39:48 pm
Home
Field Data Collection
Rainfall Gauge Station
Social Monitoring
Contact Us
Press on Drop down
Well Inventory
Ground Water
Geo-tagging of ARS
Disclaimer: Ground water levels data are picked up from the nearest monitoring station of CGWB, local conditions may vary.

Step 7	Ground Water Monitoring	Example of Existing Well



Step 8	Ground Water Monitoring	New Monitoring Well



5. Ground water measurement for data disclosure under DLI # 1

In general, ground water monitoring is regular / contiguous activity to capture the real time / near real time changes in the qualitative and qualitative aspect of the ground water with changing stress conditions and climate. Under the Atal Bhujal Yojana, ground water monitoring has been given adequate emphasis. The data so generated shall also be analyzed using advanced tools of GIS and remote sensing to convert it in to information. The Atal Jal scheme also envisages demystifying the science of ground water and bringing all the data in to public domain through public disclosure and accordingly DLI#1 has been identified.

Ground water monitoring has two broad aspects which includes monitoring the water level in time and space and ground water quality. The steps and guideline for the regular monitoring and data utility is discussed briefly in following paragraphs.

5.1 Water level monitoring

Monitoring of ground water level refers to measurement of depth to water level from a ground water observation/ monitoring well / Piezometer at pre specified location and time. The density of monitoring wells to be measured in an area and frequency of measurement are two important aspect of ground water level monitoring which has a direct relevance with the objective of monitoring. In the context of Atal Bhujal Yojana, there are two type of monitoring activity to be taken up on regular basis as discussed below.

5.1.1 Monitoring of existing wells for which data already disclosed.

As per the DLI#1, all the states have disclosed the historical data of ground water level for the period 2015-2019, which forms the base line data for the DLI#1. The wells have data with minimum frequency of two times in a year (Pre and Post monsoon).The data disclosed from the existing wells partly belongs to CGWB and partly from the State GW Departments. The same data also was included in Block Hydrogeological Reports as per the protocol of DLI#1. The data disclosed initially was verified by QCI during first round of verification conducted in year 2021.

The monitoring wells for which water level data has already been disclosed and verified, monitored by CGWB/SGWB need to be essentially monitored every year twice (Pre/Post) and updated every Year for disclosure. If for any reason the concerned department has discontinued the monitoring, in such cases the monitoring shall be done under Atal Bhujal Yojana. For existing monitoring wells, the monitoring data should be compiled as per the prevailing protocols and should be disclosed for further round of verification.

5.1.2 Establishment / Monitoring of new wells

The DLI#1 has specified targets for data disclosure against which the tentative incentive allocation has already been communicated. The data disclosure is to be gauged year on year based on additional well data disclosed. In order to achieve the target of DLI#1, there is a need to establish new existing wells/ piezometers for monitoring purpose and / or newly constructed Piezometer and monitored at least for pre and post monsoon for the reference year to qualify as new well data disclosure for disbursement. While establishing the new monitoring wells priority shall be given to piezometers being constructed and fitted with DWLR for every Panchayat under Atal Jal and also to ensure all the Blocks/ taluks are spatially covered.

6. Monitoring of observation wells against DLI#5

DLI#5 refers to arrest in rate of decline in ground water level or otherwise improvement in rate of decline of ground water level. This DLI is to be evaluated in year 4 and 5 to measure the impact of implementation of various water saving interventions proposed in the WSP. As per the proposed methodology in the program guideline, the rate of decline is to be measured at the level of Block/ taluk for which a base line data is to be fixed from the exiting long-term data of ground water level already available.

Rigorous statistical exercise has been done at the level of NPMU / QCI and states to analyze the trend in ground water level from the five-year water level data i.e., 2015-19 disclosed in the year 2020. Since all the disclosed data did not represent the blocks under Atal Jal, states were requested to identify additional wells with long term time series data so that all the blocks are represented and accordingly majority of the states have already identified the block wise/taluk wise ten ground water monitoring wells. The base line data fixation by NPMU/QCI is under progress.

However, it is essential to monitor the ground water level of these identified wells at least pre and post monsoon periods so as to analyze the changes in trend and comparison of base line data to arrive at weather there is arrest / improvement in decline in ground water level.

Here, it pertinent to mention that some of these wells might be common with already disclosed wells or otherwise, but important point is timely monitoring of these well is essential to arrive at any conclusion against DLI#5.

7. Instrument and data handling

DPMU will hand over all Water Level Indicators to concerned PGWM committee/VWSC/WUA/WUG, District Implementation Partners (DIPs). The PGWM committee/VWSC/WUA/WUG and DIP coordinators will be responsible for handling the Water Level Indicators and measuring & recording the water level data. DPMU groundwater experts will inspect the randomly selected monitoring well on monthly basis and will carry out random validation of water level data coming from DIP team. Hand over form is annexed in the annexure 2&3.

Note: All DPMU/DIP/PGWM committee/VWSC /WUA/WUG hereby ensure to fill instrument handover form while hand over & take over process, and ensure submitting of the same to DPMU/SPMU within 7 working days.

Annexure 1: Groundwater level measurement Consent Form

अटल भुजल योजना हरियाणा
सिंचाई और जल संसाधन विभाग
हरियाणा सरकार

राज्य		जिले का नाम	
ब्लॉक का नाम		ग्राम पंचायत का नाम	
गांव का नाम		जल का स्रोत (ट्यूबवेल/बोरवेल आदि)	
ट्यूबवेल/बोरवेल मालिक का नाम		ट्यूबवेल/बोरवेल मालिक के पिता का नाम	
ट्यूबवेल/बोरवेल मालिक का संपर्क नंबर			
Latitude of source		Longitude of source	
ट्यूबवेल/बोरवेल के माध्यम सेसिंचाई के अंतर्गत आने वाला क्षेत्र (एकड़ में)	रबी-	खरीफ़-	ज़ायद-

- अटल भुजल योजना हरियाणा,सहभागी भूजल प्रबंधन के लिए एक सरकारी योजना है जिसमें आपकी ग्राम पंचायत सहित 1669 ग्राम पंचायतें शामिल हैं। इस कार्यक्रम का मुख्य फोकस सामुदायिक हितधारकों की प्रभावी भागीदारी के माध्यम से भूजल संसाधनों का प्रबंधन करना है। साथ ही, इसे प्राप्त करने के लिए जल संतुलन और जल बजट बनाना प्रमुख घटक हैं।
- जल संतुलन की प्रभावी गणना करने के साथ-साथ भूजल निष्कर्षण की प्रकृति को समझने के लिए, इस योजना में व्यक्तिगत बोरवेल का भुजल स्तर मापा जाएगा। प्रत्येक ग्राम पंचायत में भूजल स्तर की गहराई को मापने के लिए जल स्तर संकेतक का उपयोग किया जाएगा।
- एकत्र किए गए डेटा का उपयोग केवल भूजल प्रबंधन योजना के लिए किया जाएगा और किसी भी समय बोरवेल मालिकों से कोई वित्तीय/नियामक शुल्क नहीं लिया जाएगा। साथ ही, एकत्र किए गए डेटा का उपयोग किसी भी समय पानी के कनेक्शन और/या कृषि विद्युत कनेक्शन की अनुमति देने या नकारने के लिए किसी भी प्रकार के निर्णय लेने के लिए नहीं किया जाएगा।

मालिक की सहमति

मैं _____ S/o, W/o, D/o_____ गांव_____
ग्रामपंचायत_____ ब्लॉक_____ जिला_____ उपर्युक्त ट्यूबवेल/बोरवेल का मालिक हुं।

इस पत्र के माध्यम से, मैं अपने नलकूप/बोरवेल पर भुजल का स्तर मापने के लिए लगने वाले समय अवधि/संग्रह/निगरानी की अनुमति देने के लिए अपनी सहमति देता हूं।

नलकूप/बोरवेल मालिक के हस्ताक्षर

दिनांक:

Annexure 2: Water Level Indicator Handover Form- DPMU to DIP

Atal Bhujal Yojana –Haryana
Irrigation & Water Resource Department,
Haryana Government

Handover of water level indicator by District Project Management Unit (DPMU) to concerned District Implementation Partners (DIPs).

Detail of Supplier and Receiver

Detail of Receiver	DIP (Authorized Signatory) Name:	
	DIP (Authorized Signatory) Contact No.:	
	DIP (Authorized Signatory) E-mail ID:	
Detail of Supplier	DPMU (Authorized Signatory) Name:	
	Designation & Office	
	Handover Date:	

Equipment Description:

Equipment Name & Number	Equipment Description	Quantity	Remarks

DIP hereby acknowledges that, above mentioned equipment/material is **checked, inspected, found functional**. They understand that this equipment belongs to the Irrigation & Water Resource Department, (ABhY) Haryana and is under their possession while carrying out the work. They hereby assure that they will take care of the equipment to the best possible extent.

Signatures of Authorized Person

Detail	Name & Department	Signature
Authorized Signature (DPMU/SE/XEN/SDO/JE)		
Signature Handed over by (DPMU representative)		
Signature DIPs Representative (Inspected & received by)		

Annexure 3: Water Level Indicator Handover Form DIP to PGWM committee/VWSC /WUA/WUG

Atal Bhujal Yojana –Haryana
Irrigation & Water Resource Department,
Haryana Government

Subject: - Handover of water level indicator by District Implementation Partners (DIPs) to concerned PGWM committee/VWSC /WUA/WUG.

Detail of Supplier and Receiver

Detail of receiver	Representative Name: (PGWM committee/VWSC /WUA/WUG)	
	Designation: (PGWM committee/VWSC /WUA/WUG)	
	Contact Number (PGWM committee/VWSC /WUA/WUG)	
Detail of Supplier	DIP (Authorized Signatory) Name:	
	DIP (Authorized Signatory) Contact No.:	
	DIP (Authorized Signatory) E-mail ID:	
	Handover date	

Equipment Description:

Equipment Name & Number	Equipment Description	Quantity	Remarks

Representative (PGWM committee/VWSC /WUA/WUG) hereby acknowledges that above mentioned equipment/material is **checked, inspected, found functional & received**. They understand that this equipment belongs to the Irrigation & Water Resource Department, (ABhY) Haryana and is under their possession while carrying out the work. They hereby assure that they will take care of the equipment to the best possible extent.

	Name & Department	Signature
Signature Handed over by (DIP representative)		
Signature Representative (PGWM committee/VWSC /WUA/WUG) (Inspected & received by)		