Government of Western Australia
Department of Transport
and Major Infrastructure

Empowering a thriving community

Generic Hydrographic Surveying Scope

Generic Hydrographic Surveying Scope

Prepared for Department of Transport and Major Infrastructure (DTMI)

Prepared by W Gardiner & T Hunt of M P Rogers & Associates Pty Ltd

Date 15/05/2025

Version control

Version No.	Date	Prepared by	Revision or issue descriptions	Issues to
Draft	10/04/2025	M P Rogers & Associates	Combined Draft for DoT review.	DoT
0	15/05/2025	M P Rogers & Associates	Updated with Client comments and issued for Client use.	DoT
1	23/06/2025	DoT	Additional updates from internal review	DTMI

Amendment record

This guidelines document is reviewed to ensure its continuing relevance to the systems and process that it describes. A record of contextual revisions is listed in the following table.

Page No.	Context	Revision	Date

Contents

Note

[It is envisaged that this scope may be used in conjunction with the UAV/drone survey specification, which can be repurposed as a scope. Combining this monitoring is likely to increase usable results and produce potential cost savings compared to completing them separately. This combination would require modification of this scope to include the UAV/drone survey requirements. The UAV/drone survey specification is available on DoT's website.

There is a possibility of cost sharing if surveys can be completed together with other costal managers. The LGA is encouraged to consult further with DoT to discuss their surveying capacity and/or history, as they regularly complete hydrographic surveying of coastal areas around the state.]

Formatting Key

[Throughout this template three text colours have been used to distinguish between the following items.]

1. Recommended content.
2. [Guidance notes for the user to be deleted prior to use.]
3. Example text to be edited by the user prior to use.

Conditions of Use

The Maritime Directorate of DTMI provides this coastal monitoring template for use by coastal managers subject to the following Conditions of Use:

1. This template is provided in good faith and believed to be suitable to enable a coastal manager to apply and amend where directed to fit the purpose described. The Department does not provide any warranty as to the accuracy of any information therein nor as to its reliability. No person or corporation should act solely on the provided information without considering, and, if necessary, seeking verification of the provided information from an industry expert on the topic.
2. Neither DTMI nor any member officer or employee undertakes responsibility in any way whatsoever to any person or corporation in respect of the information provided and any new information attained after using this template, including any errors, omissions, and/or damages therein however caused, whether through negligence or otherwise.
3. DTMI and all its member officers and employees expressly disclaim all and any liability to any person or corporation into whose hands the provided information and any new information attained after using this template may come, whether as purchased or otherwise, in respect of anything and of the consequences of anything done or omitted to be done by any such person or corporation in reliance in whole or part upon the whole or any part of the information provided.
4. If this template supplied is used in any publication, the Department shall be acknowledged as a contributing party in respect to procurement of the service published or reported.

Aim / Objectives

[A hydrographic survey aims to map the level or surface of the seafloor in nearshore and offshore areas. The survey can be used for a range of objectives including the following.

- Produce feature and contour survey plans and maps of a nearshore area.
- Produce bathymetric Digital Elevation Models (DEMs) and point clouds of a nearshore area.

Using these surveys and outputs the following tasks can be completed, especially when combined with a terrestrial survey.

- Determine the baseline levels of a seafloor.
- Assist with the design or maintenance of a structure.
- Determine sediment budgets through repeating surveys.
- Determine sediment movements through repeating surveys.

An initial survey would allow for baseline levels to be captured while repeating a survey will allow for changes in the seafloor to be identified and sediment movements calculated. Survey frequency will determine what changes can be observed. Seasonal variation needs to be considered and may be observable if surveys are repeated every 6 months. Longer term changes can begin to be observed following at least 12 months of surveying.

Timing of a survey will depend on the coastal manager's requirements. It is recommended that surveying is repeated at the same time of year for assessing longer term change, such as the end of winter each year.

The LGA will need to determine such requirements for their survey program and update this scope as required. This may include coinciding with other monitoring such as UAV/drone surveying if applicable.

Present required data and desired outcomes from the surveying below.]

The aim of a hydrographic survey is to map the surface of the seafloor for the [LGA to confirm objectives e.g. design a coastal protection structure or assess long term changes]. The objectives and purpose of this hydrographic survey are as follows.

- Identify the existing levels of the seafloor (bathymetry).
- Provide data as close to shore as possible.
- Identify changes in bathymetry between surveys. [If applicable.]
- Provide point clouds and DEM outputs for the required area. [If applicable.]
- Provide survey transects. [If applicable.]
- Provide difference plots of changes between current and previous surveys. [If applicable.]
- Provide sediment volume and movement estimates. [If applicable.]

[The LGA is to include and remove objectives as required.]

Extent

[Provide a map outlining the area to be surveyed, coordinates of extents could also be included.

It is expected that surveys may be undertaken in areas where the CHRMAP has identified a high risk of erosion and danger to assets, or ongoing change.

The seaward extent of the survey should ideally extend beyond the depth of closure to capture the most prevalent areas of sediment movement in the area.

If profile surveys are required, their location should be included in this section. The location of profile surveys is generally selected to represent the relevant shoreline sectors and directly in front of at-risk assets. Profiles can be extended further out to ensure that the depth of closure is reached.]

The LGA manages approximately XX km of coast, stretching from XX to XX. Within this section of the coast, the LGA is specifically monitoring the whole coastline / the following areas / is planning on constructing coastal structures in the following areas.

- Area one. [Include the LGAs priority areas]
- Area two.
- Area three.

The location of these areas can be found in the following figures.

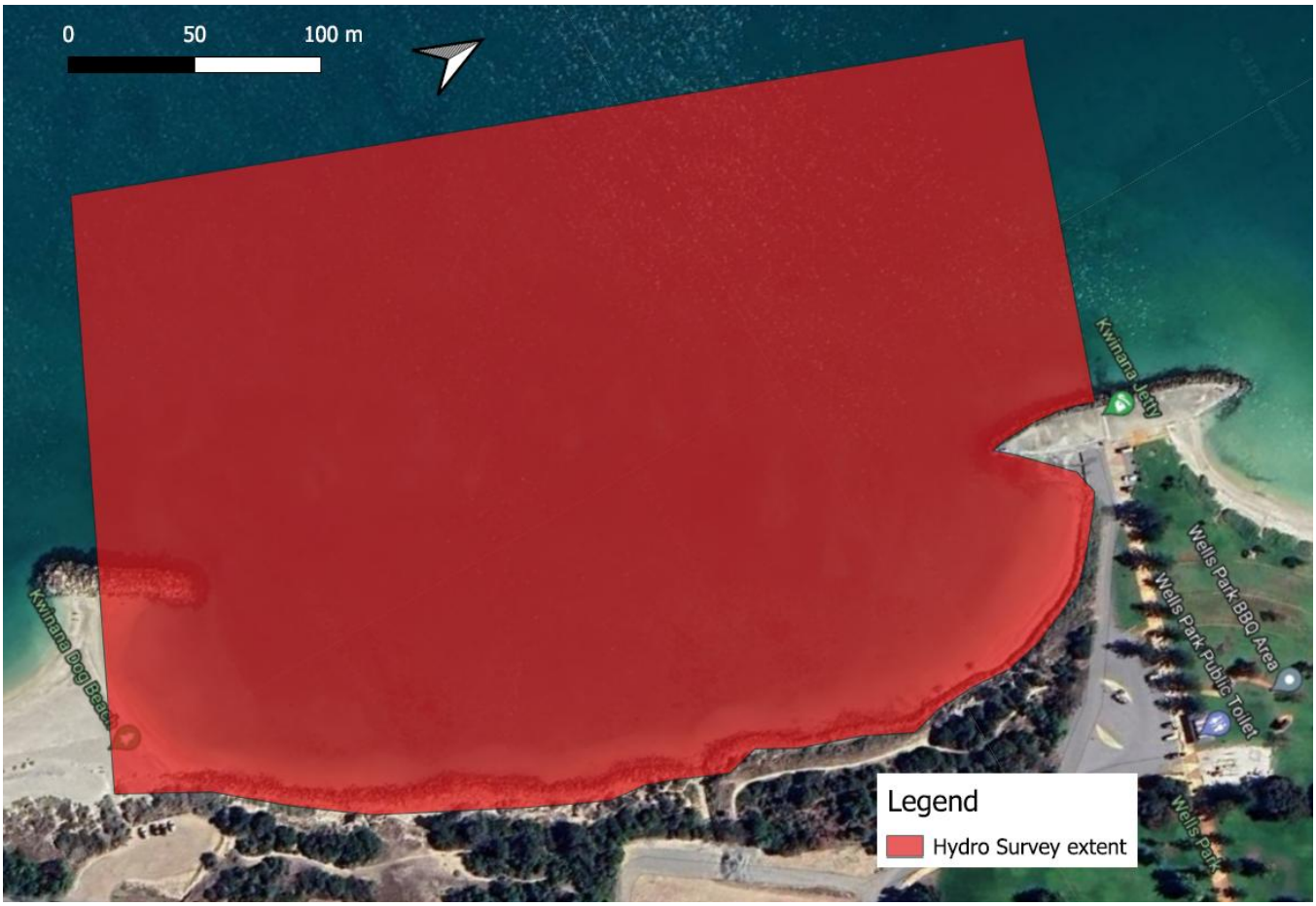

Figure 1 Example hydrographic survey extent. [Example location at Kwinana Beach from City of Kwinana CMAP.]

[Include other areas]

[If applicable.] As part of the monitoring works, profile surveys are to be extracted from survey data. Across the LGA's coastline, XX survey profile locations have been selected. The survey transects extend to an approximate depth of XX to capture key areas of sediment movement . The location of these profiles is presented in the following figure and table.

Figure 2 Example Profile Survey Locations. [Example profiles from the City of Kwinana CMAP. These existing transects have a substantial record for comparison.]

Table 1 Example Profile Survey Locations. [Example profiles from the City of Kwinana CMAP.]

Profile Name	General location	Start		End	
		Easting	Northing	Easting	Northing
AT11	Kwinana Beach South	382902.38	6431349.76	381923.65	6431554.91
PSM158	Wells Park	383015.99	6431617.42	382069.46	6431939.37
PSM159	Kwinana Beach Central	383093.74	6431861.35	382136.72	6432150.63
PSM160	Kwinana Beach North	383154.22	6432164.54	382187.46	6432419.40
PSM161	James Point 1	382821.45	6433993.10	381821.68	6433997.49
PSM162	James Point 2	382909.37	6434239.21	382003.27	6434661.77
PSM163	James Point 3	382934.58	6434358.63	381972.18	6434629.48
PSM164	James Point 4	383126.89	6434613.63	382270.36	6435129.33
PSM165	Horse Beach South	384120.35	6436146.89	383190.14	6436513.34
PSM166	Horse Beach North	384163.65	6436230.66	383230.39	6436589.25
PSM167	Challenger Beach South	384559.90	6438520.86	383574.56	6438351.57
PSM168	Challenger Beach North	384552.09	6438707.72	383560.60	6438579.27

Coordinates in GDA2020 MGA Zone 50.

Background

[Provide brief background for each area if required, including information such as access requirements and any other relevant information the LGA can provide.

The background of an example area is included below.]

The areas to be surveyed, identified in the figures above are outlined below.

Area One Example

This nearshore area at Kwinana Beach covers an identified coastal erosion hot spot and the City intends to monitor this area for ongoing change. Combining this with surveying of the seawall will also provide a clear baseline survey for this area and assist with any future management of the seawall.

[Include other areas.]

Tasks

[The tasks outlined in this section detail the required components of the surveys.]

The following tasks are required to be completed by the Consultant as part of the surveys.

1. Task 1 – Undertake Surveys.
2. Task 2 – Data Processing, QA/QC, and Survey Supply.
3. Task 3 (Provisional) – Additional Post-processing.

Task 1 – Undertake Survey

[The survey should be undertaken by a licensed surveyor with appropriate qualifications and experience. The surveyor should be familiar with the scope and data required.

It is recommended that the Geocentric Datum of Australia 2020 (GDA2020) and the Australian Height Datum (AHD) are used for the horizontal and vertical datums respectively.

DoT hydrographic survey practices often capture surveys in local Chart Datum (CD) or Lowest Astronomical Tide (LAT). This limits the availability to easily compare to terrestrial surveys. As such it is recommended all monitoring surveys are undertaken in AHD. To allow comparison to previous surveys a reference detailing where LAT and CD lie relative to AHD should be included.

It is expected that hydrographic surveys are to include a full bathymetric contour survey plan, point cloud and DEM surface for each subject area.

The surveyors could use boats, kayaks or unmanned surface vehicles (USV) with single beam, multi beam or side scanning sonar to conduct the survey.]

The Consultant is required to undertake hydrographic surveys of the required areas. Ensuring that a full bathymetric contour survey plan, point cloud and DEM surface are recorded. The following key components should be considered when conducting the survey.

- Conduct the hydrographic survey during times of higher tides to ensure that as much of the area is recorded as possible during the survey.
- Use the Geocentric Datum of Australia 2020 (GDA2020) and the Australian Height Datum (AHD) for the horizontal and vertical datums respectively.
- Complete the survey in low winds and wave conditions to improve accuracy.

Task 2 – Data Processing, QA/QC, and Survey Supply

[Provide a description of the required outputs from the survey.]

The Consultant is to process the data and provide it to the LGA in appropriate outputs. The post-processing of hydrographic spatial data shall allow for provision of mean depth results as well as shoal depth results.

As a minimum, the following should be provided in AutoCAD DWG, xyz text file and PDF format.

- A bathymetric contour survey plan.
  - Include a reference detailing where LAT and CD lie relative to AHD.
- High-resolution point cloud and DEM. [If applicable.]
- 3D spatial data of the survey points.
- QA/QC results of data to document survey accuracy.

Task 3 (Provisional) – Additional Post-processing

[Depending on the requirements of the LGA, the surveyor could be requested to provide additional deliverables from post-processed data. Common additional deliverables could include the following.

- Profile surveys.
- Estimates of sediment volumes.
- Heat maps of change if previous surveys are available.
- Sediment movement volumes if previous surveys are available.
- Combined the terrestrial and hydrographic survey.

If combined with a topographic survey, the data can provide more information to assist the LGA.

Post-processing may increase the cost of works and the LGA will need to determine their requirements and adjust the scope as required.]

The Consultant is to combine the topographical with the hydrographic survey. This combined survey will need to be compared to the previous combined surveys (supplied).

From the combined survey the following deliverables will be required to be produced and provided in AutoCAD DWG, xyz text file and PDF format where appropriate.

- A combined topographical and hydrographic contour survey plan.
  - Include a reference detailing where LAT and CD lie relative to AHD.
- Profile surveys. [The location of these profiles should be included in the extent section if required.]
- Sediment volume estimates.
- Heat map of elevation changes between surveys.
- Volumes of sediment movement, based on changes between surveys.

[The LGA will be required to determine their requirements and adjust as required.]

Methodology

[Provide a brief overview of a survey methodology. The LGA should be cautious when prescribing a methodology as it may lead to additional cost and complications. The following methodology should be used as a guide.]

The Consultant is to develop a methodology for the hydrographic survey to be approved by the LGA. All surveying must adhere to IHO S-44 standards (extract in the below Table), with an indication as to which order of survey will be nominated by the Consultant. These standards are available from IHO.

Table 2: Snippet of IHO S-44 Minimum Bathymetry Standards, order of survey (sourced from the International Hydrographic Organisation).

Reference	Criteria	Order 2	Order 1b	Order 1a	Special Order	Exclusive Order
Chapter 1	**Area description** (Generally)	Areas where a general description of the sea floor is considered adequate.	Areas where underkeel clearance is not considered to be an issue for the type of surface shipping expected to transit the area.	Areas where underkeel clearance is considered not to be critical but features of concern to surface shipping may exist.	Areas where underkeel clearance is critical	Areas where there is strict minimum underkeel clearance and manoeuvrability criteria
Section 2.6	**Depth THU** [m] + [% of Depth]	20 m + 10% of depth *Ba5, Bb2	5 m + 5% of depth *Ba8, Bb3	5 m + 5% of depth *Ba8, Bb3	2 m *Ba9	1 m *Ba10
Section 2.6 Section 3.2 Section 3.2.3	**Depth TVU** (a) [m] and (b)	a = 1.0 m b = 0.023 *Bc7, Bd4	a = 0.5 m b = 0.013 *Bc8, Bd6	a = 0.5 m b = 0.013 *Bc8, Bd6	a = 0.25 m b = 0.0075 *Bc10, Bd8	a = 0.15 m b = 0.0075 *Bc12, Bd8
Section 3.3	**Feature Detection** [m] or [% of Depth]	Not Specified	Not Specified	Cubic features > 2 m, in depths down to 40 m; 10% of depth beyond 40 m *Be5, Bf3 beyond 40m	Cubic features > 1 m *Be6	Cubic features > 0.5 m *Be9
Section 3.4	**Feature Search** [%]	Recommended but Not Required	Recommended but Not Required	100% *Bg9	100% *Bg9	200% *Bg12
Section 3.5	**Bathymetric Coverage** [%]	5% *Bh3	5% *Bh3	≤ 100% *≤ Bh9	100% *Bh9	200% *Bh12

As part of the proposed methodology, the Consultant shall nominate the following.

- Total error budget for the Consultant's survey systems to verify they meet the total vertical uncertainty and total horizontal uncertainty relating to the order of survey specified.
- Specific equipment that will achieve the nominated order of survey.
- Geodetics information that clearly identifies both the horizontal and vertical datums, what survey control will be used, how the Consultant will transform it to these specified datums and QA/QC to be performed that demonstrates the correct geodetic framework for meeting the order specified above.

The methodology will include the following aspects, noting that the following is to be used as a guideline only whereby the LGA may refine or add to the below.

1. Review of background documents.
2. Nominate the following (ensuring adherence to IHO S-44 standards).
   - Survey hardware to be used for the required order of survey.
   - Qualified personnel undertaking surveying.
   - Level of accuracy anticipated including assumptions.
   - Potential error levels inherent to the surveying method.
3. Confirm and comply with all WHS requirements.
4. Confirm access and extent requirements.
5. Undertake a comprehensive hydrographic survey of the areas per the provided survey brief and plans.
6. Process survey information. [include additional post-processing if required.]
7. Provide deliverables to the LGA.

Deliverables

[In this section the LGA should consider their survey requirements to ensure they are met within the deliverables.

The LGA is to confirm the survey requirements and adjust deliverables as required.]

The Consultant is required to provide the following deliverables.

1. A bathymetric contour survey plan.
2. Point clouds, one for mean depth and one for shoal depth [If applicable.].
3. DEMs, one for mean depth and one for shoal depth [If applicable.].
4. 3D spatial data of the survey points.
5. Difference plots or heat maps of elevation changes between surveys.
6. A combined topographic and hydrographic contour survey plan.
7. Profile surveys.
8. Sediment volume estimates.
9. Volumes of sediment movement, based on changes between surveys.
10. Total error budget, information demonstrating adherence to IHO S-44 standards and associated metadata.
11. (Include any requirements specific to the LGA).

Timeframe

[Use this section to request an estimate of the project's timeline or include a deadline if required.

The timing of the survey can also be specified here.]

The Consultant is to complete the survey during (specify time e.g. October) and provide an estimated date for supply of the deliverables.

[OR]

(The Consultant is to complete the survey during (specify time e.g. October) and supply the deliverables within XX weeks from completion of the survey.)

Documents and Files to be Provided

[This is where the LGA can provide details of any documents and files that will assist the Consultant conducting the survey. Examples of these documents are included below. Ensure to check web-hosted data sources for your project that may provide useful historical information, such as the open WA bathymetry portal.]

The following files (and documents) will be provided to the Consultant on the award of the works.

- Previous surveys, DEMs or point clouds. [If applicable.]
- Details of any changes or works since the last survey. [If applicable.]
- Details of any specific labelling requirements.
- Any relevant documents the LGA has access to.

Appendices

[Include any required documents, these could include any files containing the required extent of the surveys.]