Terms of Reference (TOR) for the Consultancy Service of Developing an Integrated Operation Model (IOM) for the Senanayake Samudraya (SS) Scheme in Gal Oya Basin

1. Background of Gal Oya Basin and Senanayake Samudraya Scheme:

The Senanayake Samudraya (SS) scheme is the largest irrigation scheme in Sri Lanka and is located in the Ampara District in the eastern part of the country. The capacity of SS is 770,000 Acft (Approx. 950 MCM), and serves an irrigation extent of 120,200 acres. Ampara, Samanthurai, Akkraipattu, and Kalmunai areas are benefitted from this reservoir. The reservoir is located in the middle reaches of the Gal Oya basin (Refer Annex 01) and is mainly used for irrigation, drinking, fish farming, and hydropower generation. In addition, water is diverted to Andal Oya (Navakiri Tank) basin as a trans-basin diversion. Multiple ethnic communities, including Sinhalese, Tamil, and Muslim populations, reside within the community group areas under the SS Irrigation Scheme. These communities depend on water supplied by SS for their agricultural and other livelihood-related activities and it is important to ensure fair water allocation among these communities. Given its importance for multi-sectoral water use and its location within a climate hotspot area, the SS Scheme has been selected as a pilot study area for the development of an operation model aimed at improving water resources management and enhancing climate resilience.

2. Objective of the study:

Since the complexity and challenging situation of SS on water management in the future with different types of stakeholders and the impacts of climate change, it is required to develop an operation model to ensure efficient water management.

3. Scope of Services, Tasks, and Expected Deliverables

3.1 Scope of Services

The consultant is expected to develop rainfall–runoff (RR) models for the main reservoir SS and reservoirs within the SS scheme, namely Padagoda Tank, Alahene Tank, Malayadi Tank, Aligalge Tank, Himidurawa Tank, Walagama Tank, Weeragoda Tank, Nawakiri Tank (In Andal Oya basin), respective anicuts and the canals of single banking sections which have pooling storage of capacity over 100 acre-feet. A Demand Assessment Tool (DAT), including all irrigable areas at the field canal level, with the other existing demands, has to be developed. An Operation Model (OM) for SS shall also be developed to prepare a seasonal operation plan (SOP) for a cultivation season. Further, these models (RR, DAT, and OM) have to be integrated into a single model in view of running SOP with a “Role-based Dashboard” to ease

the operation. The operational model shall be capable of optimizing water distribution, for both in-basin and trans-basin, for hydropower production, irrigation, and drinking water supplies, etc. The optimization objectives are to sustain hydropower generation at predetermined levels based on long-term production levels, reliably meet prescribed drinking water supply levels, and maximize the irrigable area within the satisfactory level of supply reliability criteria.

3.2 Tasks to be carried out

Task 01: Reviewing the current and planned flow monitoring, rain gauging, and control systems

Review the current and planned flow monitoring and control systems in the upper catchment of SS, and the scheme reservoirs of SS (Padagoda Tank, Alahene Tank, Malayadi Tank, Aligalge Tank, Himidurawa Tank, Walagama Tank, Weeragoda Tank, Nawakiri Tank (In Andal Oya basin), respective anicuts and the canals of single banking sections which have pooling storage of capacity over 100 acre-feet and assess their suitability for model development with respect to present and future operational purposes. Also, recommend any modifications or improvements to the flow monitoring and rain gauging systems.

Task 02: Preparing a detailed water management and operating guideline for SS

Prepare a detailed water management and operational guideline for the irrigable areas and other water demands under SS scheme in consultation primarily with the Irrigation Department and other relevant stakeholder institutions including National Water Supply & Drainage Board (NWS&DB), Ceylon Electricity Board (CEB), District Secretary, Divisional secretary, Department of Agrarian Development (DAD), Agriculture Department covering the reservoir management of SS and reservoirs of SS scheme (Padagoda Tank, Alahene Tank, Malayadi Tank, Aligalge Tank, Himidurawa Tank, Walagama tank, Weeragoda Tank, Nawakiri tank (In Andal Oya basin) and respective anicuts along the canals of single banking section which has pooling storage of capacity over 100 acre-feet, considering existing guidelines, SOPs, standing orders, and water management practices. Further, the historical details of “Pre-Kanna” and “Kanna” meeting minutes could be considered in preparing the said guideline.

Task 03: Identifying & selecting models (preferably open-source)

Consultant shall identify suitable models for RR, DAT, and OM, prioritizing these models that are compatible and meet the coding requirements, while also analyzing the advantages and disadvantages of each applicable model.

Task 04: Developing an integrated, detailed operation model for SS

The model shall provide respective water requirements at the field canal level under different growing stages with different scenarios as follows;

1. Rainfall – Normal (Average) Condition – Current Climate
2. Rainfall – Below normal (Dry) Condition – Pessimistic Climate Scenario
3. Rainfall – Above normal (Wet) Condition – Optimistic Climate Scenario

The model shall cover in depth on:

- Seasonal allocation (Maha/Yala) for irrigation, drinking water, and other demands
- Hydropower scheduling
- Environmental flows and downstream minimum releases
- Transbasin allocation (quantity and period)

Each Scenario should be tested for the following **Supply Reliability criteria** at the D canal level, respective anicuts level and the canals of single banking sections that has pooling storage of capacity over 100 acre-feet nodes;

- **Irrigation failure** occurs when the supply deficit exceeds 5% of Maha/Yala seasonal demand. It should not exceed 20% occurrence over the modeled period.
- **Significant failure** occurs when the supply deficit exceeds 10% of Maha/Yala seasonal demand. It should not exceed 10% occurrence over the modeled period.
- **Total failure** occurs when the supply deficit exceeds 20% of Maha/Yala seasonal demand. It should not exceed 5% occurrence over the modeled period.

An irrigation failure is assumed to be effectively managed by “tightening up" on water deliveries with no significant losses. For managing significant and total failures, it is required to impose water supply restrictions and restrict serviced areas. Otherwise, it may adversely impact overall agricultural production.

The main skeletal proposed for IOM is shown in **Figure 01**.

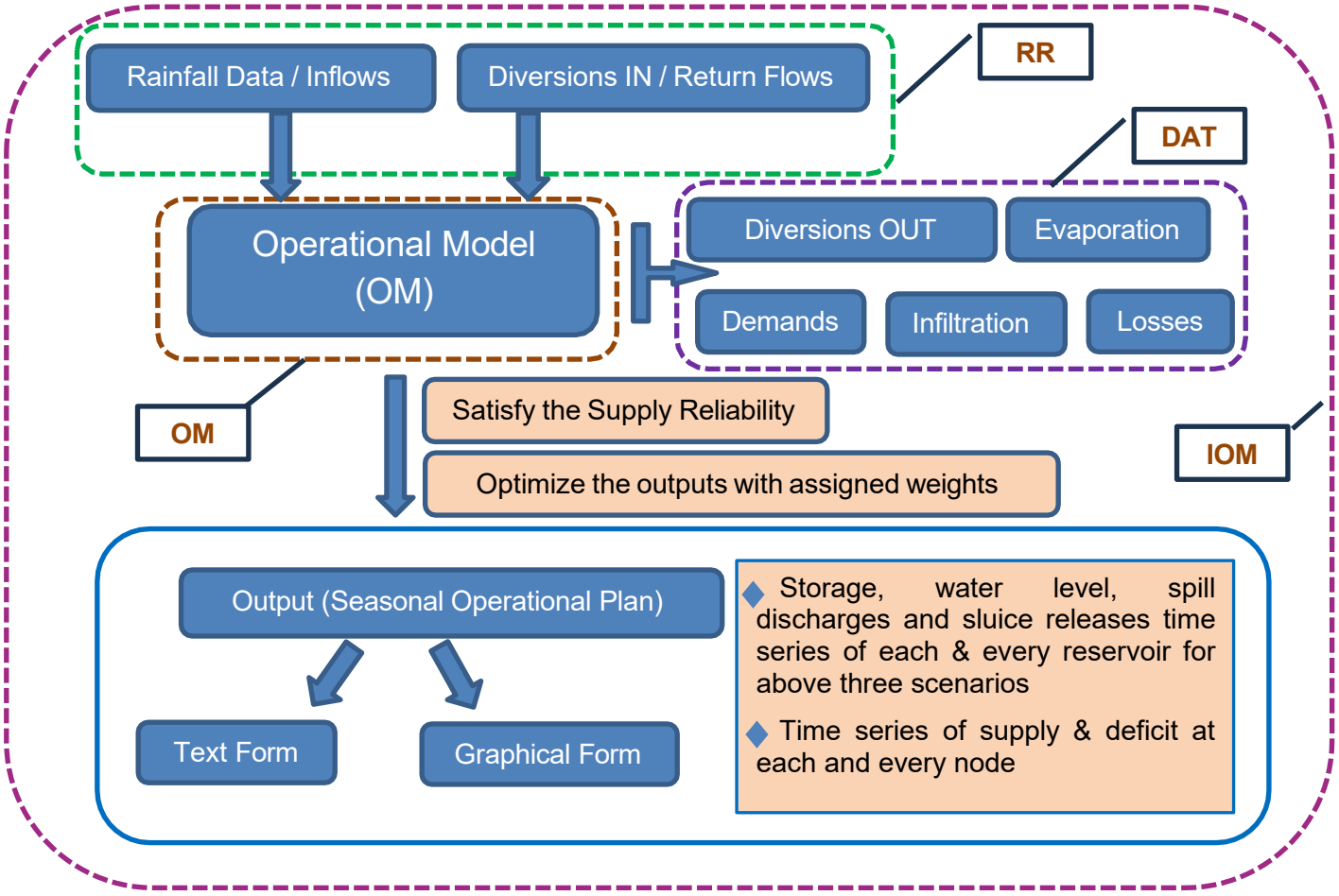

Rainfall Data / Inflows
Diversions IN / Return Flows
RR
DAT
Operational Model (OM)
Diversions OUT
Evaporation
Demands
Infiltration
Losses
OM
Satisfy the Supply Reliability
Optimize the outputs with assigned weights
IOM
Output (Seasonal Operational Plan)
Text Form
Graphical Form
Storage, water level, spill discharges and sluice releases time series of each & every reservoir for above three scenarios
Time series of supply & deficit at each and every node

Figure 01: The main skeletal proposed for IOM

If a new tank is built or a transbasin diversion is added/removed, the model should be modular enough to add/remove nodes up to ten (10) additional nodes without rewriting the core engine. Further, transferring real-time data into the model is essential for short-term forecasting. Therefore, the application of Open API (Application Programming Interface) is required with the consultation of ID. The IOM must allow operators to assign different "weights" at the D canal level during the model run, to ensure the equity of water distribution among different tracts or sectors.

Final versions of models installed in the Workstations which are covered under a three-year maintenance agreement, shall be handed over to ID. Specification of the Workstation shall be proposed and procured by the consultant.

Sub task 4.1: Raw data processing

Hydro-meteorological daily raw data (preferably 30 years) of the Gal Oya basin have to be processed by statistical means to achieve a set of quality homogeneous time series before applying them to the models. The consultant must explicitly state the uncertainty levels in the historical records.

Sub task 4.2: Developing Rainfall Runoff (RR) models (preferably open-source)

Develop daily inflow time series to the SS, Padagoda Tank, Alahene Tank, Malayadi Tank, Aligalge Tank, Himidurawa Tank, Walagama Tank, Weeragoda Tank, Nawakiri Tank (In Andal Oya basin), respective anicuts and the canals of single banking sections using rainfall–runoff (RR) model for a period of 30 years. These RR models should cover the in-basin and transbasin flows. The RR models shall be calibrated and validated by means of the goodness-of-fit, such as the Coefficient of determination, Nash-Sutcliffe Efficiency (NSE), Percent Bias (PBIAS), etc. If a new tank is built or a transbasin diversion is added/removed, the model should be modular enough to add/remove nodes up to 10 additional nodes without rewriting the core engine. Further, transferring of real-time data into the IOM is essential for short-term forecasting. Therefore, application of Open API (Application Programming Interface) with regard to real-time data transfer is required.

Sub task 4.3: Developing Demand Assessment Tool (DAT) (preferably open-source)

Develop daily demand time series for 30 years with respect to the irrigable areas at field canal levels of SS, Padagoda Tank, Alahene Tank, Malayadi Tank, Aligalge Tank, Himidurawa Tank, Walagama Tank, Weeragoda Tank, and Nawakiri Tank (In Andal Oya basin), field canal levels of respective anicuts and the canals of single banking section, using the Demand Assessment Tool (DAT). Demands such as Drinking, Hydropower, Fish farming, etc., have to be calculated with the respective stakeholders, such as the Irrigation Department, NWS&DB, and CEB, etc. Irrigation demands should be decided considering Rotational supply, Demand scheduling, Crop–stage–based allocation, and improved application efficiencies for a cultivation season, with the consultation of the Irrigation Department. Specifically, irrigation demands have to be calculated at Field Canal (FC) levels as indicated in the schematic diagrams/issue trees of the SS with "Social Priority Mapping," which could be used for assigning “weights” during the model optimization process. DAT could be able to run in daily time steps and the results could be interpreted on a daily and weekly basis. If a new tank is built or a transbasin diversion is added/removed, the model should be modular enough to add/remove nodes up to ten (10) additional nodes without rewriting the core engine. Further, transferring real-time data into the IOM is essential with regard to short-term forecasting. Therefore, application of Open API (Application Programming Interface) is required with regard to the real-time data transferring.

Sub task 4.4: Develop an Operation Model (OM) (preferably open-source)

According to the prepared detailed reservoir management and operating guideline under Task 02, an operation model has to be developed for SS, to run in daily time steps, to manage the Seasonal Operation Plans (SOP) for a season (Maha / Yala) at the FC levels with the other respective demand levels in terms of efficient water management. OM could be run in daily time steps, and the results could be interpreted on a daily and weekly basis.

In addition, the OM shall be capable of predicting weekly water requirement by adding short-term rainfall forecast into the model and subsequent changes in water requirements at FC levels and respective other demand levels for the coming week in a different window. The short-term forecasting of weekly water requirement shall be based on the forecasted rainfall by Meteorology Department. The consultant shall develop a methodology to calculate the weekly forecasted water requirements.

If a new tank is built or a transbasin diversion is added/removed, the model should be modular enough to add/remove nodes up to ten (10) additional nodes without rewriting the core engine. Further, transferring of real-time data into the IOM is essential for short-term forecasting.

Therefore, the application of Open API (Application Programming Interface) with regard to real-time data transfer is required.

Sub task 4.5: Integration of the Rainfall–Runoff (RR) model, Demand Assessment Tool (DAT), and Operation Model (OM) with "Role-Based Dashboard" for Integrated Operation Model (IOM) of SS.

These three models shall be integrated in such a way that the operator can easily change the inputs (rainfall, ET, crop type, crop stage, losses, etc), demands, and operational rules by using "Role-Based Dashboard". Hence, a separate "Role-Based Dashboard" has to be developed by the consultant to connect these three models into a single model for easy operation as an Integrated Operation Model (IOM) of SS.

The IOM could be able to run in daily time steps and results could be interpreted in daily and weekly basis in the form of maps, text, tables etc., with the consultation of Irrigation Department (e.g., Storage, water levels, spill discharges and sluice releases time series of each & every reservoir for above three scenarios and time series of supply & deficit at each and every node).

Further, IOM should be capable of short-term planning and forecasting of water allocation with respect to the SOP in a different window. The short-term forecasting of weekly water requirement shall be based on the forecasted rainfall by Meteorology Department. The consultant shall develop a methodology to calculate the weekly forecasted water requirements (as outputs) with a suitable confidence level as suggested by the Consultant. The IOM must allow operators to assign different "weights" at the D canals level to test the fairness of water distribution among different tracts or sectors. If a new tank is built or a transbasin diversion is added/removed, the model should be modular enough to add/remove nodes up to ten (10) additional nodes without rewriting the core engine. Further, the transfer of real-time data into the IOM is essential for short-term forecasting. Therefore, the application of Open API (Application Programming Interface) is required. The consultant shall propose the technical specifications, procure the workstation, install the models, and demonstrate their full operability and functionality at the time of handover. Accordingly, the Consultant can suggest/develop a proper methodology for the sustainability and smooth operation of the models in the future within ID.

Sub task 4.6: Calibration & Validation of IOM

It is required to calibrate and validate the IOM with historical SOPs representing Maha & Yala

seasons using the observed data to satisfy the **supply reliability criteria** at the D canals, respective anicuts and the single banking sections.

Task 05: Preparation of a detailed operation manual along with the Technical Architecture Manual for IOM and training of ID and Ministry officials

The consultant shall prepare a detailed operation manual for IOM for the sustainable use of the models. Further, the Technical Architecture Manual is also to be prepared and included in the detailed operation manual, which shall elaborate on full source-code documentation to ensure ID staff can maintain the system in the long term. Consultant shall organize trainings for 25 Nos of ID & Ministry Engineers on developing and operating the models and the result interpretation. Further, Consultant shall train the officials on add/remove nodes, scripting of rules for future expansions & developments for IOM, which include the changes of inflows, demands, diversions, and SOP optimization, etc., with training materials.

Task 06: Assist ID officials to use IOM for two seasons (Maha & Yala) for water management with a view to effective handing over to ID.

In general, the Director of Irrigation (DI), Ampara, will run the IOM for the preparation of SOP together with the Director of Irrigation (WM). DI Ampara shall call for weekly water panel meetings at his office with Divisional Irrigation Engineers (DIEs) at Ampara, Sammanthurai, Kalmunai, Akkaraipaththu, Pottuvil & Mahaoya together with the stakeholder institutions to take/adjust the decisions of water management for the coming week. The Director of Irrigation (WM) shall facilitate weekly water panel meetings with the guidance of Director General of Irrigation. Hence, Consultant shall support at field level for water management with the results of IOM and the outcome of weekly water panel meetings, permitting the effective handing over to ID.

Task 07: Prepare a TOR and bidding document with the Consultation of ID to procure a Supervisory Control and Data Acquisition (SCADA) system

Consultant shall prepare a TOR and bidding document with the consultation of ID to procure a Supervisory Control and Data Acquisition (SCADA) system at the regional level for real-time monitoring of water management. This includes recommending locations for flow monitoring, mechanized gates, communication and operating system, and on-screen visualization of flow measurements at the Director of Irrigation (DI) (Ampara) and Divisional Irrigation Engineer (DIE) Offices at Ampara, Sammanthurai, Kalmunai, Akkaraipaththu, Pottuvil & Mahaoya. The Integration of "Application Programming Interface (API)" with the SCADA hardware is required

to provide a link directly with the IOM in terms of transferring real-time data. When the SCADA records real-time water levels at reservoirs, the IOM should be capable of updating its forecasted water requirements (Demands) with forecasted rainfall by the Meteorology Department.

3.3 Expected Deliverables

The development of IOM for SS should be incorporated with the following deliverables, as mentioned in **Table 01**. The indicative time frame includes the TRC review period of one (01) week for each and every deliverable.

Table 01: Expected and indicative time Schedule for deliverables

No.	Deliverables	Task	Indicative Time Frame for deliverables from the Commencement of Contract
1	Inception Report		1 month
2	Report on Reviewing the current and planned flow monitoring, rain gauging, and control system	Task 01	2 months
3	Report on detailed reservoir management and operating guidelines	Task 02	2.5 months
4	Report on model selection with prioritizing the identified & proposed models	Task 03	2.5 months
5	Report on raw data processing	Sub Task 4.1	3 months
6	Report on developing daily inflow time series to SS / Scheme Reservoirs using a RR model & handing over the final RR model	Sub Task 4.2	4 months
7	Report on developing a demand assessment tool (DAT) & handing over the final DAT	Sub Task 4.3	4 months
8	Report on developing an operation model (OM & handing over the final OM	Sub Task 4.4	6 months
9	Report on integration of RR model, DAT, and OM with “Role-based Dashboard” for IOM of SS	Sub Task 4.5	6 months
10	Report on Calibration and Validation of IOM	Sub Task 4.6	9 months
11	Final draft report on the detailed operation manual, along with the Technical Architecture Manual for IOM & handing over the final IOM	Task 05	10 months

12	Report on training of ID and Ministry officials with training materials	Task 06	11 months
13	Final TOR and final bidding document to procure SCADA system	Task 07	11.5 months
14	Report on handing over of all collected data, all processed data, all developed models and all GIS shape files, maps, etc.,		12 months
15	Report on effective handing over (checking for Maha & Yala operations with IOM) to ID and the final detailed operation manual, along with the Technical Architecture Manual (Task 05 & 06)		24 months
16	Monthly progress reports		1st week of every month

4 Duration of the Assignment

This assignment consists of two (02) parts.

Part 01: Development of IOM shall be carried out from the date of signing the Agreement – Duration: **12 months**.

Part 02: Effective handing over to ID starts after the completion of Developing IOM, as in the above part 01. Checking for Maha & Yala operations has to be carried out by the Consultant at the field level with ID staff to ensure the capability of ID staff for the operations of IOM in the long term, and to ensure the correctness of the developed IOM in view of effective handing over to ID – Duration: **12 months**.

Hence, the total duration of the assignment is **24 months**.

5 Team Composition & Qualification Requirements for the Experts

Following key/non-key experts should be available in this task team, as in Table 02, with the required experience.

Table 02: Key experts and non-key experts with their experience required for this assignment

Key Position Title	Nos	Minimum Qualification and Professional Experience required	Key Expert Input (Person Months)

Key Experts			
Team Leader **Expected Role:** The Team Leader will lead the assignment and be responsible for planning, coordination, supervision, and timely and satisfactory delivery of the assignment, and duly taking into consideration review comments coordinated by the PMU and report at progress review meetings etc, and for the final handing over	01	•A university degree (UGC recognized) (BSc) in science or equivalent in engineering, hydrology, or water management. •Masters qualification in hydrology, water resources engineering, or water management. •Minimum fifteen (15) years of working experience in project management with extensive knowledge and skills in watershed management, catchment modeling, and different modeling tools. •Excellent capacity to communicate and carry out sectoral and plenary consultations with key decision-makers such as relevant government agencies, key stakeholders, academia, and watershed communities. • Fluent in English language	24
GIS Specialist	01	•A University degree (BSc) (UGC recognized) in engineering, hydrology, or Science. • Masters degree in GIS / Remote Sensing •Minimum Ten (10) years of experience in applications of GIS. Extensive and demonstrated work experience in the application of GIS tools for micro-watershed management, especially integration of models and setting up spatial databases. •Proficiency in basic computer programs (including word processing, database management, spreadsheet applications etc.). •Fluent in English language	12

Modelling Specialist	01	•A University degree (BSc) (UGC recognized) in Science or equivalent in engineering, geography, hydrology, or Agriculture •Masters degree in catchment modeling, Hydro informatics, hydrology, water engineering. •Demonstrated experience in extensive knowledge of hydrological and hydrodynamic modeling tools used in water management, catchment modeling experience with rainfall-runoff modeling. •Experience in developing operation models for water management. • A minimum of Ten (10) years in setting up models for RR models in large river basins with the ability of integrate with other models. • Fluent in English language	18
Hydrology Specialist	01	•A University degree (BSc) (UGC recognized) in Science or equivalent in engineering, geography, hydrology, or Agriculture •Masters degree in hydrology or water resources engineering. • A minimum of Ten (10) years of extensive working experience in data processing & analysis, hydrological modeling, and water management. •Conversant with relevant Policies / Ordinances / Acts on natural resources management of the Government of Sri Lanka. •Computer literacy in spreadsheet applications and statistical software, Automation of forecasting system from data collection to forecast dissemination, write scripts for exchange of data between various formats and models, coupling real-time data for forecast, assist in procuring hardware / software for the forecasting systems. Fluent in English language	12

Software Engineering Specialist	01	•A University degree (BSc) (UGC recognized) in Science or equivalent in Computer Science, Computer engineering, •Masters degree in computer science, electronics and telecommunication, computer science, Hydro informatics, or equivalent •A minimum of ten (10) years of experience in database management, applications for databases, web management, etc. •Extensive experience in scripting using Python or related languages, internet searching, interface designing (Role-based dashboard), and computer programming and web development, etc. •Proficiency in computer programing (including word processing, database management, spreadsheet applications, statistical software, Automation of forecasting system from data collection to forecast dissemination, writing scripts for exchange of data between various formats and models, coupling real-time data for forecast, assisting in procuring hardware/software for the forecasting systems. • Fluent in English language	18
Irrigation Engineering Specialist	01	•A University degree (BSc) (UGC recognized) in Science or equivalent in engineering, geography, hydrology, or Agriculture •Masters degree in hydrology, Irrigation Engineering, Water resources management or equivalent. •Minimum Ten (10) years of working experience in the irrigation sector with extensive knowledge and skills in catchment management, water management, irrigation scheduling, etc. • Fluent in English language	18

Procurement Specialist		• A University degree (BSc) (UGC recognized) in science or equivalent in Business Administration, engineering, Economics, Finance •Masters degree in contract management, or relevant field •Minimum 10 years" experience in procurement, ideally with experience in government, international organizations, or large-scale project environments. • Skills in Project Procurement with EOI, RFP, tender documents, and agreements for major projects. Knowledge on procurement guidelines of the Government of Sri Lanka (GOSL), procurement guidelines of World Bank / ADB, etc., Technical Skills in Contract management, financial/budgetary management, and logistics •Computer literacy in internet searching, MS Office packages, etc. • Fluent in English language.	12
Climate Change Specialist	01	•A University degree (BSc) (UGC recognized) in Science or equivalent in engineering, geography, hydrology, or Agriculture •Masters degree in hydrology, water resources engineering or a relevant field. •A minimum of ten (10) years of extensive working experience in hydrological modeling, Climate analysis, Atmospheric modelling, and conversant with water management with IPCC climatic scenarios. •Conversant with relevant Policies /Ordinances /Acts on natural resources management of the Government of Sri Lanka. • Fluent in English language.	12
Non-Key Experts			
Modeling & GIS officer	01	•A University degree (BSc) (UGC recognized) in engineering, geography, hydrology, or water management. •Minimum Five (5) years of professional experience in GIS, RS, and modeling. •Extensive and demonstrated work experience in the application of GIS tools in catchment management, RR modeling, etc… •Computer literacy in internet searching, interface	18

		designing (Role based dashboard) and computer programing etc. Fluent in English language.	
Project Secretary	01	• A Bachelors degree holder (UGC recognized). •Proficiency in the English language with Five (5) years of experience in government-related projects, Proficiency in the MS Office software package, Project coordinating and office management, Effective communication between stakeholders and the consultancy team, and handling administrative tasks	24
Accounting Assistant	01	• BSc degree in finance, accounting, or a relevant field (UGC recognized). • Minimum of 5 years of experience in a similar capacity in Finance and record keeping, handling day-to-day finance transactions, Budget management, Audit support, and financial analysis	24
Management Assistant	01	• Passes in at least 3 subjects at the GCE AL examination with Computer literacy and proficiency in the MS Office software package. • Assist the secretary and other team members in Document management and office management	24

6 Reporting Requirements and Time Schedule for Deliverables

6.1 Reporting requirements

The reporting language shall be in English, and all deliverables shall be submitted to the Project Director.

Final version of all reports shall be submitted with 10 hard copies and 10 soft copies (In Pen drives) to ID through PD. Final versions of RR model, DAT, OM and IOM models installed in the Workstation which are covered under a three-year maintenance agreement, shall be handed over to ID through PD. The consultant shall propose the technical specifications, procure the workstation, install the models, and demonstrate their full operability and functionality at the time of handover.

- All collected and prepared /processed data shall be submitted with 10 soft copies (In Hard disks), including spreadsheets, databases, GIS data, shape files, maps, and other Data sets, etc., which must be in computer-compatible formats.

- All reports should be easy-to-read layouts, good text, and have helpful illustrations, graphics, charts, schematics, and maps, etc.

- Monthly progress reports shall be submitted to PD with a hard copy and a soft copy at the 1st week of every month.

- All deliverables shall be accompanied with presentations and PD shall arrange the presentations with the participation of TRC members and relevant officers in Irrigation Department and the Ministry to facilitate interaction and easy understanding.

6.2 Time Schedule for Deliverables

The time schedule for the deliverables is indicated in Table **01**. Indicative time frame includes the TRC review time of one (01) week for a deliverable.

7 Payment Schedule

All payments shall be released upon the acceptance of the deliverable by the Technical Review Committee (TRC). TRC will review the deliverables within one (01) week after the submission of the deliverable by the consultant. Indicative time frame includes the TRC review time for the deliverables. The payment schedule is shown in Table **03**.

Table 03: Payment Schedule

No.	Deliverables	Task	Indicative Time Frame for deliverables from the Commencement of Contract	Percentage (%) of total price
1	Inception Report		1 months	10
2	Report on Reviewing the current and planned flow monitoring, rain gauging, and control system	Task 01	2 months	5

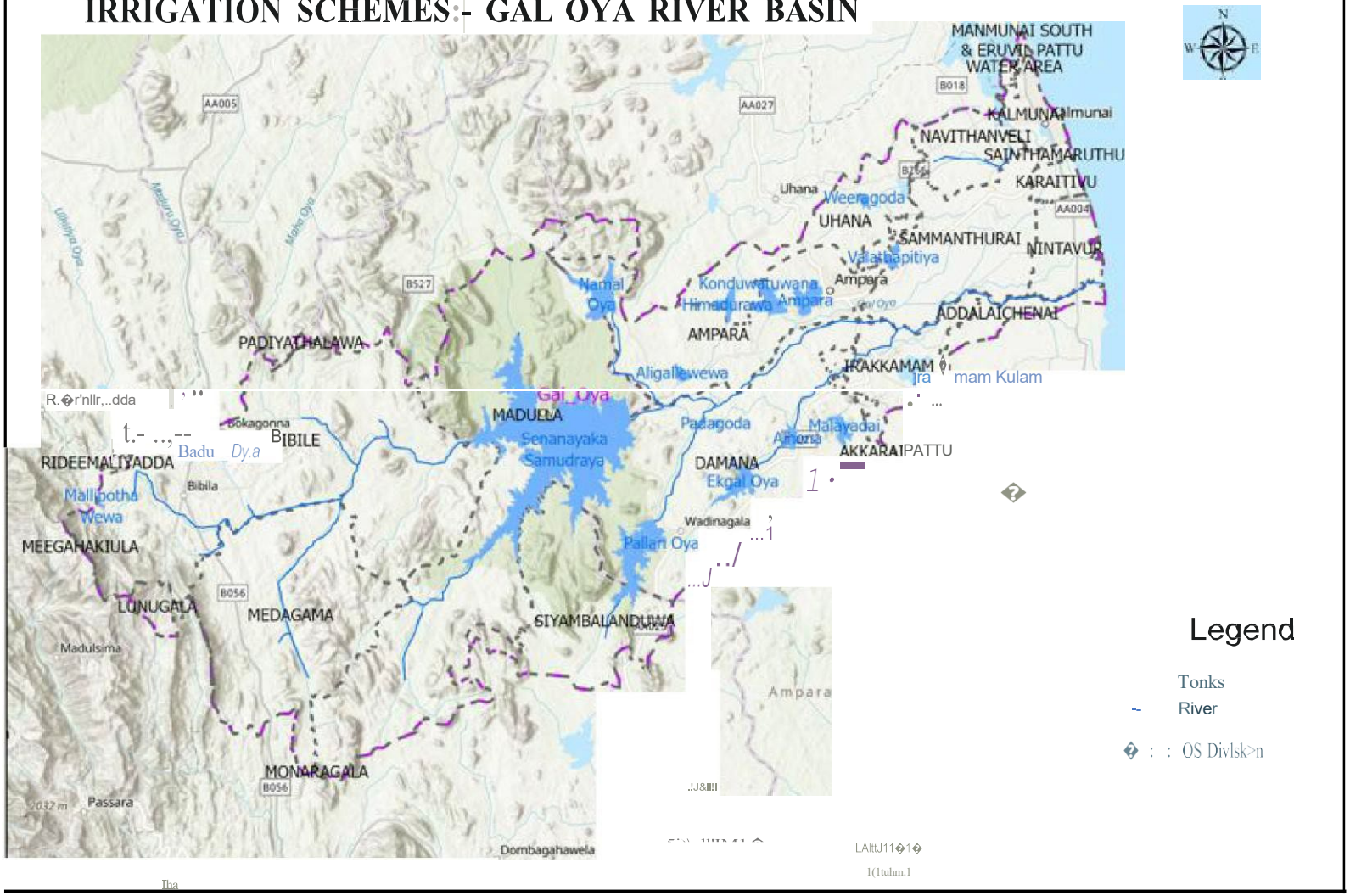
3	Report on a detailed reservoir management and operating guidelines	Task 02	2.5 months	5
4	Report on model selection with prioritizing the identified & proposed models	Task 03	2.5 months	
5	Report on raw data processing	Sub Task 4.1	3 months	5
6	Report on developing daily inflow time series to SS / Scheme Reservoirs using a RR model & handing over the final RR model	Sub Task 4.2	4 months	5
7	Report on developing demand assessment tool (DAT) & handing over the final DAT	Sub Task 4.3	4 months	5
8	Report on developing an operation model (OM) & handing over the final OM	Sub Task 4.4	6 months	5
9	Report on integration of RR model, DAT, and OM with “Role-based Dashboard.” for IOM of SS	Sub Task 4.5	6 months	5
10	Report on Calibration and Validation of IOM	Sub Task 4.6	9 months	5
11	Final draft report on detailed operation manual, along with the Technical Architecture Manual for IOM & handing over the final IOM	Task 05	10 months	5
12	Report on training of ID and Ministry officials with training materials	Task 06	11 months	5
13	Final TOR and final bidding document to procure SCADA system	Task 07	11.5 months	10
14	Report on handing over of all collected data, all processed data, all developed models and all GIS shape files, maps, etc.,		12 months	10
15	Report on effective handing over (checking for Maha & Yala operations with IOM) to ID, and the final detailed operation manual along with the Technical Architecture Manual (Task 05 & 06)		24 months	20
16	Monthly progress reports		1st week of every month	

8 Client's Input

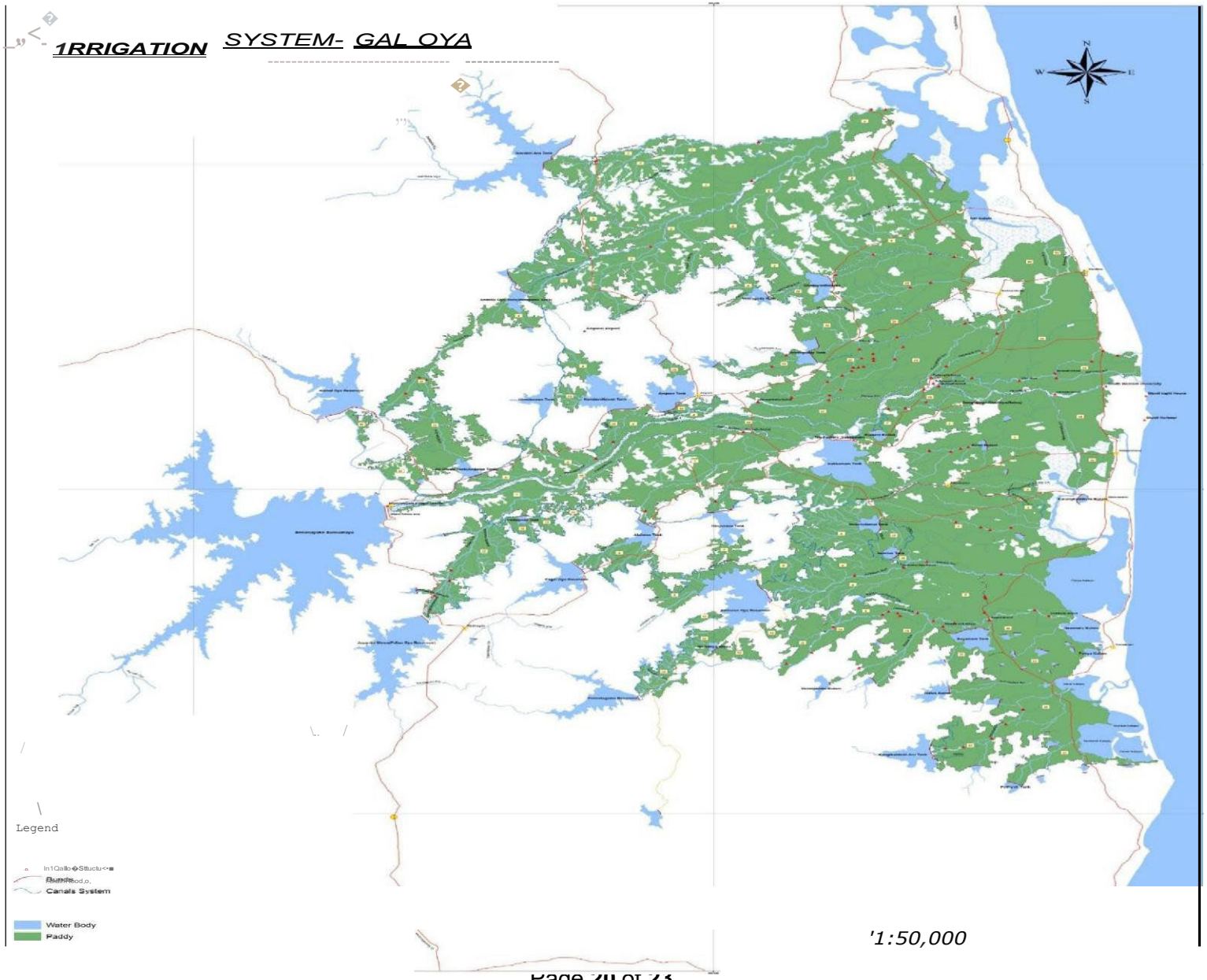
Client (PD, PMU) will facilitate in getting the relevant data (if available) from respective organizations/stakeholders. If there is a payment to be made for acquiring such data, the consultant shall bear the cost. The list of available data in ID is attached as **Annexes 02** (Hydro-meteorological data & Reservoir operation data) **& 03** (Historical Crop types and cropping patterns). Office space with electricity supply will be provided by PD (PMU) with the assistance of ID enabling smooth on the job training for ID and Ministry officials, as well as for effective handing over. All other costs shall be incurred by the consultant for the proper execution and development of the Integrated Operation Model (IOM) for Senanayake Samudraya Scheme in Gal Oya Basin.

9 Ownership and Property Rights

The ownership and the property rights of the developed models, documents, and data are solely vested with ID. No one can make use part or the whole of the said ownership and the property rights without the permission of DGI of ID. The consultant shall propose and develop user access levels and cybersecurity safeguards in consultation with ID officials. These proposals shall be included in the **inception report** for TRC approval.


IRRIGATION SCHEMES:- GAL OYA RIVER BASIN
MANMUNAI SOUTH & ERUVIL PATTU WATER AREA
KALMUNAI
NAVITHANVELI
SAINTHAMARUTHU
KARAITIVU
UHANA
SAMMANTHURAI
NINTAVUR
ADDALAICHENAI
AMPARA
PADIYATHALAWA
MADULLA
BIBILE
RIDEEMALIYADDA
Bibila
MEEGAHAKIULA
LUNUGALA
MEDAGAMA
SIYAMBALANDUWA
MONARAGALA
Passara
Dombagahawela
Ampara
DAMANA
AKKARAIPATTU
Legend
Tonks
River
OS Divlsk>n

1RRIGATION SYSTEM- GAL OYA



'1:50,000

Annex 02

Hydro-meteorological data & Reservoir operation data

Data with Time series

No.	Data type	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
1	Daily Rainfall Data																															
2	Spilling Data of SS																															
3	Sluice Issues of SS																															
4	Tank Return Data of SS																															
5	Water Usage of Gal Oya scheme																															
6	Storage Tanks' Operational Data																															

Data Available

Fixed Data

7 Standing Order for SS

8 Issue Tree

9 Area/ Capacity Curve for SS

10 Standard Operating Procedure for Gal Oya Scheme

11 Main Canals and D- Canals Capacities

12 Soil Data

Annex 03

Historical Crop types and cropping pattern

Data with Time series

No.	Data type	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
1	Kanna Meeting Minutes																															
2	Cropping Calender																															
3	Crop Types																															
4	Cultivation Performance																															

Data Available