

SECTION -5
CHAPTER-I

GENERAL SPECIFICATION FOR SURVEY WORK

Objective

Assess technical feasibility of constructing Weir works along identified reach(s) in Mahi River Near Varnoli Village in Desar Taluka for flood moderation, water storage, groundwater recharge, and river training. By conducting detailed survey investigation for Identifying optimal site(s) having minimal LAQ, adverse social/environmental impacts and maximum benefit-cost ratio.

Scope of Work

The detailed survey work shall include all field investigations, measurements, data collection, mapping, and preparation of survey drawings required for identifying techno-economically feasible location(s) which include planning, design, and construction of the weir and its allied structures. Preparation of DPR with subsequent approvals are also required.

General Experience:

Experience in successfully completing at least one contract of Single Consultancy work of similar nature such as detail survey & investigation, providing techno-economically feasible location(s)(if applicable), Planning, detailed drawings & designs and DPR for work of Dam/Weir/Barrage having Estimated cost of structure not less than 288.00 Crore (considering escalation factor as per table given below) during last 5 (five) financial years.

Year	Financial Year	Multiplying Factor
Base of inviting tender	2026-2027	1.00
-1	2025-2026	1.10
-2	2024-2025	1.21
-3	2023-2024	1.33
-4	2022-2023	1.46
-5	2021-2022	1.61

Standards:

The entire work shall be carried out in accordance with:
Relevant BIS Codes, State Water Resources Department guidelines (GR/Circular), Central Water Commission (CWC) guidelines, Applicable investigation standards and specifications from various other government bodies either state or central government departments.

**Signature of
Contractor**

**Deputy Executive Engineer
Irrigation Project Sub Division No. 21
Vadodara**

**Executive Engineer
Vadodara Irrigation Division
Vadodara**

CHAPTER-II

DETAILED ITEMWISE TECHNICAL SPECIFICATION

DETAILED ITEM WISE TECHNICAL SPECIFICATION

Name of work: Providing Consultancy Services for Construction of New Weir On River Mahi in Desar Taluka, Vadodara District.

Item No. 1: Jungle cutting for preliminary surveys (a) Light jungle cutting (bushes, hedges)

1. Scope of Work

The work shall consist of clearing light jungle, bushes, shrubs, grass, creepers, small plants, and other vegetation required for Approach work , carrying out preliminary survey, leveling, cross sections, contour survey, soil investigation, and alignment marking of the proposed weir site and its appurtenant works.

2. Items Included

Cutting and removing bushes, shrubs, grass, thorny vegetation, and undergrowth. Clearing survey lines, grid points, benchmarks, and instrument stations. Removal of small saplings and plants up to 100 mm girth measured at 1.0 m above ground level. Clearing pathways for movement of survey personnel and equipment. Collection and disposal of cut vegetation at locations directed by the Engineer-in-Charge.

Maintenance of cleared survey lines during the survey period if required. Making an approach for carrying out survey.

3. Method of Execution

Clearing shall be carried out manually using approved tools and equipment. Existing large trees shall not be cut without written approval of the Engineer-in-Charge. Care shall be taken to avoid damage to existing structures, utilities, boundary markers, and environmentally sensitive areas. The ground surface shall be left reasonably clean and suitable for survey operations.

4. Disposal of Materials

Cut vegetation shall be stacked, removed, or disposed of as directed by the Engineer-in-Charge. Burning of vegetation shall not be permitted unless specifically approved by the competent authority.

5. Safety Requirements

Workers shall use appropriate personal protective equipment (PPE). Adequate precautions shall be taken while working on slopes, near water bodies, and in wildlife-prone areas. All applicable labour and safety regulations shall be followed.

6. Mode of Measurement and payment

The payment shall be made in square meter basis for the work completed. The work shall be measured in Square Metres (Sq.m.) of area actually cleared as directed and approved by the

Engineer-in-Charge.

The rate shall include:

Labour, tools, tackles, and equipment.

Cutting, clearing, removal, stacking, loading, unloading, transportation, and disposal of vegetation.

No extra payment shall be made for leads, lifts, or handling of materials.

Item No. 2: FLY Level for connecting and checking the B.M With double levelling.

1. Scope of Work

The work shall consist of establishing, transferring, connecting, and verifying Reduced Levels (R.L.) of Bench Marks from an existing permanent Bench Mark (Poicha(K) Weir) to the proposed survey area by the method of double levelling. Initial Chainage 0.00 m shall be fixed by intimating authority and then survey must be carried out.

2. Method of Execution

Levelling shall be carried out using calibrated Auto Level or Digital Level with suitable levelling staff. The levelling line shall start from a known Bench Mark and terminate at another known Bench Mark or return to the starting Bench Mark. Observations shall be taken in both forward and reverse directions (double levelling) to ensure accuracy. Change points shall be established on firm and stable ground.

All field observations shall be entered in standard level field books with 500 m interval (line). Additional GCP Points at every 500 m interval for conducting Topographical survey using DGPS for River area. All these DGPS GCPs should be evenly distributed over the area in Triangulation pattern. DGPS GCPs should be on Pillars (200mm x 150mm x 750 mm with 12mm rods in centre) or on permanent structures. Reference taken Level- for permanent bench-mark and Post Posting shall be supported by sketches and digitized photographs for completion of Contour Map. DGPS GCPs shall be connected by levelling to the nearest SOI / GTS using digital level for achieving height accuracy of 24 \sqrt{K} mm and Post Posting supported by sketched and digitized photographs for Photogrammetric completion of Base Map. Identify the nearest SOI/GTS BM/PBM with known geodetic coordinates and orthometric height (RL). Plan a static DGPS session on the BM and proposed control points

3. Accuracy Requirements

The permissible closing error shall conform to standard surveying practices and departmental specifications. Any error beyond permissible limits shall require re-observation at the consultant's cost. Necessary arithmetic checks and adjustments shall be carried out before final submission. Check redundant baselines for closure and network integrity.

4. Deliverables

The consultant shall submit:

Field level books. Calculation sheets. Bench Mark Register. RL details of all established Bench Marks. Location plan showing Bench Mark positions. Processed Baseline Reports and adjustment results. Control Network Map showing BM and control points. Digital files: Coordinate files (CSV/KML/DXF).

5. Safety Requirements

Proper precautions shall be taken while working near roads, water bodies, steep slopes, and construction areas. All necessary safety measures and PPE shall be provided by the agency.

6. Mode of Measurement and payment

The work shall be measured in Kilometres (Km.) of double levelling actually completed. The payment shall be made Kilometres (Km.) of double levelling basis for the work completed.

The rate shall include:

Supply and use of all instruments and accessories.

Labour, transportation, supervision, and calculations. Preparation and submission of field books, reports, and drawings in 3 hard Copy and 1 Soft copy. All incidental charges necessary for completion of the work.

Item No. 3: Carrying out Sub soil investigation for Soil Bearing Capacity test with machine drilling of bore holes at specified location including collection of samples, laboratory testing, submitting report including transport and others. (Unit Rate carried out for 10 m. depth of Bore)

1. Scope of Work

The work shall comprise carrying out detailed sub-soil investigation at bank of Mahi River in any type of strata (Soil, Sand, Murrum, Hard and Soft Rock) and available ground condition at specified locations to determine the safe bearing capacity and engineering properties of the soil for foundation design. The agency shall provide all labour, machinery, equipment, transportation, testing materials, and other incidental items necessary to complete the work.

Drilling Bore hole using Rotary/core drilling rig with NX Size triple core barrel (76 mm core Diameter). conducting Standard Penetration Test (SPT) at 1.5 m intervals or as directed by engineer in charge. The scope of work incorporates carrying out drilling 76 mm dia. Holes are to be drilled for collecting soil/ rock samples, on selected sites after careful analysis of L/S & C/S data of the river. The locations of drill holes should also be marked and shown in the drawings.

Type of Drilling: Rotary core drilling with double or triple tube core barrel. Core Size: NX size (\approx 54.7 mm core diameter, \approx 75.7 mm borehole diameter).

Drilling Equipment: Hydraulic or mechanical rotary core drilling rig with necessary accessories. Diamond-tipped NX size core bit. Suitable flushing medium (water, mud, polymer solution) to maintain borehole stability and cool the bit.

Drilling Depth: Drilling Depth at River Bank Shall be 30 m or Up to Suitable Hard Rock in Foundation or directed by Engineer-in-Charge.

Core Recovery: Minimum 70% recovery in hard rock formations.

2. Field Investigation

Setting out borehole locations as directed by the Engineer-in-Charge. Machine drilling of boreholes up to the required depth or refusal strata, whichever occurs earlier. Recording detailed bore logs indicating soil strata, groundwater table, and other relevant observations. Collection of disturbed and undisturbed soil samples at specified intervals and change of strata. Conducting Standard Penetration Tests (SPT) at regular depth intervals as per relevant IS Codes. Proper preservation, labeling, and transportation of samples to the laboratory.

3. Laboratory Testing:

The collected samples shall be tested in GERI / NABL Approved laboratory for determination of: Natural Moisture Content, Specific Gravity, Grain Size Analysis, Atterberg Limits (Liquid Limit, Plastic Limit, Plasticity Index), Bulk Density and Dry Density, Direct Shear Test, SPT Test, Swell Pressure Test, Unconfined Compression Test, Triaxial Shear Test, Consolidation Test, Chemical Analysis of Soil and Water, Any other tests necessary for assessment of foundation characteristics.

4. Analysis and Reporting

Evaluation of Safe Bearing Capacity (SBC) at various foundation depths. Assessment of settlement characteristics and foundation recommendations. Preparation of borehole logs, test results, soil profiles, and groundwater details. Submission of detailed geotechnical investigation report in hard copy and soft copy including design recommendations. Test shall be carried out by GERI / NABL Approved laboratory. The report shall conform to relevant provisions of IS 1892, IS 6403, IS 2131, IS 2720 and other applicable Indian Standards.

5. Measurement and Payment

The payment shall be made Running meter basis for the work completed.

Measurement shall be made in Running meter (RMT) of Bore hole.

The rate shall include:

- Mobilization and demobilization of drilling equipment.
- Borehole drilling, sampling, SPT testing, laboratory testing, casing pipe.
- Preparation and submission of reports in 3 hard copy and 1 soft copy.
- Transportation, labour, tools, plants, safety arrangements, royalties, taxes, and all incidental charges.

No extra payment shall be made for any item required to complete the work satisfactorily

Item No. 4: Carrying out Sub soil investigation for Soil Bearing Capacity test with machine drilling of bore holes at specified location (in big river ex. Narmada) including collection of samples, laboratory testing, submitting report including transport and others.

Technical Specification for Sub-Soil Investigation and Soil Bearing Capacity Test in **Bed of Mahi River.**

1. Scope of Work

The work shall comprise carrying out detailed sub-soil investigation at bed of Mahi River in any type of strata (Soil, Sand, Murrum, Soft and Hard Rock) and available ground condition to determine the safe bearing capacity and engineering properties of the soil for foundation design. The agency shall provide all labour, machinery, equipment, transportation, testing materials, and other incidental items necessary to complete the work.

Drilling Bore hole using Rotary/core drilling rig with NX Size triple core barrel (76 mm core Diameter). conducting Standard Penetration Test (SPT) at 1.5 m intervals or as directed by engineer in charge. Bore Hole should be carried out in River bed of Mahi in any type of strata and available ground condition. The scope of work incorporates carrying out drilling 76 mm dia. Holes are to be drilled for collecting soil/ rock samples, on selected sites after careful analysis of L/S & C/S data of the river. The locations of drill holes should also be marked and shown in the drawings.

Type of Drilling: Rotary core drilling with double or triple tube core barrel.

Core Size: NX size (≈ 54.7 mm core diameter, ≈ 75.7 mm borehole diameter).

Drilling Equipment: Hydraulic or mechanical rotary core drilling rig with necessary accessories. Diamond-tipped NX size core bit. Suitable flushing medium (water, mud, polymer solution) to maintain borehole stability and cool the bit.

Drilling Depth: Drilling Depth at River Bed Should be 20 m. Drilling Should be Done Depth Upto Suitable Hard Rock Foundation or directed by Engineer-in-Charge.

Core Recovery: Minimum 70% recovery in hard rock formations.

2. Field Investigation

Setting out borehole locations as directed by the Engineer-in-Charge. Machine drilling of boreholes up to the required depth or refusal strata, whichever occurs earlier. Recording detailed bore logs indicating soil strata, groundwater table, and other relevant observations. Collection of disturbed and undisturbed soil samples at specified intervals and change of strata. Conducting Standard Penetration Tests (SPT) at regular depth intervals as per relevant IS Codes. Proper preservation, labeling, and transportation of samples to the laboratory.

The contractor shall make his own arrangement of dewatering during drilling of surface and sub surface flow of river and tidal water during currency of drilling operation. The arrangement of disposal of dewatered water shall be made without disturbing adjoining area and component.

Since nature of work in difference situations i.e. carrying out drilling work in river bed the contractor shall have to take necessary precaution against natural calamities viz. floods & tides etc. The department is not responsible for any such happenings.

3. Laboratory Testing

The collected samples shall be tested in GERI / NABL Approved laboratory for determination of Natural Moisture Content, Specific Gravity, Grain Size Analysis, Atterberg Limits (Liquid Limit, Plastic Limit, Plasticity Index), Bulk Density and Dry Density, Direct Shear Test, SPT Test, Swell Pressure Test, Unconfined Compression Test, Triaxial Shear Test, Consolidation Test, Chemical Analysis of Soil and Water, Any other tests necessary for assessment of foundation characteristics.

4. Analysis and Reporting

Evaluation of Safe Bearing Capacity (SBC) at various foundation depths. Assessment of settlement characteristics and foundation recommendations. Preparation of borehole logs, test results, soil profiles, and groundwater details. Submission of detailed geotechnical investigation report in hard copy and soft copy including design recommendations. The report shall conform to relevant provisions of IS 1892, IS 6403, IS 2131, IS 2720 and other applicable Indian Standards.

5. Measurement and Payment

The payment shall be made Running meter basis for the work completed.

Measurement shall be made in Running meter (RMT) of Bore hole.

The rate shall include:

- Mobilization and demobilization of drilling equipment.
- Borehole drilling, sampling, SPT testing, laboratory testing, casing pipe.
- Preparation and submission of reports in 3 hard copy and 1 soft copy.
- Transportation, labour, tools, plants, safety arrangements, royalties, taxes, and all incidental charges.

No extra payment shall be made for any item required to complete the work satisfactorily

Item No. 5: Conducting a detailed bathymetric survey of the river using a calibrated echosounder for the assessment of riverbed morphology, channel geometry and sedimentation characteristics. The work shall include the mobilization and demobilization of suitable survey vessels or boats and all associated survey equipment at site by the contractor. The contractor shall provide all vessels, qualified personnel, tools, shackles, mounting frames, survey instruments, positioning and navigation systems, accessories, consumables, fuel, power supply, and safety equipment necessary for the complete execution of the survey. The survey shall cover the full width and length of the designated river reach using a 5 m x 5 m survey grid, with proper equipment calibration, water level referencing, and quality control procedures. The scope of work also includes processing and analysis of the collected data to generate bathymetric contour maps at 0.5 m vertical intervals, longitudinal (L-section) profiles along the river centerline, and cross-sections at 30 m intervals. All processed data shall be used to develop digital bathymetric models and to evaluate riverbed conditions and sediment deposition patterns. The contractor shall submit all deliverables, complete in all respects, in both hard and soft copies, including reports, drawings, digital models, and raw survey data, in formats acceptable to the Engineer.

The work of Detailed Bathymetric Survey of River suitable for inclusion in consultancy/survey tender documents.

1. Scope of Work

The work shall consist of conducting a detailed bathymetric survey of the designated river reach using a calibrated single-beam or multi-beam echo sounder integrated with DGPS/RTK-GNSS positioning systems. The survey shall be carried out to determine riverbed morphology, channel geometry, bed levels, sediment deposition patterns, and hydraulic characteristics.

2. Mobilization and Demobilization

Mobilization of survey vessels/boats, echo sounder, DGPS/RTK-GNSS equipment, computers, software, power supply systems, communication devices, safety equipment, and all ancillary accessories. Transportation of equipment and personnel to and from the survey site. Arrangement of launching facilities, permissions, and local logistics. Demobilization after successful completion of the survey work.

3. Survey Equipment Requirements

The contractor shall deploy: Calibrated Hydrographic Echo Sounder (Single Beam/Multi Beam). RTK-GNSS/DGPS positioning system with sub-meter accuracy. Data acquisition and

navigation software. Survey-grade laptop/workstation. Water level measuring equipment and staff gauges. Calibration bar/check plate for echo sounder calibration. Communication equipment and safety gear. Survey vessels suitable for river conditions.

4. Pre-Survey Activities

Reconnaissance survey shall be carried out of the 13 km length of Mahi River as directed by Engineer in charge and provide at least 2 feasible locations for proposing the weir structure.

Establishment and verification of horizontal and vertical control points. Installation of temporary benchmark(s) connected to permanent benchmarks. Water level observation arrangements. Echo sounder calibration (Bar Check Test) before commencement of survey operations. Preparation of survey methodology and quality assurance plan.

5. Bathymetric Data Collection

Survey shall cover the 12 km U/S and 1 km D/S of at least 2 Feasible Locations and After confirmation Fetch length survey must be carried out for finalized location. Soundings shall be recorded on a grid spacing of 5 m × 5 m. Continuous depth recording shall be carried out throughout the survey area. Positioning data shall be synchronized with depth measurements. Survey shall include shallow areas, channel margins, islands, shoals, and sediment deposition zones. Adequate overlap between survey lines shall be maintained.

6. Water Level Referencing:

Simultaneous water level observations shall be carried out during survey operations. All bathymetric levels shall be Recorded With respect to the MSL. Corrections for water level fluctuations shall be applied to all recorded soundings.

7. Quality Control and Verification:

Daily calibration of echo sounder. Verification of DGPS positioning accuracy. Cross-check survey lines shall be conducted at suitable intervals. Data validation and removal of spikes, noise, and erroneous readings. Accuracy assessment shall comply with applicable hydrographic survey standards.

8. Data Processing:

The contractor shall process the collected field data including: Depth corrections, Water level corrections, Coordinate transformation, Filtering and editing of erroneous data, Generation of Digital Terrain Model (DTM), Development of Digital Bathymetric Model (DBM), Preparation of contour datasets and survey drawings.

9. Preparation of Bathymetric Contour Maps :

Bathymetric contour maps shall be prepared at 0.50 m contour intervals. Maps shall clearly indicate: River boundaries, Survey grid, Benchmarks, Water levels, Channel features.

Sedimentation zones, Coordinates and north direction.

10. Longitudinal Profiles (L-Sections):

Longitudinal section shall be prepared along the river centerline, Existing bed levels and water levels shall be plotted, Chainages and reduced levels shall be clearly shown, Suitable horizontal and vertical scales shall be adopted.

11. Cross Sections:

Cross-sections shall be prepared at 30 m intervals along the river reach, Additional cross-sections shall be taken at locations showing significant morphological changes, Sections shall include riverbed levels, water surface levels, and bank details.

12. Riverbed Morphology and Sedimentation Assessment:

The contractor shall analyze: River channel geometry, Bed slope variations, Scour and deposition areas, Sediment accumulation patterns, Riverbed irregularities and morphological changes, Storage capacity implications, if required.

13. Deliverables:

The contractor shall submit: 3 Hard Copies

Survey report, Methodology report, Bathymetric contour plans, Longitudinal sections, Cross-sections, Sedimentation assessment report.

1 Soft Copies

Raw bathymetric survey data, Processed survey data, CAD drawings (DWG/DXF), PDF drawings and reports, GIS files (Shape Files/Geodatabase), Digital Bathymetric Model (DBM), Digital Terrain Model (DTM), Coordinate and benchmark details, Survey photographs with geotag photo.

14. Safety Requirements

Provision of life jackets, lifebuoys, first aid kits, and emergency communication equipment. Compliance with all applicable waterway and navigation safety regulations. Safe operation of boats and survey equipment during all survey activities. For any incident occurrence department will not be responsible Since nature of work in difference situations i.e. contractor shall have to take necessary precaution against natural calamities viz. floods etc. The department is not responsible for any such happenings.

15. Mode of Measurement

The payment shall be made in Hactor basis for the work completed.

Measurement of bathymetric survey shall be measured in Hactor.

The rate shall be deemed to include:

- Mobilization and demobilization.
- Supply of boats, echo sounder, DGPS, instruments, software, and accessories.
- All manpower including hydrographic surveyors, boat operators, and data processing specialists.

- Calibration, field survey, data processing, contour generation, profile preparation, reporting, and submission of all deliverables.
- Fuel, power supply, transportation, insurance, safety arrangements, and all incidental expenses.
- Complete execution of the bathymetric survey and submission of approved final reports and drawings in all respects.

Item No.6: Survey by using own DGPS instrument for the topographical and contour survey work in 10x10 mt grid with 0.5mt contour interval, locating all existing features with preparation and submission of survey drawing in A0 size sheet in one Hard & soft copy etc complete.

1. Scope of Work:

The work covers carrying out a topographical and contour survey using Differential Global Positioning System (DGPS) and other total station equipment as required. The survey shall include recording of all ground features, preparation of contour maps at a 0.5 m contour interval on a 10 m x 10 m grid, and submission of survey drawings in A0 size (1 Hard + 1 Soft Copy).

2. Instruments and Equipment:

Survey to be conducted using contractor's own DGPS instrument (dual frequency, geodetic grade, RTK/Static capable) with accuracy:

Horizontal: $\pm 10 \text{ mm} + 1 \text{ ppm}$

Vertical: $\pm 15 \text{ mm} + 1 \text{ ppm}$

Auxiliary instruments like Total Station, Auto Level, Tripods, Reflectors, Staff, etc. shall be used wherever required. All instruments must have valid calibration certificates.

3. Survey Grid and Accuracy Requirements:

Grid Interval: 10 m x 10 m or as directed by the Engineer-in-Charge.

Contour Interval: 0.5 m.

Horizontal Position Accuracy: $\pm 0.10 \text{ m}$

Vertical Elevation Accuracy: $\pm 0.05 \text{ m}$

Benchmark (BM): All levels shall be referred to a permanent GTS Benchmark or established BM with proper description.

4. Survey Procedure:

- **Establishment of Control Points:**

DGPS base station shall be established on a known point or on a new control point coordinated using static survey method. Minimum 2 permanent reference benchmarks (PBMs) to be established on site with proper coordinates and descriptions.

- **Field Data Collection:**

Conduct the topographical survey covering the entire project area at 10 m x 10 m grid spacing. Take additional spot levels at: Sudden changes in ground levels Road crossings, culverts, drains, structures, trees, poles, pipelines, and utilities Boundaries and fence lines Ensure contour points are dense enough to generate 0.5 m contour accuracy.

- **Feature Mapping:**

Locate and map all existing natural and man-made features including: Buildings, roads, culverts, bridges, drainage lines Trees, water bodies, canals, rivers, embankments Overhead lines, poles, pipelines, wells, boreholes All features should be clearly coded and described in the survey database.

- **Leveling and Contour Generation:**

Reduce all levels to a common benchmark.

Contour map to be prepared with 0.5 m contour interval.

Cross-check random points with Auto Level for quality assurance.

5. Data Processing and Drawing Preparation:

All collected survey data shall be processed using standard survey software (e.g., Leica Geo Office, Trimble Business Center, AutoCAD Civil 3D, etc.).

Prepare the following deliverables:

Contour Map with 0.5 m interval, Topographical Plan showing all natural and man-made features

Benchmark Table with coordinates and elevations, Grid points & Spot levels clearly indicated

Drawing scale: 1:1000 or 1:2000 (as directed), North direction, legend, scale bar, grid lines, and benchmark details must be shown.

6. Deliverables:

Drawings: 3 Hard Copy (A0 size) + 1 Soft Copy (AutoCAD .dwg + PDF)

Raw Data Files: DGPS observation files, processed data, CSV or Excel format

Report:

Project description and methodology Control point details (coordinates, elevations)

Equipment used and accuracy achieved Field observation records.

7. Quality Control and Verification:

Minimum 10% of points shall be re-checked randomly by Total Station or Auto Level to verify accuracy.

Any deviation beyond tolerance limits shall result in re-survey at contractor's cost.

8. General Conditions:

Contractor is responsible for transportation, safety, and site clearance for survey operations.

Work shall be executed under supervision of the Engineer-in-Charge.

All costs including manpower, equipment, software, travel, and report preparation are deemed to be included in the quoted rate.

9. Measurement & Payment

Unit of Measurement: Hectare (Ha), as specified in the BOQ.

Payment will be made in Area Covered in Survey in Hectare (Ha).

Item No.7: Preparation of Pre-Feasibility Report (PFR)and Detailed Project Report (DPR) for the proposed Gated or Ungated Weir, including development of preliminary engineering design, preparation of relevant drawings, preparation of detailed project cost estimates and compilation of tender documents for execution of the work under Engineering, Procurement and

Construction(EPC)contract mode, based on the survey data, investigations and studies carried out under other items of this contract, and in accordance with applicable codes, standards and departmental guidelines, complete in all respects and suitable for submission to the concerned authorities for approval and tendering purposes.

Preparation of Pre-Feasibility Report (PFR) and Detailed Project Report (DPR) for Proposed Gated/Ungated Weir

1. Scope of Work:

Reconnaissance survey shall be carried out of the 13 Km length of Mahi River as directed by Engineer in charge and provide at least 2 feasible locations for proposing the weir structure.

The main objective of the study is to prepare Detailed Project Report (DPR) comprising of the following components-

- Survey & Investigation of river on u/s and d/s of centerline
- Geological survey & Investigation including SBP/ABP
- Hydrological Assessment and Design Discharge Estimation for proposed Weir
- Mathematical & Hydraulic Design of proposed Weir
- Preliminary structural Drawings.
- Prepare Detail estimate for EPC Contract
- Prepare DTP for EPC contract
- Evaluation report of EPC Contract

2. Collection and Review of Data

- a. Collection, compilation and review of all available hydrological, topographical, geological, geotechnical, environmental and socio-economic data.
- b. Review of existing reports, maps, satellite imagery, survey records and departmental records relevant to the project.
- c. All 2 location shall be studies with respect to hydrological & Hydraulic aspects and B/C ratio data.

3. Pre-Feasibility Report (PFR)

- a. Assessment of alternative weir locations and preliminary site suitability.
- b. Preliminary assessment of water availability, catchment characteristics and river morphology.
- c. Evaluation of gated and ungated weir options.
- d. Preliminary estimate of storage potential, command benefits and project viability.
- e. Preparation and submission of Pre-Feasibility Report including recommendations.

4. Engineering Surveys and Investigations

- a. Utilization of topographic survey, DGPS survey, Total Station survey, bathymetric survey and other investigations carried out under the contract.
- b. Analysis of geotechnical and geological investigation data.
- c. Establishment of design parameters based on collected field data.

5. Hydrological Assessment and Design Discharge Estimation for proposed Weir.

- a. Hydrological analysis including rainfall-runoff assessment and flood frequency studies.
- b. Determination of design flood, HFL, MWL and tail water levels.
- c. Hydraulic design studies for river training works, energy dissipation arrangements and flow regulation structures.
- d. Water balance studies and sedimentation assessment.
- e. All the required data collection shall be done by contractor from relevant department / offices.

❖ Data collection:

This shall involve gathering historical and current data on rainfall, river flow, and meteorological conditions in the project area. This data shall be essential for understanding the local hydrological regime and developing a reliable hydrological model. Some of the specific data that shall be collected include but not limited to:

- Rainfall data from rain gauges and satellite observations
- River flow data from gauging stations
- Meteorological data from weather stations, including temperature, humidity, wind speed and direction, and solar radiation

❖ Site characterization:

This shall involve conducting a detailed site visit to understand the local topography, river characteristics, and geological features. The information shall be used to develop the hydrological model and identify potential sources of data, such as river gauging stations and rainfall monitoring stations.

❖ Hydrological modelling:

This shall involve developing a hydrological model for the project site. The model shall simulate the rainfall-runoff processes, considering factors like land use, soil types, and land cover. The model shall be used to generate runoff estimates for various rainfall events and to assess the impact of climate change on future hydrological conditions.

❖ Rainfall-runoff analysis:

This shall involve analyzing historical rainfall data to determine rainfall patterns, intensity, and variability. This data shall combine with the hydrological model to estimate runoff during various rainfall events. The runoff estimates shall be used to assess the flood risk in the area and to design the weir capacity.

❖ Flood frequency analysis:

This shall involve employing statistical methods to assess the frequency and magnitude of floods in the area. The design flood event is determined, which serves as a basis for the weir's capacity. The design flood event shall typically be selected based on a specified return period, such as 100 years or 500 years.

❖ **Flow duration curve:**

This shall involve developing a flow duration curve to understand the distribution of flow rates over time. This curve shall aid in identifying critical flow rates for the weir's design, such as the minimum flow rate and the maximum flow rate.

❖ **Design discharge estimation:**

This shall involve calculating the design discharge that the weir should be capable of handling to meet project objectives. This design discharge shall be based on the flood frequency analysis and other factors, such as the desired level of protection and the economic consequences of flooding.

❖ **Report generation:**

This shall involve compiling all findings and analysis into a comprehensive report that includes the hydrological assessment, design discharge calculations, and relevant data. The report should also include recommendations for the design and capacity of the Weir based on the hydrological assessment. These recommendations should be in line with project objectives and safety considerations.

6. Preliminary Engineering Design

- Preparation of Preliminary design for gated or ungated weir structure.
- Design of foundation system based on geotechnical investigation.
- Design of piers, abutments, raft, glacis, cutoff walls, floor protection and energy dissipation arrangements, Flood protection work.
- Design of gates, hoisting arrangements and mechanical components wherever applicable.
- Design of approach roads, inspection paths and ancillary structures.
- Structural analysis and stability analysis against overturning, sliding, uplift pressure and seismic forces.
- Seismic parameters shall be considered while designing.

7. Preparation of Drawings

- General layout plan.
- Index plan and location plan.
- Longitudinal section and cross sections.
- Gate and mechanical equipment drawings.
- River training and protection work drawings.
- Construction staging drawings and other necessary drawings.

8. Detailed Cost Estimates

- Preparation of quantity calculations based on approved drawings.
- Preparation of abstract cost estimate, detailed estimate and project cost summary.
- Preparation of rate analysis for non-scheduled items, if required.

9. Environmental and Social Assessment

- Identification of environmental impacts.
- Preliminary environmental management measures.
- Assessment of land acquisition and rehabilitation requirements, if any.

10. DPR Preparation

- Compilation of all survey data, investigations, studies, designs and estimates.
- Preparation of comprehensive Detailed Project Report (DPR).
- Incorporation of comments from departmental authorities.
- Submission of final DPR in hard and soft copies suitable for administrative approval, technical sanction and tendering.

11. Tender Documentation for EPC Mode

- Preparation of Notice Inviting Tender (NIT).
- Preparation of EPC tender documents.
- Preparation of Employer's Requirements.
- Preparation of technical specifications, special conditions of contract and bill of quantities.
- Preparation of bidding schedules and evaluation criteria.
- Uploading DTP of EPC Contract Tender
- prequalification analysis of EPC Tender.

12. Deliverables

- Pre-Feasibility Report (PFR).
- Draft DPR.
- Final DPR.
- Design calculations.
- Detailed drawings in AutoCAD and PDF formats.
- Cost estimates and quantity calculations.
- EPC tender documents.
- Evaluation of EPC tender documents.
- All supporting studies, reports and digital data.

13. Applicable Codes and Standards

All works shall conform to the latest applicable provisions of IS Codes, BIS Standards, CWC Guidelines, Ministry of Jal Shakti Guidelines, State Government norms and departmental specifications applicable to weir design and construction.

14. Measurement and Payment:

The item shall be measured on Job work for complete preparation, submission and approval support of PFR, DPR, drawings, estimates and EPC tender documents.

Rate include:

The rate shall include all manpower, engineering services, software, computations, office expenses, travel, report preparation, printing, submission, revisions and all incidental charges required for completion of the work in all respects

Item No.8: Providing Land Acquisition (LAQ) consultancy services for all land and assets falling within the submergence area of the proposed weir. The scope includes side identification and demarcation of the submergence limits,

verification of land records, preparation of cadastral and submergence maps, and preparation of schedules of affected land parcels, structures, and assets. All deliverables shall be submitted complete in all respects in both hard and soft copies.

1. Scope of Work

A. Collection and Verification of Revenue Records

- Collection of village maps, cadastral maps, Record of Rights (RoR), 7/12 extracts, Village Form No. 6, 8A and other relevant land records from concerned revenue authorities.
- Verification of ownership details, survey numbers, block numbers, land classification and land use.
- Identification of Government land, private land, forest land and other categories of land falling within the project influence area.

B. Delineation of Submergence Area and Area required for Weir construction

- Determination of Full Reservoir Level (FRL), Maximum Water Level (MWL) and other design levels based on approved project data.
- Superimposition of submergence levels on topographical survey data and contour maps.
- Identification and demarcation of permanent and temporary submergence areas.
- Preparation of village-wise and survey-wise submergence statements.

C. Field Survey and Demarcation

- Joint field verification of affected areas using DGPS, Total Station and other suitable survey instruments.
- Demarcation of submergence boundaries on ground.
- Establishment of reference pillars, benchmarks and control points wherever required.
- Preparation of field measurement records and survey sheets.

D. Cadastral Mapping

- Digitization and geo-referencing of village cadastral maps.
- Overlay of submergence limits on cadastral maps.
- Preparation of survey number-wise affected area maps.
- Preparation of GIS-based land acquisition maps and database.

E. Inventory of Affected Land Parcels

- Identification of all affected survey numbers and land parcels.
- Measurement and calculation of affected area for each land parcel.
- Classification of affected land as irrigated, non-irrigated, agricultural, residential, commercial, industrial, forest or Government land.
- Preparation of village-wise and survey-wise schedules of affected lands.

F. Inventory of Structures and Assets

- Identification and enumeration of residential, commercial and institutional structures falling within the submergence area.
- Inventory of wells, bore wells, tube wells, pump houses, compound walls and other immovable assets.
- Enumeration of trees, crops, orchards and plantations.
- Preparation of structure and asset registers with photographs and geo-coordinates.

G. Preparation of Land Acquisition Schedules

- Preparation of survey number-wise land acquisition schedules.
- Preparation of ownership schedules and area statements.
- Preparation of village-wise abstract and detailed land acquisition statements.
- Preparation of compensation assessment data as per prevailing Government guidelines.

H. GIS Database and Digital Mapping

- Development of GIS database containing land parcels, ownership details and asset inventory.
- Preparation of geo-referenced digital maps compatible with departmental GIS platforms.
- Integration of survey, cadastral and submergence data.

I. Coordination with Revenue Authorities

- Liaison and coordination with Revenue Department, Land Acquisition Officer and other concerned authorities.
- Participation in joint inspections, verification meetings and site visits.
- Incorporation of observations and corrections suggested by authorities.

J. Reports and Documentation

- Preparation of Draft Land Acquisition Report.
- Preparation of Final Land Acquisition Consultancy Report.
- Preparation of village-wise land schedules, asset schedules and summary statements.
- Submission of all supporting calculations, maps, field records and survey data.

K. Deliverables

- Geo-referenced cadastral maps.
- Submergence area maps.
- Village-wise land acquisition plans.
- Survey number-wise affected area statements.
- Ownership schedules.
- Structure and asset inventory registers.
- GIS database and digital mapping files.

- Draft and Final Land Acquisition Consultancy Reports.
- Joint measurement sheet of entire submergence area
- All reports, maps and drawings in hard copy and editable soft copy formats.

L. Applicable Standards

All works shall be carried out in accordance with the prevailing provisions of the Land Acquisition, Rehabilitation and Resettlement Act, applicable State Government Revenue Rules, Survey Manual, Irrigation Department Guidelines and other relevant statutory provisions.

2. Measurement and payment:

The item shall be measured on job work complete land acquisition consultancy services including surveys, verification, mapping, inventory preparation, reporting and submission of all deliverables.

Rate include:

The rate shall include all manpower, survey equipment, GIS software, transportation, liaison work, data collection, map preparation, report preparation, printing, binding, submission of hard and soft copies and all incidental expenses required for completion of the work in all respects.

**Signature of
Contractor**

**Deputy Executive Engineer
Irrigation Project Sub Division No. 21
Vadodara**

**Executive Engineer
Vadodara Irrigation Division
Vadodara**

Schedule of Time for Activities

Sr. No	Description	Timeline from the award of Work order	Cumulative Timeline
1	Completion of prefeasibility survey & Submission of prefeasibility survey report for weir at minimum 2 location on the river Mahi and approval of finalized Location	30 days	30 days
2	Completion of detail survey & hydrological design and submission of DPR of proposed weir at finalised location	40 days	70 days
3	Preparation of detail estimate proposal for EPC contract and getting administration approval & Technical Sanction of project. Also Submission of LAQ Demarcation on JM Sheet.	50 days	120 days
4	Preparation, approval & Uploading DTP for EPC Contract of project	20 days	140 days
5	Evaluation of tender & approval of tender for EPC contract for Project (Excluding Tender floating period)	40 days	180 days

Conditions: -

- 1) After submitting pre-feasibility reports for all the techno-economically feasible location(s), after finalizing by the competent authority, the bidder has to start work of detailed Design and Estimate for approved location immediately.
- 2) After submitting Detailed Design and Estimate for Admirative approval if any remarks received from the competent authority, then the bidder must have to comply as soon as possible.
- 3) After receiving administrative approval, the bidder has to submit the detailed estimate and design for Detailed Technical Sanction within the remaining days as mentioned in the above table point No.3. if any Remarks received from competent authority, then the bidder must have to comply as soon as possible.
- 4) After receiving Detailed Technical Sanction Approval from competent Authority, the bidder has to submit Draft tender papers immediately. if any Remarks received from competent authority, then the bidder must have to comply as soon as possible.
- 5) Bidder has to perform each activity within time limit as mentioned in the above table. If bidder fails to do so the Liquated Damage clause will be applied as mention in SBD.

**Signature of
Contractor**

**Deputy Executive Engineer
Irrigation Project Sub Division No. 21
Vadodara**

**Executive Engineer
Vadodara Irrigation Division
Vadodara**