

TRANSPORT FOR NSW (TfNSW)

QA SPECIFICATION G73

DETAIL SURVEY

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REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 0		First issue.	GM, RNIC	28.06.01
Ed 1/Rev 1	Various 1.2, 1.5 1.2 1.8 3.0 G73/A1	Format changed, annexures rearranged and renumbered. ISO 9001:1994 changed to ISO 9001:2000. Rewritten, references transferred to Annexure G73/M. Use of appropriate OH&S spec. Format of transmitted data.	GM, RNIC	28.03.03
Ed 2/Rev 2		Fonts changed.	GM, RNIC	05.08.03
Ed 2/Rev 0	various 3 1.1 1.4 1.7 1.11 2 3.2.1 2 & 3.2.1 3.3	Guide to specification G73 included. Checklist for project managers for survey input. Direct imperative language used. Minor editorial changes. Revised surveying legislation. Scope of work stated. Definitions. Surveyor's qualifications. Rewritten to conform with RTA Traffic Control at Work Sites Manual. Reformatted; Data Exchange imported to clause 2 and strengthened. Following clause numbers increased by 1. Requirement to produce locality sketches. Response time by Roads and Maritime to Hold Points. Accuracy of cadastral overlay where requested.	GM, RNIC	18.08.05

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 2/Rev 0 (cont'd)	3.5	Revised model naming convention.		
	4	Revised output requirements.		
	5	More flexibility in reporting requirements.		
	3.4 & Annex A1	Extra detail and requirements more model validation.		
	3.1	String label and legends supplied by Roads and Maritime Services Representative instead of attached to specification.		
	3.2.2	Survey Control Sheet supplied for each survey.		
	3.2.2	Primary Survey Control Mark Schedule supplied for each survey.		
Ed 2/Rev 1	Global	Specification reformatted. Links updated.	GM, IC	22.09.08
Ed 3/Rev 0	Global	Specification title changed. Clauses rearranged and reworded to improve clarity.	DCS	22.08.17
	Guide Notes	Guide Notes which are now in RMS CADD Manual Part 3.2 "Surveying" or in main body of specification removed. RMS Survey Input checklist moved to Annex E1.		
	1.1	Cadastral overlay added to scope summary.		
	1.2.1	Sub-clause heading title changed; reference to Description of Services (Brief) added.		
	1.2.2	New sub-clause on RMS Project Reference Number added. Subsequent sub-clauses renumbered accordingly.		
	1.3	Previous clause 1.3 on "Purpose and Extent of Survey" deleted and requirements now incorporated into clause 1.1. Previous clause 1.4 now becomes clause 1.3. Definitions amended and new definitions added.		
	2	New clause to align with project workflow.		
	2.1.1	Previously clause 1.5.		
	2.1.2	New sub-clause on appointment of a (RMS) Technical Representative.		
	2.1.4	New sub-clause referencing RMS Rep Checklist in Annex E1.		
	2.2.1	Previously clause 1.7; heading title changed. Qualifications updated to include confined spaces and critical licences.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 0 (cont'd)	2.2.2, 2.2.3	New sub-clauses on accreditation for working in confined spaces and near utilities.		
	2.2.4	Previously part of clause 1.7.		
	2.3	Previous clause 1.6, heading title changed.		
	2.3.1	New sub-clause on quality management system.		
		Reference made to option in Annex A to specify 3rd party accredited quality management system.		
		Project Quality Plan mandated.		
	2.3.2	New sub-clause incorporating requirements in previous clause 1.6.2.		
	2.3.3	New sub-clause on software name and version; previously part of sub-clause 1.6.2.		
	2.3.4	Previously sub-clause 1.6.3.		
	2.3.5	Previously sub-clause 1.6.4; heading title changed.		
	2.3.6	Previously sub-clause 1.6.5.		
	2.3.7	New sub-clause on corrective actions, including new Hold Point.		
	2.4	Previously clause 1.8; heading title changed. Heading titles added to form new sub-clauses 2.4.1 to 2.4.3.		
	2.5	New clause on WHS replacing previous clause titled "Safe System of Work".		
	2.5.2	New sub-clause with requirements on Safety Management Plan, SWMS and monthly reporting.		
	2.5.3	New sub-clause incorporating requirements of previous clause 1.11.		
	2.5.4	New sub-clause incorporating requirements of previous clause 1.10.		
	2.55, 2.56	New sub-clauses on SWMS for working in confined spaces and near utilities.		
	2.6	New clause on environmental considerations added.		
	2.7	New clause added on required submissions prior to commencement of field work and Hold Point.		
3	Heading title changed.			
3.1.1	New sub-clause incorporating parts of previous clause 3.1.			
3.1.2	New sub-clause incorporating parts of previous clause 3.1.			

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 0 (cont'd)	3.1.3	New sub-clause on new checklists in Annex E2 to E9.		
	3.2	Previously clause 2, with heading titles added to form new sub-clause.		
	3.3	New clause on preservation of the state control network and cadastre added.		
	3.4	Previously clause 3.2, with heading titles added to form new sub-clauses 3.4.1 to 3.4.4.		
	3.4.5	New Hold Point on submission details of planned survey control network.		
	3.4.6	New sub-clause incorporating parts of previous clause 3.2.1.		
	3.4.7	New sub-clause incorporating parts of previous clause 3.2.1.		
	3.4.8	New sub-clause on Survey Control Report added.		
	3.4.9	Previously clause 3.2.2. Required CLASS of survey for procedures cross referred to clause 3.4.4.		
	3.4.10	New sub-clause incorporating parts of previous clause 3.2.2.		
	3.4.11	New sub-clause incorporating parts of previous clause 3.2.2.		
	3.4.12	New sub-clause incorporating parts of previous clause 3.2.2 to standardise term of Survey Mark Register to align with G71.		
	3.4.13	Previous Hold Point in clause 3.2.1 amended.		
	3.5	New clause on survey of detail features added.		
	3.6	New clause on drainage network investigation added.		
	3.7	New clause on utility investigation added.		
	3.8	New clause on cadastral overlay added.		
	3.9	New clause on bridge site survey added.		
	4	Previous clauses 4 and 5 on deliverables and progress reporting combined together under clause 4.		
	4.2	New clause on liquidated damages and variations added.		
4.3.3	New Hold Point on processing payment claims added.			

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 0 (cont'd)	Annex A	Expanded to provide for customisation of various issues mentioned in main body of spec. Guide notes on customisation of each issue added.		
	Annex A3.6	Table on tolerances for horizontal coordinates and heights amended.		
	Annex A3.8	Default model names moved here from previous clause 3.5.		
	Annex C1	Schedule of Hold Points updated.		
	Annex C2	Schedule of Project Records added.		
	Annex D	Planning Documents added.		
	Annex E	New RMS Rep checklist moved here from previous Guide Notes, and new Contractor checklists incorporating checklist from previous Annex I.		
	Annex F	Sample Data File Heading (Metadata) amended.		
	Annex G	Heading title changed. CADD Data Acceptance Testing and Data Transmission Record details deleted, replaced by reference to Part 2.1 and Part 3.2 of the CADD Manual with additional requirements.		
	Annex H	Requirements amended.		
	Annex J	Previous Annex J deleted and requirements moved to Part 3.2 "Surveying" of CADD Manual.		
	Annex K	Annex title changed.		
	Annex L	Annex title changed.		
Annex M	Referenced documents updated.			
Ed 3/Rev 1	Global	References to "Roads and Maritime Services" or "RMS" changed to "Transport for NSW" or "TfNSW" respectively.	DCS	22.06.20

GUIDE NOTES (Not Part of Contract Document)

GN1 Use of TfNSW G73

Specification TfNSW G73 sets out the requirements for undertaking detail surveys to provide TfNSW with digital terrain models of the existing natural and manmade terrain and features, for the purpose of preparing designs for road infrastructure.

G73 sets out survey requirements that are specific to TfNSW needs as well as defining survey best practice to minimise project delays that inadequate or erroneous survey data may cause during the construction phase.

G73 is also suitable for use for As Built or Works-As-Executed surveys.

The Tender Documenter must complete Annexures G73/A, E9, F, H and K.

GN2 Relation to Other Documents

G73 refers extensively to Part 3.2 “Surveying” of the CADD Manual, which also contains notes on interpretation of the technical aspects of this Specification.

The new Professional Services Specifications for Detailed Survey and Utility Adjustment under Concept Design Services and Detailed Design Services, PS221 and PS321 respectively, contains references to G73.

GN3 Edition 3

Edition 3 contains the following major changes:

- Previous extensive Guide Notes mainly moved to Part 3.2 “Surveying” of the CADD Manual.
- Types of survey activities expanded to include major control, drainage investigation, utility location and cadastral overlays that can be associated with detail surveys.
- Dealt with technical risk by requiring surveying qualifications as a requirement for customising G73.
- Provided the ability to edit the annexures to provide the Description of Services (Brief) for contracting purposes.



DETAIL SURVEY

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VERSION FOR: DATE:

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW G73 Edition 3 Revision 0.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

TfNSW QA SPECIFICATION G73

DETAIL SURVEY

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for undertaking detail surveys, for the purpose of preparing designs for road infrastructure or traffic facilities using current TfNSW surface modelling software.

It includes the following:

- (a) control survey requirements;
- (b) method of collecting field data;
- (c) preparation of digital terrain models to represent ground features, in a format suitable for TfNSW;
- (d) preparation of a cadastral overlay to indicate the approximate position of the property boundaries contained in the project area;
- (e) validation that the digital models represent ground and property features to the specified accuracy;
- (f) reporting requirements; and
- (g) method of data transfer.

The purpose of the survey is to determine the three-dimensional coordinates of all points relevant to the proposed road infrastructure or traffic facility.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Project Specific Requirements

Project specific details of work are shown in Annexure G73/A, which may form the Description of Services (“the Brief”) or Scope of Works.

1.2.2 Project Reference Number

The TfNSW Project Reference Number and Records File Number for the survey work are stated in Annexure G73/A1.

Include the Project Reference Number, Records File Number and date in the electronic filenames of all data sent to the TfNSW Representative, or delegate. The format of the date must be as stated in Annexure G73/A1.

1.2.3 Schedules of HOLD POINTS and Project Records

The schedules in Annexure G73/C list the **HOLD POINTS** that must be observed. Refer to Clause 1.3 for the definition of **HOLD POINTS**.

The records listed in Annexure G73/C are **Project Records** in accordance with Clause 2.3.5.

1.2.4 Referenced Documents

Unless otherwise specified, the applicable issue of a referenced document, other than a TfNSW Specification, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure G73/M.

1.3 DEFINITIONS

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The definitions of terms relating to quality assurance in AS/NZS ISO 9000 also apply to this Specification.

In addition, the following definitions apply to this Specification:

Cadastral overlay	A survey to determine the property (cadastral) boundaries at the site.
Cadastral overlay model	<p>A representation of the cadastre, being more accurate than that achieved by using the State Digital Cadastre Database (DCDB) alone, but is less accurate than a registered Deposited Plan (DP).</p> <p>The accuracy is dependent on the age of the existing cadastral Deposited Plans, and the number and density of coordinated marks. The model must include all cadastral and State control marks that are likely to be impacted by the project, including utility adjustments. The marks include those that have been surveyed, calculated or shown as not found or gone on the Deposited Plans.</p> <p>Refer to Part 3.2 “Surveying” of the CADD Manual.</p>
Confined space	<p>An enclosed or partially enclosed space that:</p> <ul style="list-style-type: none">(a) is not designed or intended primarily to be occupied by a person; and(b) is, or is designed or intended to be, at normal atmospheric pressure while any person is in the space; and(c) is or is likely to be a risk to health and safety from:<ul style="list-style-type: none">• an atmosphere that does not have a safe oxygen level, or• contaminants, including airborne gases, vapours and dusts, that may cause injury from fire or explosion, or• harmful concentrations of any airborne contaminants, or• engulfment. <p>Examples are tank-like compartments, open-topped spaces such as pits, pipes and void spaces.</p>

Hold Point	<p>A point in the work process beyond which work must not proceed without the TfNSW Representative’s expressed written authorisation.</p>
Locality sketch	<p>A sketch of location of State permanent marks as described in Surveyor General’s Directions No. 2. A sketch is required for all new marks or, for existing marks, where the environment has changed from the existing sketch.</p>
Preservation of Survey Infrastructure (POSI) - Survey marks	<p>State Survey marks underpin the state spatial data systems and are protected under the <i>Surveying and Spatial Information Act 2002 (NSW)</i>. These marks are described in Schedule 4 of the <i>Surveying and Spatial Information Regulation 2012 (NSW)</i>.</p> <p>Cadastral survey reference marks are used to define the cadastre and help define land ownership. These marks are described in Schedules 1, 2, and 3 of the <i>Surveying and Spatial Information Regulation 2012 (NSW)</i>.</p> <p>Such survey marks must not be removed without the prior approval of the Surveyor General – refer to Surveyor General’s Directions No. 11.</p>
Preservation of Survey Infrastructure (POSI) Drawing	<p>A post-design drawing showing all of the survey control marks and cadastral reference marks that may be disturbed or destroyed by the planned construction activities.</p> <p>Refer to Part 3.2 “Surveying” of the CADD Manual for details.</p>
Preservation of Survey Infrastructure (POSI) Register	<p>A schedule of all survey control marks and cadastral marks with additional information suitable for Specification TfNSW G71 “Survey Marks Register” requirements.</p>
Substantial survey mark	<p>An approved permanent mark, as defined by Surveyor General’s Directions No. 1, or marks as prescribed by Schedules 1, 2 (excluding pegs and lockspit), 3 and 4 of the <i>Surveying and Spatial Information Regulation 2012 (NSW)</i>.</p>
Survey Control Network Drawing (SCD)	<p>A drawing showing survey control mark location, observation network, marks and schedule or register of values suitable for lodgement in the NSW Survey Control Information Management System (SCIMS), as defined by the <i>Surveying and Spatial Information Act 2002 (NSW)</i>.</p> <p>Such drawings are generally required where there are 3 or more State Survey permanent marks whose coordinates and levels need to be determined. This drawing will be registered in TfNSW Plan Management System.</p> <p>Refer to Part 3.2 “Surveying” of the CADD Manual.</p>
Survey Control Sheet (SCS)	<p>A drawing showing the survey control marks and schedule or register of values established for this survey. It may include survey control marks which are not permanent survey marks and also include cadastral reference marks. This may be included in drawings for detail survey, drainage, utility location, cadastral overlay or against aerial or other imagery.</p> <p>Refer to Part 3.2 “Surveying” of the CADD Manual.</p>

2 SURVEY – GENERAL REQUIREMENTS

2.1 TfNSW REPRESENTATIVE AND TECHNICAL REPRESENTATIVE

2.1.1 TfNSW Representative

TfNSW will nominate a TfNSW Representative for the survey work. The TfNSW Representative will have, as a minimum, a Diploma in Surveying or equivalent, and at least 5 years' experience in surveying.

Details of the TfNSW Representative and, where applicable, the Technical Representative (refer following Clause 2.1.2), are shown in Annexure G73/A1.

2.1.2 Technical Representative

Where the TfNSW Representative does not have the requisites stated in Clause 2.1.1 previously, a Technical Representative with the qualifications and experience stated for the TfNSW Representative will be appointed to assist the TfNSW Representative in defining the technical aspects of the project requirements and validating the information supplied by the Contractor.

The Technical Representative will be a TfNSW Survey Unit Manager, or delegate.

2.1.3 Liaison with TfNSW Representative

Liaise closely with TfNSW Representative when carrying out the survey work.

2.1.4 TfNSW Representative Checklist

The TfNSW Representative Checklist in Annexure G73/E1 is provided for your information. The TfNSW Representative or the Technical Representative (if one is appointed) will complete the Checklist.

2.2 CONTRACTOR SURVEYOR – QUALIFICATIONS

2.2.1 General

Surveyors appointed by the Contractor to direct and be responsible for the survey work must be either:

- (a) a Registered Land Surveyor under the *Surveying and Spatial Information Act 2002 (NSW)*; or
- (b) a person who holds a Diploma in Surveying, or recognised equivalent, from a recognised tertiary institution and has at least 2 subsequent years of practical experience in surveying satisfactory to TfNSW.

2.2.2 Confined Spaces

All personnel entering drainage pits, utility access pits or other confined spaces (refer Clause 1.3 of this Specification for definition of “confined space”) must be trained and accredited for working in confined spaces. Provide evidence of the currency of their licence in accordance with Clause 2.5.5 of this Specification.

2.2.3 Utility Investigation

All personnel undertaking utility investigation must be trained and accredited in accordance with the requirements of the utility owners or operators. Provide evidence of the currency of their licence in accordance with the requirements of Clause 2.5.6 of this Specification.

2.2.4 Cadastral Overlays

Cadastral overlays (refer Clause 3.8 of this Specification) must be undertaken only by a Registered Land Surveyor, or by a surveyor under the Registered Land Surveyor's immediate supervision. Where the latter is the case, the Registered Land Surveyor takes responsibility for the work.

2.3 QUALITY MANAGEMENT

2.3.1 General

Where so specified in Annexure G73/A2.1, the Contractor must have a third party accredited Quality Management System complying with AS/NZS ISO 9001. Provide your Corporate Quality Manual (if not previously provided) to the TfNSW Representative prior to starting work.

Regardless of whether an accredited Quality Management System is required, provide your Project Quality Plan complying with Clause 8.1 of AS/NZS ISO 9001 which must include the details specified in following Clauses 2.3.2 to 2.3.6 and the Planning Documents listed in Annexure G73/D of this Specification. Further guidance on preparation of quality plans is given in AS/NZS ISO 10005.

2.3.2 Procedures

Develop and implement survey procedures in accordance with Clause 8.5 of AS/NZS ISO 9001 for all survey activities.

Include in the procedures your methods to verify and extend the survey control network and to locate detail features necessary to form the digital terrain models. Include also your methods to determine point and stringline position and point selection along the stringline for forming the digital terrain models.

Your survey methods and equipment must be capable of attaining the tolerances shown in Annexure G73/A3.6, which is in accordance with Part 3.2 "Surveying" of the CADD Manual but modified as required. Refer also to Specification Guide TfNSW NG71 for guidance.

2.3.3 Software

Provide details of your computer software, and its version number, to be used for forming the digital terrain models.

2.3.4 Equipment

Comply with Clause 7.1.5 of AS/NZS ISO 9001 in relation to monitoring and measuring resources, which applies to all survey instruments and ancillary equipment used for carrying out the survey work.

Comply also with the Surveyor General's Directions No. 5 and No. 9 in relation to verification of survey equipment used for the works.

2.3.5 Project Records

Comply with Clause 7.5 of AS/NZS ISO 9001 in relation to the project records listed in Annexure G73/C2.

Make the records available to the TfNSW Representative or persons nominated by the TfNSW Representative when requested to do so. The request may require the records to be made available in a particular format; e.g. paper or electronic.

Retain the project records for 5 years after submission of the outputs specified in Clause 4.3 of this Specification and its acceptance by TfNSW. At completion of the 5 years storage, notify the TfNSW Representative or person appointed by the TfNSW Representative at least 28 days prior to the date scheduled for disposal of the records.

2.3.6 Inspections and Quality Audits

At any time prior to completion of the Contract, the TfNSW Representative, or delegate, may conduct inspections to verify compliance with these specifications. Cooperate with the TfNSW Representative during any such inspections.

Should field inspections and/or examination of survey records indicate that a condition adverse to quality might exist, the TfNSW Representative may conduct a quality audit. The TfNSW Representative will give you 3 days written notice of any impending quality audits. Provide every assistance to the TfNSW Representative and persons nominated in writing by the TfNSW Representative, for conduct of the quality audits.

2.3.7 Corrective Actions

Where the audit reveals that a condition adverse to quality exists, the TfNSW Representative may issue you with a Corrective Action Request and impose a Hold Point on the survey work process.

HOLD POINT

Process held:	Survey work process.
Submission details:	Verification that the condition adverse to quality has been rectified and closed out.
Release of hold point:	The Principal will consider the evidence provided, prior to authorising the release of the Hold Point.

2.4 PRIVATE PROPERTY ACCESS

2.4.1 General

Information on property owners and/or occupiers, including their contact details, and any known individual access requirements, is provided in Annexure G73/A2.2 if available.

2.4.2 Contact With Property Owners Or Occupiers

In consultation with the TfNSW Representative, contact the property owners or occupiers prior to entry to their property for survey purposes, to facilitate their cooperation on your access and to acquaint them with the nature and extent of your surveying activities.

Enter details of any such meetings with the affected property owners or occupiers in the form provided in Annexure G73/K, or similar.

If entry to any property is refused, refer the matter immediately to the TfNSW Representative for instructions.

Carry out any negotiations with property owners or occupiers in a manner that is not detrimental to the public acceptance of TfNSW activities, or hinder your schedule.

2.4.3 Damage and Restoration

Carry out your survey work in a manner that minimises the impact on the property owners or occupiers. Do not cause any damage to property when carrying out the survey work.

Deal with any claims for compensation for any damage caused by your survey work as your responsibility, but inform the TfNSW Representative immediately of any such incidents or claims.

Restore to their original condition any areas disturbed by your survey activities and any other damage caused by your staff or subcontractors.

2.5 WORK HEALTH AND SAFETY

2.5.1 General

Depending on the survey contract value and risk, a project specific version of Specification TfNSW G24 may be included as part of the contract documentation. If not, the WHS requirements for the Contract will be stated in Annexure G73/A2.3.

2.5.2 Safety Management

Develop and implement a site specific Safety Management Plan and Safe Work Method Statements (SWMS) covering all aspects of your field survey activities in accordance with Specification TfNSW G24.

If so specified in Annexure G73/A2.3, submit a monthly WHS Report.

The TfNSW Representative, or delegate, may conduct site safety inspections and safety audits at any time.

2.5.3 Clothing

Provide high visibility clothing to your surveying field personnel conforming to AS 4602 which is suitable for either day and/or night work, and footwear conforming to AS 2210.

Ensure that long sleeve shirts and long pants are worn by your field personnel when carrying out survey work.

2.5.4 Working On or Near Roads

Provide SWMS and Traffic Control Plans (TCP) for carrying out a field survey on or near roads in accordance with TfNSW G24. The TCP must comply with the TfNSW Traffic Control at Work Sites Manual.

Comply with any additional WHS requirements specified in Annexure G73/A2.3.

Use only trained and qualified personnel, including survey personnel, to carry out any traffic control activity. Where so specified in Annexure G73/A2.3, at least one person in the survey team on site must possess a “Prepare a Work Zone Traffic Management Plan” qualification.

2.5.5 Confined Spaces

Where the survey work includes entry to pits and chambers to obtain drainage details in accordance with Clause 3.6.1, provide SWMS for working in confined spaces. Your survey personnel carrying out such work must be accredited for working in confined spaces in accordance with Clause 2.2.2.

2.5.6 Utility Investigation

Where the survey work includes determining the locations of existing utilities in accordance with Clause 3.7.1, provide SWMS for such work. Your survey personnel carrying out such work must be accredited by the relevant utility owner or operator in accordance with Clause 2.2.3.

2.6 ENVIRONMENTAL CONSIDERATIONS

2.6.1 General

Details of known heritage and other environmental constraints will be stated in Annexure G73/A2.4. If so specified in Annexure G73/A2.4, carry out a preliminary site visit to define and ascertain any restricted areas.

2.6.2 Procedures

Carry out your survey activities in an environmentally sensitive manner.

Include procedures for working around known heritage and other environment constraints in the project area.

2.6.3 Unexpected Finds

Notify the TfNSW Representative immediately if you uncover any unexpected finds during the course of the survey. Cease all work at that location and restart only after approval is given by the TfNSW Representative.

2.7 COMMENCEMENT OF FIELD WORK

2.7.1 Submissions

Prior to commencement of field work, submit to the TfNSW Representative the following:

- (a) List of surveyors proposed to undertake the survey work, including their names, qualifications including critical licences (e.g. confined space), and details of their survey work experience. (Refer Clause 2.2 of this Specification.)
- (b) Corporate Quality Manual (if so specified in Annexure G73/A2.1 and not previously provided), and Project Quality Plan which must include details of your survey procedures and methods to carry out the work in accordance with the requirements of this Specification, and the software and version number to be used for forming the digital model. (Refer Clause 2.3 of this Specification.)

- (c) List of survey and ancillary equipment proposed for use to undertake the survey work, including unique identification and calibration and verification records in accordance with Surveyor General's Directions No. 5 and 9. (Refer Clause 2.3.4 of this Specification.)
- (d) Safety Management Plan and Safe Work Method Statements. (Refer Clause 2.5.2 of this Specification.)
- (e) Traffic Control Plan(s) for working on or near roads, and dates and times of any such survey work or work which will affect traffic flow. (Refer Clause 2.5.4 of this Specification.)
- (f) Traffic control qualifications of surveying personnel, and names and qualifications of any Traffic Controllers proposed. (Refer Clause 2.5.4 of this Specification.)
- (g) Procedures for working around known heritage and other environment constraints in the project area. (Refer Clause 2.6.2 of this Specification.)

2.7.2 Hold Point

HOLD POINT

Process Held:	Commencement of survey field work.
Submission Details:	Items (a) to (g) in Clause 2.7.1.
Release of Hold Point:	The TfNSW Representative will consider the submitted documents prior to the release of the Hold Point.

3 SURVEY – TECHNICAL REQUIREMENTS

3.1 GENERAL

3.1.1 Datum

Generally, all survey work and final digital models are based on the appropriate Zone of the Map Grid of Australia (MGA) and Australian Height Datum (AHD) as defined by the relevant control network of TfNSW or values supplied by SCIMS.

Use the datum specified in Annexure G73/A3.1 for this survey.

For certain infrastructure projects, for example, projects in remote locations where there is a lack of MGA control stations available or where the establishment of the MGA datum for the project provides no long term benefits to TfNSW, the Contractor may base the survey on an assumed datum.

The TfNSW Representative may direct that the survey be based on the datum of an existing survey, where the survey work under this Contract extends or adds to an existing survey. The TfNSW Representative may direct additional work be carried out to create information necessary to satisfy the requirements of Spatial Services within the Department of Finance, Services and Innovation ("Spatial Services").

3.1.2 Stringlines

Gather information using the “stringline” technique in accordance with Part 3.2 “Surveying” of the CADD Manual. Do not survey in point format with strings constructed in the office. Do not use strings with discontinuities. Keep the use of single point natural surface strings to a minimum.

String labels and symbols must comply with the TfNSW Standard Survey String Labels and Legends in Part 3.2 “Surveying” of the CADD Manual. Note down any deviations from the Standard in the metadata documentation which you provide to the TfNSW Representative at the completion of the survey work.

3.1.3 Checklists

Complete the checklists included in Annexure G73/E2 to E9 where applicable. These checklists form part of the quality assurance process and project records for the Contract.

3.2 DATA EXCHANGE AND TESTING

3.2.1 Electronic CADD Data Format

Provide the electronic CADD data to TfNSW in a format which will generate valid digital terrain models using the current TfNSW CADD software without requiring additional processing by TfNSW.

Refer to Annexure G73/A3.2 for details of the current TfNSW CADD software and version, as well as the required format for the transmitted electronic data.

3.2.2 CADD Data Acceptance Testing

Comply with the TfNSW CADD Data Acceptance Testing requirements stated in Annexure G73/G.

Verify the capability to exchange CADD data in accordance with the TfNSW CADD Data Acceptance Testing Procedure by exchanging sample data. Provide metadata files in accordance with Annexure G73/F for all electronic data transmitted to TfNSW.

3.2.3 Hold Point

HOLD POINT

Process Held:	Commencement of survey field work.
Submission Details:	Notification of the date of commencement of survey work and evidence of compliance with TfNSW CADD Data Acceptance Testing Procedure, at least 5 working days prior to the proposed commencement of survey work.
Release of Hold Point:	The TfNSW Representative will consider the submitted documents prior to the release of Hold Point.

3.3 PRESERVATION OF THE STATE CONTROL NETWORK AND CADASTRE

3.3.1 General

TfNSW has an obligation to preserve the integrity of the State Control Network and the property cadastre for the people of New South Wales.

To this end, prior to commencement of detail survey work, carry out an investigation to determine all existing State Control and cadastral reference marks within and adjacent to the project area, and produce a drawing showing the location of the marks together with a survey mark register or schedule of these marks. Refer to Part 3.2 “Surveying” of the CADD Manual for details.

The TfNSW Representative will provide details of the scope of work of the investigation.

3.3.2 Preservation of Survey Infrastructure Drawing

Where required by the scope of work, produce a post-design Preservation of Survey Infrastructure (POSI) drawing for use during future construction works, showing the likely impact (“To Be Destroyed”, “Vulnerable”, “Safe”) of the proposed works on existing survey marks in an accompanying register or schedule. Refer to Part 3.2 “Surveying” of the CADD Manual and TfNSW NG71 for details.

3.4 SURVEY CONTROL NETWORK

3.4.1 General

Define a survey control network for the survey. As a minimum, the survey control network must consist of three survey control marks of a substantial nature (refer Clause 1.3 of this Specification for definition of a “substantial survey mark”).

3.4.2 Control Survey Standards

Comply with the set of technical standards and specifications in Intergovernmental Committee on Surveying and Mapping (ICSM) Special Publication No. 1 Version 1.7 “Standards and Practices for Control Surveys” (SP1) for the horizontal and vertical control under this Contract. Comply further with the Surveyor General’s Directions No. 9 and No. 12, and where any of the requirements are in conflict, the Surveyor General’s Directions takes precedence over SP1.

Survey control details are shown in Annexure G73/A3.3 including, where required, requirements for discussions and signoff by the TfNSW Principal Surveyor or delegate.

Validate the coordinate values of all survey control marks, regardless of their source, before use.

All survey control marks within the model must have four dimensions in the model. These are “Name”, “Easting”, “Northing” and “Height”. The mark name is limited to four alpha-numeric characters. Refer to Part 3.2 “Surveying” of the CADD Manual for further details.

3.4.3 Establishing the Survey Control Network

To establish the survey control network for this Contract, carry out also the following:

- (a) Survey all existing approved permanent marks (details obtainable from SCIMS or the TfNSW Representative) that are located in an area contiguous to or within the survey area, or nominated by the TfNSW Representative. The naming convention for permanent marks for the digital terrain models must be the last four numerals of its number, or as specified in Annexure G73/A3.3 (c).
- (b) Place and survey sufficient survey control marks as prescribed by Schedule 4 of the *Surveying and Spatial Information Regulation 2012 (NSW)*, so that the maximum distance between any adjacent survey control marks does not exceed 500 m, unless specified otherwise in the Annexure G73/A3.3 (b).

- (c) Place survey control marks well clear of the proposed construction area and clear of traffic, in stable material and with a clear sky suitable for Global Navigation Satellite System (GNSS) observations.
- (d) Place all marks clear of underground utilities. Details of existing utilities within the project area obtained from Dial Before You Dig or utility service providers are given in Annexure G73/A1.3.

3.4.4 CLASS of Survey

The CLASS of survey of the established survey control network must be **CLASS B** if using GNSS techniques or **CLASS C** if using traditional surveying techniques, in accordance with SP1 and the Surveyor General's Directions, or as specified in Annexure G73/A3.3.

In addition, surveying procedures for determining coordinates of survey control marks must, as a minimum, conform to the Surveyor General's Directions as follows, unless specified otherwise in Annexure G73/A3.3:

- (a) EDM and horizontal angle measurements must comply with **CLASS C** requirements;
- (b) GNSS techniques must comply with **CLASS B** requirements as a minimum. In addition, observations are required between adjacent detail survey control marks; and
- (c) height determination must comply with **CLASS LC** for differential levelling techniques or **CLASS C** for trigonometric heighting method;

Submit to the TfNSW Representative evidence of compliance with the specified CLASS of survey and an estimate of the ORDER of survey in accordance with SP1. This may require liaising with the Technical Representative.

Depending on the magnitude and complexity of the survey control network established to comply with this Clause, the TfNSW Representative may request electronic and field records and calculations for examination before use of the survey control network.

3.4.5 Hold Point

HOLD POINT

Process Held:	Commencement of survey field work.
Submission Details:	Planned survey control network, location of new marks, observation methodology and records, adjustment methods and CLASS test, at least 5 working days prior to the proposed commencement of survey control work. If required, evidence of communication and concurrence by the TfNSW Principal Surveyor, or delegate and provide methodology of compliance with the requirements for control survey.
Release of Hold Point:	The TfNSW Representative will consider the submitted documents prior to the release of Hold Point.

3.4.6 Survey Control Network Drawing

Provide a Survey Control Network Drawing (SCD) if three or more approved State permanent marks are given new or amended MGA coordinates and/or AHD height values, or where specified in Annexure G73/A3.4, or where directed by the TfNSW Representative.

The Survey Control Network Drawing requirements are stated in G73/A3.4.

The TfNSW Drawing Set Number for the Survey Control Network Drawing is stated in Annexure G73/A3.7. Unless specified otherwise by the TfNSW Representative in Annexure G73/H, the presentation requirements must be as detailed in Part 3.2 “Surveying” of the CADD Manual.

If required, provide a Survey Control Sheet (SCS) in accordance with Part 3.2 “Surveying” of the CADD Manual that includes the survey mark register or schedule as shown in the “Sample Data File Heading” in Annexure G73/F.

3.4.7 Survey Control Mark Locality Sketches

Where approved State marks are added, given new or amended coordinates and/or height values, or the local environment has changed from the original sketch, submit new locality sketches for affected permanent marks in accordance with Surveyor General’s Directions No. 2. Refer to Annexure G73/A3.5 for other requirements.

3.4.8 Survey Control Report

Where a Survey Control Report is specified in Annexure G73/A3.5 as required, produce the report in the format required by Spatial Services. Refer to Annexure G73/A3.5 for the hyperlink to the Spatial Services report template.

3.4.9 Detail Survey Control Marks

Break down and/or extend the survey control network by placing detail survey control marks, which must be of a stable nature, to give uniform coverage of the project area.

The spacing between adjacent survey control marks must not exceed 300 m. For surveying nominated special features, the distance between adjacent survey control marks must not exceed 200 m, unless specified otherwise in the Annexure G73/A3.3 (b).

Surveying procedures for determining coordinates of detail survey control marks must, as a minimum, conform to Clause 3.4.4.

Where requested by the TfNSW Representative, provide evidence of all closures and/or adjustments for all EDM traverse, GNSS baselines and level runs.

3.4.10 Use of Non-substantial Detail Survey Control Marks

If required, you may place non-substantial detail survey control marks. All non-substantial survey control marks, including “fly” stations, must be identified as temporary stations and may include dumpy pegs and nails placed in earth.

3.4.11 Marks Labelling

Label all survey control marks in the digital terrain models in accordance with Part 3.2 “Surveying” of the CADD Manual to facilitate recognition of the type of mark used.

Temporary survey marks must be labelled starting with the letter “T” to indicate that they are not suitable for construction set-out purposes, unless directed otherwise by the TfNSW Representative.

3.4.12 Survey Control Mark Register (Schedule)

Prepare the Survey Control Mark Register (Schedule) in accordance with the format contained in the “Sample Data File Heading” in Annexure G73/F.

Report in the Register any variations that may exist between the values of survey control marks given in Annexure G73/A3.3 (c) and the values used in the survey. This schedule will form part of the SCD or SCS described in Clause 3.4.6.

Prepare the drawing in accordance with Annexure G73/H.

Submit copies of the Primary Survey Control Mark Register (Schedule) or register to the TfNSW Representative in both paper and electronic format.

3.4.13 Hold Point**HOLD POINT**

Process Held:	Use of survey control mark values for processing detail survey observations.
Submission Details:	Draft versions of Survey Control Mark Register, CSD or SCS drawing, survey adjustment files and CLASS test results.
Release of Hold Point:	The TfNSW Representative will consider the submitted documents prior to the release of Hold Point.

3.5 SURVEY OF DETAIL FEATURES**3.5.1 General**

Create feature points and stringlines, and select points within each string so that surface modelling of existing features achieve the tolerances shown in Annexure G73/A3.6, which is in accordance with Part 3.2 “Surveying” of the CADD Manual but may include additional features where required.

Divide the spatial data into various models as listed in Annexure G73/A3.8, which is in accordance with Part 3.2 “Surveying” of the CADD Manual.

3.5.2 Model Validation

Validate models in accordance with Part 3.2 “Surveying” of the CADD Manual.

Use the number, position and frequency of checking strings (known as QQ strings) shown in Annexure G73/A3.9. As stated in Part 3.2 “Surveying” of the CADD Manual, observe these strings independently of the detail survey.

If the final presentation of spatial data is a composite of previous models supplied by TfNSW and the survey details obtained under this Contract, carry out checks to eliminate any duplication, omission, discontinuity or incompatibility at any interface between this survey and other survey data.

Complete the Contractor Detail Survey checklist in Annexure G73/E5 in accordance with Clause 3.1.3 and include it with the deliverables.

TfNSW will perform compliance checks to spatial data. The results of these checks will determine whether the supplied ground model is acceptable.

3.6 DRAINAGE NETWORK INVESTIGATION

3.6.1 General

Where so specified in Annexure G73/A3.10, obtain drainage details such as pit inverts, pipe sizes, pipe lines and inverts as part of the drainage network investigation.

3.6.2 Model Validation

Validate the models in accordance with Part 3.2 “Surveying” of the CADD Manual.

Complete the Contractor Drainage Network Investigation checklist in Annexure G73/E6 in accordance with Clause 3.1.3 and include it with the deliverables.

3.7 UTILITY INVESTIGATION

3.7.1 General

Where so specified in Annexure G73/A3.11, determine the locations of existing utilities in two or three dimensions.

3.7.2 Model Validation

Validate the models in accordance with Part 3.2 “Surveying” of the CADD Manual.

Complete the Contractor Utility Investigation checklist in Annexure G73/E7 in accordance with Clause 3.1.3 and include it with the deliverables.

3.8 CADASTRAL OVERLAY MODEL

3.8.1 General

Where a cadastral overlay model is specified in Annexure G73/A3.12 as required, include all visible property boundary marks in the survey of detail features in accordance with Part 3.2 “Surveying” of the CADD Manual. Determine by survey or calculation the details of all existing control and cadastral reference marks to assist with developing a strategy for POSI.

As the fabric of the cadastre varies greatly in age and accuracy, allow for extra work to include additional field work, data processing, computations and adjustments.

3.8.2 Model Validation

Validate the model in accordance with Part 3.2 “Surveying” of the CADD Manual.

Complete the Contractor Cadastral Overlay checklist in Annexure G73/E8 in accordance with Clause 3.1.3 and include it with the deliverables.

3.8.3 Cadastral Overlay Report

Where required, provide a brief report to communicate your methodology used, inconsistencies and problems within the cadastre found as a result of compiling the model. The report may include the following details:

- (a) introduction or project background information;

- (b) azimuth of survey, stating what marks were adopted and the associated values;
- (c) method of calculation and model validation;
- (d) expected accuracy, highlighting any areas that are outside the general tolerance of the model.

Attach the report to the completed Contractor Cadastral Overlay checklist and note accordingly under item E8.6 of the checklist.

Notify the TfNSW Representative immediately if you encounter any major issues during the compilation of the overlay model.

3.9 BRIDGE SITE SURVEY

Where a bridge site survey is included in the scope of work, carry out such surveys as a separate activity from the normal detail survey as outlined in Clause 3 and in accordance with the requirements of Annexure G73/L.

Complete the Contractor Bridge Design Data Survey checklist incorporating TfNSW Form OTB-TP-202-F03 in Annexure G73/E9 in accordance with Clause 3.1.3 and include it with the deliverables.

4 PROGRESS AND DELIVERABLES

4.1 PROGRESS REPORTING

4.1.1 General

Provide a monthly Progress Report in accordance with Annexure G73/A4. Use the progress reports to flag possible problems for discussion with the TfNSW Representative.

4.1.2 Notification

Notify the TfNSW Representative immediately when an WHS incident or enquiry from the general public or land owner arise, and provide details of the incident or enquiry in a written WHS report or in the form provided in Annexure G73/K respectively.

4.2 LIQUIDATED DAMAGES AND VARIATIONS

If included as part of the Contract terms, liquidated damages will apply if you fail to meet milestones or agreed timeframes.

All time and cost variations must be approved before payment for the work can be claimed.

4.3 DELIVERABLES FROM CONTRACTOR

4.3.1 Submissions

On completion of the survey, submit to the TfNSW Representative the survey model obtained. Include text metadata at the top of each electronic data file, as shown in Annexure G73/F.

Comply with the requirements of Annexures G73/G for CADD Data Acceptance Testing requirements.

Comply with Annexure G73/H for requirements on presentation of CADD drawings.

In addition, submit also to the TfNSW Representative the following:

- (a) All completed originals of the form provided in Annexure G73/K for logging contact with each property owner or occupier.
- (b) Field notes of survey to establish and extend survey control network. If field observations are by electronic means, provide copies of the raw and adjusted data in electronic format.
- (c) Adjustment of the survey control network with verification of CLASS of survey and an estimate of the ORDER of survey, in accordance with SP1 and Surveyor General's requirements.
- (d) Electronic copy of raw (field) and reduced survey data generated during collection of feature strings.
- (e) Summary table of all redundant observations, with comparisons, for the control survey and detail survey to verify the accuracy of the surveys.
- (f) Completed Contractor Checklists, including details of the validation of the ground survey model and certification that the survey conforms to this Specification.

If required, the TfNSW Representative will establish electronic file transfers using the organisation's large file transfer system Accellion.

Allow 10 working days following submission of the final outputs for TfNSW to review and comment on the survey.

4.3.2 Corrections

The TfNSW Representative will refer to you any errors, ambiguities or deficiencies where they exist for correction or clarification. Give these issues a high priority and take action on them within 24 hours of notice being presented. Resolve all such issues in accordance with this Specification and to the satisfaction of the TfNSW Representative at your own cost.

The survey work will be considered to be completed when all errors, ambiguities and deficiencies have been resolved, and final payment will not be made until the survey is considered to be completed.

4.3.3 Hold Point

HOLD POINT

Process Held: Processing of payment claims.

Submission Details: Outputs and records as specified in Clause 4 of this Specification and in the correct format. All data provided has been checked and free of errors.

Release of Hold Point: The TfNSW Representative will consider the submitted documents prior to the release of Hold Point.

ANNEXURE G73/A – PROJECT SPECIFIC REQUIREMENTS

The details stated in Annexures G73/A will form the Description of Services (“the Brief”) or Scope of Works.

A1 PROJECT INFORMATION

TfNSW Project Reference Number (refer Clause 1.2.2)

The Project Reference Number, Records File Number and date must be included in all electronic filenames of all data sent to the TfNSW Representative, or delegate.

Project Reference Number:

TfNSW Records File Number:

Date format: *year, month, day*. For example, “5 September 2017” is shown as

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Complete the sentence above by inserting after “... is shown as ...”, the example date in the required format. E.g. “5 September 2017” is shown as 20170905”.

TfNSW Representative (refer Clause 2.1.1)

Name:

Contact Details:

Surveying Qualifications:

TfNSW Technical Representative (if appointed) (refer Clause 2.1.2)

Name:

Contact Details:

Surveying Qualifications:

A1.1 Project Description

A1.2 General Limits of Work

A1.3 Utilities Information Supplied by TfNSW (refer Clause 3.4.3 (d))

Details of existing utilities within the project area obtained from Dial Before You Dig or utility service providers are shown below or attached. You must verify that the information provided is current at the time of survey.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Insert here or attach details of existing utilities within the project area. Include contact details of Dial Before You Dig or utility service provider and date of contact with them.

A2 GENERAL REQUIREMENTS

A2.1 Quality Management (refer Clause 2.3)

The Contractor must have a third party accredited Quality Management System complying with AS/NZS ISO 9001: Yes / No

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify whether a third party accredited Quality Management System is required by deleting whichever of the “Yes / No” option that is not applicable.

If yes, the Contractor must provide a copy of the Corporate Quality Manual.

Regardless of whether a third party accredited Quality Management System is required, the Contractor must provide a copy of the Project Quality Plan complying with AS/NZS ISO 9001 which must include the documents listed in Annexure G73/D.

A2.2 Property Owners and/or Occupiers Contact Details (refer Clause 2.4)

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Insert here list of property owners or occupiers and their contact details.

If appropriate, insert flowchart for property access process, and hyperlinks to templates for consent request letters and consent forms.

The form to be used for listing and recording details of contact made with property owners or occupiers on site is provided in Annexure G73/K.

A2.3 Work Health and Safety (refer Clause 2.5 and TfNSW G24)

Monthly WHS Report required: Yes / No

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify whether a monthly WHS Report is required by deleting whichever of the “Yes / No” option that is not applicable.

If appropriate, insert here requirement that monthly WHS report must be in the same format as that in TfNSW G24 Annexure G24/L.

At least one person in survey team must have “Prepare Work Zone Traffic Management Plan” qualification: Yes / No

Additional requirements are:

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify whether at least one person in survey team must have “Prepare Work Zone Traffic Management Plan” qualification by deleting whichever of the “Yes / No” option that is not applicable.

To assist the Contractor with assessing the impact and risk of working near or on roads, provide here additional traffic information e.g. vehicle counts, times and particular days of week of peak traffic occurrence, restrictions on road closures near community facilities such as hospitals, etc.

A2.4 Environmental Constraints (refer Clause 2.6)

An initial site visit is required to define and ascertain any restricted areas: Yes / No

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify whether an initial site visit is required to define restricted area by deleting whichever of the “Yes / No” option that is not applicable.

*Refer to TfNSW EIA-PO5-1 “Environmental assessment procedure for routine maintenance and minor works - roads and maritime activities” for guidance, available from:
<http://home.rta.nsw.gov.au/dts/cserv/os/original/environment/eia-p05-1.pdf>*

Extract from the documents provided such as Environmental Memo, Minor Works REF or Project REF the survey activity constraints and insert them below under the relevant headings.

(a) **Flora and Fauna**

(b) **Aboriginal**

(c) **Non-aboriginal**

(d) **Noise Sensitive Areas**

A3 TECHNICAL REQUIREMENTS

A3.1 Datum of Survey (refer Clause 3.1.1)

Horizontal Datum:

Vertical Datum:

A3.2 Current TfNSW CADD Software and Version and Required Format for Transmitted Electronic Data (refer Clause 3.2.1)

The format for electronic input data must be in MX major option SURVEY. Input files in GENIO format are not acceptable.

OR

The format for electronic input data must be in GENIO file format in fixed field format with real coordinates, with one point per line. All survey control stations must be in 4D format.

OR

Other format:

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Select the required format by deleting whichever 2 of the above 3 options that are not applicable. If the 3rd option of "Other format" is selected, provide further details as appropriate.

If MX is specified, the Contractor may utilise major options SURVEY and EDIT.

Should the Contractor propose to provide the survey data in a format that is not used by TfNSW, the TfNSW Representative must first ensure that the data can be converted to a format used by TfNSW ("standard format") without loss of functionality or integrity for archival purposes before accepting the proposal.

The TfNSW Representative must ensure that any non-standard formats, if accepted, are clearly marked as non-standard.

A3.3 Control Survey Information (refer Clauses 3.4.4 and 3.4.9 respectively)

(a) CLASS compliance requirements:

- (i) EDM and horizontal angle measurements: **CLASS C**
- (ii) GNSS techniques: **CLASS B**
- (iii) differential levelling techniques: **CLASS LC**
- (iv) trigonometric heighting method: **CLASS C**
- (v) breakdown traversing EDM techniques: **CLASS D**

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

The CLASS stated above are the default requirements. Amend them as appropriate to suit the requirements of the project.

(b) Maximum spacing between adjacent survey control marks:

- (i) State survey control marks: 500 metres
- (ii) Project detail survey control marks:
 - Nominated special features: 200 metres
 - All others: 300 metres

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

The spacings stated above are the default requirements. Amend them as appropriate to suit the requirements of the project.

Insert under item (c) below any additional control survey information or requirements.

Include all existing Survey Control Marks within and adjoining the project area. The new marks must be of a permanent and stable nature, and be suitable for use during the construction phase. Such marks may include bolts in kerb/footpath, star pickets, etc.

(c) Additional control survey information and requirements:

A3.4 Survey Control Network Drawing (refer Clause 3.4.6)

Survey Control Network Drawing required (existing and/or proposed network): Yes / No

Survey Control Sheet required: Yes / No

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify whether a SCD and SCS is required by deleting whichever of the “Yes / No” option that is not applicable.

A3.5 Survey Control Report (refer Clauses 3.4.8 and 3.4.7 respectively)

Survey Control Report required: Yes / No

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify whether a Survey Control Report is required by deleting whichever of the “Yes / No” option that is not applicable.

For the report format, use the Spatial Services Survey Report template, which is available at:
https://www.spatial.nsw.gov.au/surveying/surveying_services/survey_information

Include the TfNSW Project Reference Number in the report.

Attach all locality sketch plans to the report. For the locality sketch, use the Spatial Services locality sketch plan form, which is available at:
https://www.spatial.nsw.gov.au/surveying/scims_online/lsp_form

A3.6 Spatial Data Tolerances and Nominated Special Features (refer Clause 3.5.1)

(a) Spatial Data Tolerances

The feature tolerances to define the model are shown in Table G73/A.1, which is in accordance with Part 3.2 “Surveying” of the CADD Manual. This includes information regarding underground utility location requirements in accordance with AS 5488. The Feature Zones are areas of “like” surfaces.

The tolerances at 68% confidence interval (CI) or one standard deviation (1σ) are shown in Table G73/A.1, together with the uncertainty values at 95% CI or two standard deviations (2σ). Survey control, technologies, observation methodologies, error mitigation and processing should ensure that the model is within the specified positional and height tolerance requirements.

Table G73/A.1 – Tolerances for Feature Horizontal Coordinates and Heights

Typical Features	Feature Zone	Positional Tolerance (m)		Height Tolerance (m)	
		@ 1σ [68% CI]	@ 2σ [95% CI]	@ 1σ [68% CI]	@ 2σ [95% CI]
Nominated special features ⁽¹⁾	Zone A	± 0.02 [0.04]	± 0.04 [0.08]	± 0.005 [0.01]	± 0.01 [0.02]
Roads and bridges when required for design	Zone 1	± 0.02 [0.04]	± 0.04 [0.08]	± 0.01 [0.02]	± 0.02 [0.04]
Nominated hard surfaces Kerbs, driveways and footpaths	Zone 1 or Zone 2	± 0.04 [0.08]	± 0.08 [0.16]	± 0.02 [0.04]	± 0.05 [0.10]
Batters, edge of formation and drains (natural surface) Buildings, including floor height Utilities (surface and above ground) ⁽²⁾	Zone 2	± 0.10 [0.2]	± 0.2 [0.4]	± 0.05 [0.10]	± 0.1 [0.20]
Trees (diameter > 0.3 m), if required	Zone 3	± 0.10 [0.2]	± 0.2 [0.4]	± 0.10 [0.20]	± 0.2 [0.40]
Natural surface, overhead non-utility cables	Zone 3	± 0.25 [0.5]	± 0.5 [1.0]	± 0.10 [0.20]	± 0.2 [0.40]
Railway and drainage structures (including pipe invert) ⁽²⁾	Zone 4	± 0.05 [0.10]	± 0.10 [0.2]	± 0.025 [0.05]	± 0.05 [0.10]

Note:

- ⁽¹⁾ See below for details of nominated special features.
- ⁽²⁾ Generally, all visible drainage features and structures at surface level must be included in the survey of detail features. This may include pit inlets, pit invert and headwall and pipe information not requiring confined space accreditation to access.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

The tolerances shown in Table G73/A.1 above are the default requirements. If required, amend table to suit the requirements of the project. If appropriate, add the underground utility location table from Part 3.2 “Surveying” of the CADD Manual.

(b) Details of nominated special features:

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Insert here description of nominated special features, or alternatively insert a sketch of the features.

(c) Additional features to be surveyed (e.g. overhead utility cables):

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Insert here description of additional features to be surveyed, or alternatively insert a sketch of the features.

A3.7 Designated TfNSW Drawing Set Numbers

Survey Control Network:

Preservation of Survey Infrastructure:

Detail features:

Drainage investigation:

Utility investigation:

Cadastral overlay model:

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Insert above the relevant Drawing Set Numbers. Delete any items that are not applicable.

A3.8 Project Specific Model Naming Convention (refer Clause 3.5.1)

Divide the spatial data into various models as listed in Table G73/A.2.

Table G73/A.2 – Project Specific Model Names

Model Name (28 character limit)	Description
SURV ### Ground !!!	Detail or survey feature model (DTM).
TRI ### GRD Triangles !!!	Triangulation model of detail survey (with masking applied).
CONT ### GRD Contours !!!	Contour model of detail survey.
SURV ### Text !!!	Model of geo-referenced text information that enhances the understanding of the associated model(s).
SURV ### Control !!!	If required, the survey control information (4D) can be used to create a separate model.
SURV ### Bridge !!!	If required, bridge details are separated from the detail survey model. This can assist the creation of the triangulation and contour models.
SURV ### Drain !!!	If required, detailed information about the drainage systems.
UTIL ### Utilities !!!	If required, utilities can be separated from the detail survey model. This can be used for 3D investigations of underground utilities.
CADA ### Cadastral !!!	If required, a model of the cadastral (property) boundaries can be created. Accuracy is dependent on the source information, methodology of calculation and age of the cadastre.
WAE ### Location !!!	If required, a model of the Works-As-Executed (As Built) features, including subsurface utilities.
SURV ### QQ !!!	QQ check strings for validation of detail survey.

Legend:

Project Reference Number

!!! Version number, either numeric or reverse date format

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

The CADD Manual naming conventions are reproduced in Table G73/A.2 above. If required, amend table to suit the requirements of the project.

A3.9 Validation of Detail Feature Model (refer Clause 3.5.2)

The number, position and frequency of checking strings (QQ strings) within the project area is either shown below or attached as a sketch.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Insert here the required details or attach a sketch.

Suggested number, position and frequency of checking strings are:

- Minimum of 3 QQs required.

- One QQ string for each 200 metres of the surveyed corridor for urban projects.
- Three QQ strings per road intersection.
- Each QQ string should transverse the model at approximately 45 degrees and must extend outside the transverse limits of the model.
- Generally, points along QQ strings must be at no greater than 10 metres apart and at all changes of grade.
- Generally, QQs need be investigated for vertical differences between the model and the observed string. If horizontal offsets are required, specify the locations and details below.

Provide a report of:

- (a) QQ point positional offset comparisons with the nominated feature strings;
- (b) QQ point height comparisons with the triangulated model.

For both items (a) and (b) above, the variations must comply with the tolerances listed in Table G73/A.1 at 68% CI.

A3.10 Drainage Network Investigation (refer Clause 3.6)

Details of the drainage network investigation within the project area is either shown below or attached as sketch.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Provide details here or attach a sketch. If not applicable, insert here the words "Drainage network investigation not required".

A3.11 Utility Investigation (refer Clause 3.7)

The details of the utility investigation within the project area is either shown below or attached as a sketch.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Provide details here or attach a sketch. If not applicable, insert here the words "Utility investigation not required".

A3.12 Cadastral Overlay Model (refer Clause 3.8)

Cadastral overlay model required: Yes / No

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify above whether a cadastral overlay model is required by deleting whichever of the "Yes / No" option that is not applicable.

To enable adoption of appropriate protection or remedial measures prior to any construction activities, survey or calculate all cadastral reference and control marks within and adjacent to the project area. Show the marks in a survey mark register and include them in the model.

Post-design POSI drawing for this project is required: Yes / No

Details of the cadastral model overlay within the project area is either shown below or attached as a sketch.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify above whether a post-design POSI drawing is required by deleting whichever of the “Yes / No” option that is not applicable.

Provide details here or attach a sketch. If not applicable, insert here the words “Cadastral overlay model not required”.

A4 PROGRESS REPORTING (refer Clause 4.1)

Unless otherwise stated, submit progress reports on the first business day of each month and provide details of work to date, notation of milestones achieved and an updated program. These reports must also identify the progress to date in the form of percentage of each activity completed and any impediments to completing the program on schedule.

OR

Report your progress each month by completing the table for progress reporting.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

Specify the progress reporting requirements by deleting whichever of the two options above on progress reporting that is not applicable.

A5 SURVEY DELIVERABLES (refer Clause 4.3)

On completion of the survey, submit the survey model obtained.

As soon as practicable after completion of the survey work, submit also the following:

- (a) All completed originals of the form provided in Annexure G73/K for logging contact with each property owner or occupier.
- (b) Field notes of survey to establish and extend survey control network. If field observations are taken electronically, provide copies of the raw and adjusted data in electronic format.
- (c) Adjustment of survey control network with verification of CLASS of survey and an estimate of the ORDER of survey, in accordance with SP1 and Spatial Services requirements.
- (d) Electronic copy of raw (field) and reduced survey data generated during collection of feature strings.
- (e) Summary table of all redundant observations, with comparisons, for the control survey and detail survey to verify the accuracy of the surveys.
- (f) Completed Contractor Checklist(s) in Annexure G73/E, including details of the validation of the ground survey model and certification that the survey conforms with this Specification.
- (g) All drawings as specified in Annexure G73/A1 “Project Information” and G73/H “Presentation of CADD Drawings”.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/A)

The items listed above are default requirements. Amend as required. Alternatively, delete the items above and insert a table of deliverables.

ANNEXURE G73/B – (NOT USED)

ANNEXURE G73/C – SCHEDULES OF HOLD POINTS AND PROJECT RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS

Clause	Description
2.3.7	Rectification of survey work process which have a condition adverse to quality
2.7.2	Submission of surveyor details, Quality Manual, Project Quality Plan, survey equipment details, Safety Management Plan and SWMS, TCP and traffic control personnel details, and procedures for working around known heritage and other environment constraints
3.2.3	Compliance with TfNSW CADD Data Acceptance Testing Procedure
3.4.5	Submission of details of planned survey control network, location of new marks, observation methodology and records, adjustment methods and CLASS test
3.4.13	Submission of draft versions of Survey Mark Register, CSD or SCS drawing, survey adjustment files and CLASS test results
4.3.3	Submission of outputs and records

C2 SCHEDULE OF PROJECT RECORDS

Refer to Clause 2.3.5. Retain the records for 5 years.

Clause	Description of Identified Record
2.2	Qualification and accreditations of surveyors and other personnel
2.3.4	Survey instrument and ancillary equipment calibration records
2.3.7	Close-out of corrective actions
2.4.2	Copies of completed “Entry by Consent” form and other information regarding contact with the public and land owners or occupiers
2.5	WHS induction training records, including copies of all signed inductions
2.5.4	Traffic Control accreditations of personnel
3.2.2	CADD Data Acceptance Testing results
4.3.1	Survey model
	Field notes of survey to establish and extend survey control network
	Adjustment of survey control network
	Electronic copy of raw (field) and reduced survey data generated
	Summary table of all redundant observations
	Completed checklists and results from model validation(s)

ANNEXURE G73/D – PLANNING DOCUMENTS

Refer to Clause 2.3.1.

The following documents are a summary of documents that must be included in the Project Quality Plan, which is sometimes referred to as the Project Management Plan. The requirements of this Specification and others included in the Contract must be reviewed to determine additional documentation requirements.

Clause	Description of Document
2.2.1	Names, responsibilities and authorities of personnel responsible for quality assurance activities on this Contract
2.3.2	Survey procedures, including methods to verify and extend the survey control network and to locate detail features necessary to form the digital terrain model, and methods to determine point and stringline position and point selection along the stringline
2.3.2	Survey methods and equipment to achieve specified tolerances
2.3.5	Methods of storing and maintaining project records for 5 years
2.5.2	Safety Management Plan and relevant Safe Work Method Statements
2.5.4	Traffic Control Plans for working on or near roads
2.6.2	Procedures for working around known heritage and other environment constraints in project area
3.3	Procedures and methods for preservation of survey infrastructure

ANNEXURE G73/E – CHECKLISTS

E1 TfNSW REPRESENTATIVE CHECKLIST

Verified by: TfNSW Representative / Technical Representative (*delete as applicable*)

Item	Details	G73 Clause	Sign off
Preliminary			
1	Data Exchange verification:		
	Determine format of data that Contractor will supply at the completion of the Contract, e.g. MX major option SURVEY or GENIO input file	3.2	
	Supply or request sample survey data	3.2	
	Transmit sample data to Contractor with instructions on data manipulation	3.2	
	Verify successful data transmitted back to TfNSW with specified manipulation	3.2	
2	Verify calibration of Contractor's total station, levels and GNSS equipment and other measurement or ancillary equipment	2.3.4	
3	Obtain verification of Contractor surveyor's qualification, including accreditations and WHS certificates	2.2	
4	Supply Contractor with standard TfNSW string labels and legends	3.1.2	
5	Determine grid and height datum	3.1.1	
6	Determine scope for Preservation of Survey Infrastructure – permanent marks likely to be impacted and a replacement strategy	3.8	
7	Determine accuracy required of the cadastral overlay	3.8	
8	Provide Contractor with electronic copy of metadata (text file G73/F)	4.3.1	
9	Supply Contractor with available survey control information. (Note: the Contractor takes responsibility for all survey control data, regardless of the source.) Review preservation of survey marks requirements	3.4	
10	Review Contractor's WHS and environmental systems	2.5, 2.6	
During Survey			
11	Review Contractor surveying procedures before fieldwork and/or when requested by the Representative	2.3.2	
12	Verify Contractor's control survey where requested to release Hold Point	3.4.5	
13	Arrange field audit and records inspection with Contractor when requested	2.3.6	

Detail Survey**G73**

Item	Details	G73 Clause	Sign off
14	Provide Contractor with template for preparation of Survey Control Drawing or Sheet	3.4.6	
15	Check placement (for longevity) and locality sketches of State permanent marks and cadastral reference marks	3.4.3	
Close Out of Survey			
16	Contractor's output verification:	4	
	All survey data is concise, legible and relevant	3.2	
	Field and adjustment data for survey control network/traverse	3.4.3	
	Adjustment of survey control network/traverse and evidence of accuracy	3.4.3	
	Field data and reduced observation of field data for creation of models	3	
	Summary of redundant observations with comparisons	3	
	Model validation (QQ strings, string labels, model names, contours, etc)	G73/A	
	Completed checklists	G73/E	
	Survey Control Drawing, including Survey Control Marks Schedule	G73/H	
	If required, checklists for Drainage, Utilities and Cadastral Overlay	G73/E	
17	Lodge amended State Control Survey information with Spatial Services (DFSI)	3.4.3	

Notes:

E2 CONTRACTOR CHECKLIST – PROJECT DOCUMENTATION

Refer to Clause 4.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor's Rep:

TfNSW Technical Rep:

E2.1 Survey Instruction

- | | Y | N | NA |
|---|--------------------------|--------------------------|--------------------------|
| (i) Horizontal Datum adopted: Zone: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ii) Height Datum adopted: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iii) Instrument calibration listed in E5 Detail Survey Checklist | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E2.2 Checklist(s) to be Completed

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| (i) E2 Project Documentation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ii) E3 Adjustment of Survey Control | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iii) E4 Survey Control Network Drawing | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iv) E5 Detail Survey | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (v) E6 Drainage Network Investigation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (vi) E7 Utility Investigation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (vii) E8 Cadastral Overlay | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (vi) E9 Bridge Design Data Survey incorporating Form OTB-TP-202-F03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E2.3 Information to be Provided to TfNSW Representative

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| (i) Completed checklists | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ii) Completed Report(s) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iii) Field and level books or folders and electronic file copies | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iv) Drawings | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (v) Processed model(s) with metadata | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (vi) State Control Mark Sketches (original and copy for new marks) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (vii) Utility plans | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (viii) Completed CADD Data Transmission Record(s) for all files | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ix) Originals of completed log of contact with owners or occupiers and consent forms | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (x) Completed WHS documentation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E2.4 Comments

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Signed: Completion Date/...../.....

Position:

E3 CONTRACTOR CHECKLIST – ADJUSTMENT OF SURVEY CONTROL

Refer to Clause 4.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor’s Rep:

TfNSW Technical Rep:

E3.1 Adjustment Details **Y N NA**

- (i) Program Name:
Version:
- (ii) Horizontal Datum adopted: Zone:
- (iii) Height Datum adopted:
- (iv) Survey Data Input files as per table below (or listed separately):

Digital Level	Conventional EDM	GNSS

E3.2 Free Network Adjustment (check on observations) **Y N NA**

- (i) Check initial fixed station values and any DUPLICATE stations
- (ii) Any tagged lines or observations out of tolerance?
- (iii) Check observation residuals for larger than expected values
Largest Residuals for each type of observation
.....
- (iv) Estimated Variance Factor (*state value*):
Confirm EVF is acceptable, i.e. within range of $0.5 < VF < 1.5$
- (v) Acceptable number of flagged residuals of total observations/.....
- (vi) Does F Test pass?
- (vii) For GNSS Surveys, Gravimetric adjustment completed and AHD heights checked. Geoid acceptable.
- (viii) Output file name and date:

E3.3 Fixed Network Adjustment **Y N NA**

- (i) Validate coordinates and height of fixed and weighted stations
- (ii) Confirm correct nomination of fixed and weighted stations

Detail Survey

G73

- (iii) Tagged lines or observations out of tolerance?
- (iv) Check observation residuals for larger than expected values
 Largest Residuals for each type of observation

- (v) Note Estimated Variance Factor:
 Confirm EVF is acceptable, i.e. within range of $0.5 < VF < 1.5$
- (vi) Acceptable number of flagged residuals of total observations/.....
- (vii) Does F Test pass?
- (viii) CLASS and ORDER agreement OK?
- (ix) Average Combined Scale Factor = Range = +/-
- (x) Check calculated CSF against SCIMS (if available)
- (xi) Output file name and date:

E3.4 Comments

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Signed:

Position:

Completion Date/...../.....

E4 CONTRACTOR CHECKLIST – SURVEY CONTROL NETWORK DRAWING

Refer to Clause 3.4.6.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor’s Rep:

TfNSW Technical Rep:

Drawing Reference Number:

E4.1 Metadata Block

Y N NA

- (i) Coordinate system and Zone shown correctly
- (ii) Adopted control marks shown correctly
- (iii) Instrument listing is correct and all instruments calibrated
- (iv) Date of survey shown correctly
- (v) GNSS and Network Adjustment software shown correctly
- (vi) Horizontal and Vertical CLASS and ORDER of adjustment shown correctly

Combined Scale Factor (CSF)

(vii) Average Combined Scale Factor =

(viii) Range of Combined Scale Factor =

(If range of Point CSF is > ±10 ppm, consider: varying accuracy statement; showing multiple Average CSF and ranges; or showing individual CSF for each station.)

- (ix) Multiple or Station CSF used?
- (x) Project Reference and Drawing Set Numbers shown correctly
- (xi) Road Number and Name shown correctly
- (xii) Local Government Area shown correctly

E4.2 Diagrams and Schedules

- (i) Each station shown on drawing is shown in Coordinate Schedule
- (ii) Each station shown in Coordinate Schedule are on drawing
- (iii) Lines between control stations have been observed
- (iv) Control Station values, CLASS, ORDER, Description and Source are correct

All records, electronic files and drawings to be supplied and “E2 CONTRACTOR CHECKLIST – PROJECT DOCUMENTATION” is to be completed.

E4.3 Comments

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Signed: Completion Date/...../.....

Position:

E5 CONTRACTOR CHECKLIST – DETAIL SURVEY

Refer to Clause 3.5.

TfNSW Project Reference:

Location:

Contractor:

Contractor’s Rep:

TfNSW Technical Rep:

Drawing Reference Number:

E5.1 Survey Instruction **Y N NA**

- (i) Horizontal Datum adopted: Zone:
- (ii) Height Datum adopted:
- (iii) Clause 2.7.2 HOLD POINT released
 - Names and qualifications of surveyors, including critical licences
 - Corporate Quality Manual (if applicable) and Project Quality Plan
 - Safety Management Plan and SWMS
 - Traffic Control Plans and traffic control qualifications
 - Procedures for working around environmental constraints
- (iv) Clause 3.2.3 HOLD POINT released – CADD Data Acceptance
- (v) Clause 3.4.5 HOLD POINT released – Survey Control Network
- (vi) DBYD search received and dated:

E5.2 Equipment Calibration

Equipment Records	Make & Model	Serial Number	Calibration Date
Total station (EDM)			
Level			
GNSS			

If space is insufficient, attach list

E5.3 Fieldwork **Y N NA**

- (i) Date from: to:
- (ii) Check (CHE) shots to survey control complies with CADD Manual
- (iii) Maximum distance to feature shots complies with CADD Manual
- (iv) Feature coding complies with CADD Manual
- (v) Feature tolerances comply with CADD Manual
- (vi) Point natural surface shots (PNSS) reduced to a minimum

- (vii) If required, lowest point and pole position on overhead wires surveyed
- (viii) Check strings (QQ) independently observed

E5.4 Model Validation **Y N NA**

- (i) All check shots (CHE) to control compared and validated
- (ii) All feature coding comply with CADD Manual
- (iii) Model checked for noncompliant single point strings
- (iv) Model checked for duplicate strings
- (v) Model checked for crossing strings
- (vi) Bridge features placed in separate model and checked
- (vii) Contour model checked (especially high and low points)
- (viii) "Walked through" project area with survey plot as final check
- (ix) Check strings (QQ) conformance report validated
- (x) Metadata (Annexure G73/F) completed for survey data file

E5.5 Final Drawings **Y N NA**

- (i) Comply with Annexure G73/H
- (ii) Locality details and disclaimers added
- (iii) Schedule of control mark values added
- (iv) Details of special features and structures added
- (v) Where appropriate, site photographs added

E5.6 Comments

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Signed: Completion Date/...../.....

Position:

E6 CONTRACTOR CHECKLIST – DRAINAGE NETWORK INVESTIGATION

Refer to Clause 3.6.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor’s Rep:

TfNSW Technical Rep:

Drawing Reference Number:

- | | | | |
|--|--------------------------|--------------------------|--------------------------|
| E6.1 Survey Instruction | Y | N | NA |
| (i) Items as listed in E5.1 completed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ii) TfNSW drainage structure details (RAA) supplied | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iii) Clause 2.7.2 HOLD POINT released | | | |
| - Critical licence for working in confined spaces | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| - SWMS for working in confined spaces | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E6.2 Equipment Calibration

Equipment Records	Make & Model	Serial Number	Calibration Date
Total station (EDM)			
Level			
GNSS			

If space is insufficient, attach list

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| E6.3 Fieldwork | Y | N | NA |
| (i) Items as listed in E5.3 and complete | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ii) TfNSW drainage structure details (RAA) validated | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iii) Site checked for additional drainage structures | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| E6.4 Model Validation | Y | N | NA |
| (i) Items as listed in E5.4 completed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (ii) Underground drainage features placed in separate model and checked | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iii) Invert level checked for consistency (water flows downwards) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (iv) “Walked through” the project area with survey plot as final check | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (v) Metadata (Annexure G73/F) completed for survey data file | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | | | |
|--------------------------------|--------------------------|--------------------------|--------------------------|
| E6.5 Final Drawings | Y | N | NA |
| (i) Comply with Annexure G73/H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(ii) Items as listed in **E5.5** completed

E6.6 Comments

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Signed: Completion Date/...../.....

Position:

E7 CONTRACTOR CHECKLIST – UTILITY INVESTIGATION

Refer to Clause 3.7.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor’s Rep:

TfNSW Technical Rep:

Drawing Reference Number:

E7.1 Survey Instruction

Y N NA

- (i) Items as listed in **E5.1** completed
- (ii) DBYD search received and dated:
- (iii) Clause 2.7.2 HOLD POINT released
 - Critical licence for working in confined spaces
 - SWMS for working in confined spaces
 - Critical licence for working near utilities
 - SWMS for working near utilities

E7.2 Equipment Calibration

Equipment Records	Make & Model	Serial Number	Calibration Date
Total station (EDM)			
Level			
GNSS			

If space is insufficient, attach list

E7.3 Fieldwork

Y N NA

- (i) Dates from: to:
- (ii) Items as listed in **E5.3** completed
- (iii) Lowest point on above ground cables surveyed
- (iv) Site checked for additional utilities
- (v) Photographs and/or videos of the site were taken

E7.4 Underground Utility Location

Note: SUI location Quality Levels (QL) shown in tables below are in accordance with AS 5488.

Details	Electricity	Communications	Water
SUI location Quality Levels	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)
For QL-B locates, minimum threshold methods have been used	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Access is available to all assets (e.g. pits not locked or in restricted areas)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Property connections were located	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Comments:

.....

Details	Gas	Fuel	Sewer
SUI location Quality Levels	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)
For QL-B locates, minimum threshold methods have been used	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Access is available to all assets (e.g. pits not locked or in restricted areas)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Property connections were located	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Comments:

.....

Details	Stormwater	Other:	Other:
SUI location Quality Levels	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)	<input type="checkbox"/> QL-A <input type="checkbox"/> QL-B <input type="checkbox"/> QL-C <input type="checkbox"/> QL-D (tick multiple boxes if more than one quality level is used)
For QL-B locates, minimum threshold methods have been used	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Access is available to all assets (e.g. pits not locked or in restricted areas)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Property connections were located	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Comments:

.....

G73

Detail Survey

E7.5 Model Validation

Y N NA

- (i) All check shots (CHE) to control compared and validated
- (ii) All feature coding comply with CADD Manual
- (iii) Model checked for noncompliant single point strings
- (iv) Model checked for crossing and duplicate strings
- (v) Where appropriate, underground features RL checked
- (vi) Bridge features placed in separate model and checked
- (vii) Contour model checked (especially high and low points)
- (viii) "Walked through" project area with survey plot as final check
- (ix) Check strings (QQ) conformance report validated
- (x) Metadata (Annexure G73/F) completed for survey data file

E7.6 Final Drawings

Y N NA

- (i) Comply with Annexure G73/H
- (ii) Locality details and disclaimers added
- (iii) Schedule of control mark values added
- (iv) Details of special features and structures added
- (v) Where appropriate, site photographs added

E7.7 Comments

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Signed: Completion Date/...../.....

Position:

E8 CONTRACTOR CHECKLIST – CADASTRAL OVERLAY

Refer to Clause 3.8.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor’s Rep:

Drawing Reference Number:

E8.1 Survey Instruction

Y N NA

- (i) Information as listed in **E5.1** and is complete
- (ii) DBYD search received and dated:
- (iii) Relevant title and plan search received:
- (iv) Title and plan search is current

E8.2 Equipment Calibration

Equipment Records	Make & Model	Serial Number	Calibration Date
Total station (EDM)			
Level			
GNSS			

If space is insufficient, attach list

E8.3 Fieldwork

- (i) Is fieldwork required (*if “No”, go to E8.4*)
- (ii) Dates from: to:
- (iii) Items as listed in **E5.3** completed

E8.4 Model Validation

Y N NA

- (i) All survey control and reference marks checked
 - (ii) All feature coding comply with CADD Manual
 - (iii) Model compilation method was PO comparison
 - (iv) Model compilation method was Least Squares
- COMMENT on compilation method (or attach a report)

(v) Model checked independently (*circle method used*)

Photogrammetry Detail Survey DCDB Other (*specify in space below*)

(vi) Estimated accuracy of model

(vii) Any areas in excess of the estimated accuracy

COMMENT on accuracy (or attach a report)
.....

E8.5 Final Drawings **Y N NA**

(i) Comply with Annexure G73/H

(ii) Locality details and disclaimers added

(iii) Schedule of all control and cadastral reference mark values added

(iv) Details of special features and structures added

(v) Where appropriate, site photographs added

(vi) Where appropriate, text on accuracy of model added

(vii) Comply with the Preservation of Survey Infrastructure (POSI)

(viii) List of all Deposited Plans and Cadastral Plans

All records, electronic files and drawings to be supplied and “E2 CONTRACTOR CHECKLIST – PROJECT DOCUMENTATION” is to be completed.

E8.6 Comments

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Signed: Completion Date/...../.....

Position:

E9 CONTRACTOR CHECKLIST – BRIDGE DESIGN DATA SURVEY CHECKLIST

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/E9)

If a bridge design data survey is not required, delete this clause and change the title to “NOT USED”

Refer to Annexure G73/L for further guidance.

TfNSW Project Reference Number:

Location:

Contractor:

Contractor’s Rep:

Drawing Reference Number:

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/E9)

Insert here TfNSW Form OTB-TP-202-F03 “Checklist for Bridge Design Data”.

ANNEXURE G73/F – SAMPLE DATA FILE HEADING (METADATA)

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/F)

Complete, as appropriate, an electronic copy of metadata text file as shown in example below and forward it to the Contractor.

Remaining unfilled fields must be completed by the Contractor.

```

----  ***  TRANSPORT FOR NSW MX SURVEY/GENIO INPUT FILE METADATA  ***  ----
PROJECT REFERENCE NO.:                               RECORD FILE NO.:
Location:
Contractor:
Contractor's Rep:
TfNSW Rep:
TfNSW Technical Rep:

```

```

      GRID DATUM:                               ZONE:
      HEIGHT DATUM:

```

DIAL BEFORE YOU DIG (DBYD) JOB NO.:

The following models (MAX 28 characters) are created below:

- 1) SURV # CONTROL !!
- 2) SURV # GROUND !!
- 3) SURV # DRAIN !!
- 4) UTIL # UTILITIES !!
- 5) CADA # CADASTRAL !!
- 6) SURV # BRIDGE !!
- 7) TRI # GRD TRIANGLES !!
- 8) CONT # GRD CONTOURS !!
- 9) SURV # TEXT !!
- 10) SURV # QQ !!

```

*****
MODEL NAMING:
Replace # with project reference number issued by the Representative.
Replace !! with the versioning system adopted for the project.
*****

```

```

STYLESET ASSOCIATED WITH MODELS
SURV: eg Survey 2009
UTIL:
CADA:

```

```

*****      AMENDMENTS/ADDITIONS SCHEDULE      *****
NO. DATE   SURVEYOR           LOCATION/DETAILS
1.
2.
3.
*****

```

```

*** eg of Schedule of Control. Could be used for Ground or ISG update for project ***
<<<<<< OR INSERT SURVEY MARK REGISTER SPREADSHEET (OTV-TP-03-T1) >>>>>>>>>>
      SURVEY CONTROL MARK SCHEDULE - MGA ZONE 56   GDA94
(alternate)      SURVEY CONTROL MARK REGISTER - MGA ZONE 56   GDA94
      *****
      ** SURVEY PROJECT: (Ref and description**** **)

```

```

-----
NAME* STATION  EASTING  NORTHING  CLASS  HEIGHT  CLASS COMBINED
ORDER SOURCE  A.H.D  ORDER  FACTOR  DESCRIPTION  SOURCE
-----
0648 PM 50648  323699.111  6234193.775  B 4  SCIMS  62.725  LB L2  0.999973  PIN+BOX  [P] SCIMS
0652 PM 50652  323656.185  6233814.903  B 4  SCIMS  57.578  LB L2  0.999974  PIN+BOX  [P] SCIMS
7075 SS 37075  323802.418  6233971.222  B 4  SCIMS  61.902  LB L2  0.999973  SS PLQ   [P] SCIMS
7097 SS 37097  323658.787  6233993.282  B 4  SCIMS  62.258  LB L2  0.999973  SS PLQ   [P] SCIMS
2889 SS 32889  323663.072  6234006.203  C 3  TfNSW  62.790  LD/L3  0.999973  SS PLQ   [P] TfNSW

```

Detail Survey

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BT01	323632.635	6234006.359	C 3	TfNSW	60.716	C/3	0.999974	TRI IN KB[P]	TfNSW
TDY1	323691.167	6234002.889	D 5	TfNSW	63.278	E/5	0.999973	DUMPY [T]	TfNSW
HIL1	323655.378	6233950.269	D 4	TfNSW	61.503	C/3	0.999974	HILTI [C]	TfNSW
HIL2	323645.268	6233895.965	D 4	TfNSW	159.818	C/3	0.999958	HILTI [C]	TfNSW

MEAN COMBINED SCALE FACTOR (CSF)= 0.999972

[P] = PERMANENT SURVEY MARK AS DEFINED BY SURVEYOR GENERAL'S DIRECTIONS NO.1 AND MUST BE PROTECTED IN ACCORDANCE WITH SPECIFICATION G71

[C] = SUITABLE FOR CONSTRUCTION AND MUST NOT BE DISTURBED UNTIL ASSESSED BY SURVEYOR

[T] = TEMPORARY SURVEY MARK, NOT SUITABLE FOR CONSTRUCTION

* = LAST FOUR CHARACTERS OF THE PERMANENT MARK NUMBER OR FOUR CHARACTER DESCRIPTOR USED IN DTM

NB: ALL OTHER SURVEY STATIONS ARE CONSIDERED TEMPORARY AND UNSTABLE FOR CONSTRUCTION

HORIZONTAL ADJUSTMENT METHOD AND FILENAME:

VERTICAL ADJUSTMENT METHOD AND FILENAME:

COMPUTED BY:

ISSUE DATE:

SURVEY DATE OF COMPLETION:

SURVEYED BY :

UTILITIES LOCATED BY :

***** (IF REQUIRED) *****

<<<<<<< OR INSERT SURVEY MARK REGISTER SPREADSHEET (OTV-TP-T1) >>>>>>>

CADASTRAL MARK SCHEDULE - MGA ZONE 56 GDA94

(alternate) CADASTRAL MARK REGISTER - MGA ZONE 56 GDA94

** SURVEY PROJECT: (Ref and description**** **)

NAME*	STATION	EASTING	NORTHING	CLASS ORDER	HEIGHT SOURCE	A.H.D	CLASS ORDER	COMBINED FACTOR	DESCRIPTION	SOURCE
0648	PM 50648	323699.111	6234193.775	B 4	SCIMS	62.725	LB L2	0.999973	PIN+BOX [P]	SCIMS
0652	PM 50652	323656.185	6233814.903	B 4	SCIMS	57.578	LB L2	0.999974	PIN+BOX [P]	SCIMS
7075	SS 37075	323802.418	6233971.222	B 4	SCIMS	61.902	LB L2	0.999973	SS PLQ [P]	SCIMS
7097	SS 37097	323658.787	6233993.282	B 4	SCIMS	62.258	LB L2	0.999973	SS PLQ [P]	SCIMS
2889	SS 32889	323663.072	6234006.203	C 3	TfNSW	62.790	LD/L3	0.999973	SS PLQ [P]	DP 123456
9001	RMGIP	323632.635	6234006.359	C 3	TfNSW	60.716	D/4	0.999974	RMGIP FD	DP 123456
9002	RM TREE	323691.167	6234002.889	D 5	TfNSW	63.278	E/5	0.999973	RM TREE FD	DP 123456
9003	RM DH&W	323655.378	6233950.269	D 4	TfNSW	61.503	C/3	0.999974	RM Calc'd	DP 123456
9004	PEG FD	323645.268	6233895.965	D 4	TfNSW	159.818	C/3	0.999958	PEG FD	DP 135790

MEAN COMBINED SCALE FACTOR (CSF)= 0.999972

[P] = PERMANENT SURVEY MARK AS DEFINED BY SURVEYOR GENERAL'S DIRECTIONS NO. 1 AND MUST BE PROTECTED IN ACCORDANCE WITH SPECIFICATION G71

[C] = SUITABLE FOR CONSTRUCTION AND MUST NOT BE DISTURBED UNTIL ASSESSED BY SURVEYOR

* = LAST FOUR CHARACTERS OF THE PERMANENT MARK NUMBER OR FOUR CHARACTER DESCRIPTOR USED IN DTM

NB: ALL OTHER SURVEY STATIONS ARE CONSIDERED TEMPORARY AND UNSTABLE FOR CONSTRUCTION

HORIZONTAL ADJUSTMENT METHOD AND FILENAME:

VERTICAL ADJUSTMENT METHOD AND FILENAME:

COMPUTED BY :

ISSUE DATE:

STANDARD ROADS AND MARITIME STRING LABEL CODES HAVE BEEN USED WITH THE EXCEPTION OF THE FOLLOWING:

APPLICATION OF COMBINED SEA LEVEL AND SCALE FACTOR:

- 1) PPM FACTOR HAS BEEN APPLIED TO THE OBSERVED LINES IN THE FIELD, OR
 - 2) LEVEL AND SCALE FACTORS HAVE BEEN APPLIED IN THE 200 MOSS SURVEY OPTION, OR
 - 3) FACTOR NOT APPLIED, SURVEY IS BASED ON GROUND DISTANCES / LOCAL COORDINATES.
- ***** TWO OF ABOVE THREE TO BE DELETED *****

MX Version xx.x

DELETE SURV # GROUND !!

CREATE SURV # GROUND !!

INSERT SURVEY OR GENIO DATA BELOW

```
SURVEY SURV # GROUND !!
OR
GENIO SURV # GROUND !!
*****
INSERT 180'S OR 4D GENIO FORMAT CONTROL STATION DETAILS BELOW
*****

*****
INSERT SURVEY DATA BELOW
*****

999
**** REPEAT FOR ALL OTHER MODELS CONTAINED WITHIN THE FILE *****
FINISH
```


ANNEXURE G73/G – CADD DATA ACCEPTANCE TESTING

Refer to Part 2.1 “CADD Data Exchange Policy” and Part 3.2 “Surveying” of the CADD Manual.

If GENIO format is used, all survey control stations must be in 4D strings, being the station name or number, Easting, Northing and Height. Null heights are shown as -999 and not zero.

Should the Contractor propose to provide the survey data in a format that is not used by TfNSW, the TfNSW Representative must first ensure that the data can be converted to a format used by TfNSW (“standard format”) without loss of functionality or integrity for archival purposes before accepting the proposal.

The TfNSW Representative must ensure that any non-standard formats, if accepted, are clearly marked as non-standard.

ANNEXURE G73/H – PRESENTATION OF CADD DRAWINGS

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure G73/H)

Complete Tables G73/H.1 and G73/H.2 below by filling in the required details.

H1 DRAWING DETAILS

Supply paper copies of drawings of the survey in accordance with the requirements stated in Table G73/H.1.

Table G73/H.1 – Details of Paper Copy Drawings Required

Description	Control Network ⁽¹⁾	Detail Survey ⁽²⁾	Drainage Network	Utility	Cadastral Overlay
G73 clause reference	Clause 3.4	Clause 3.5	Clause 3.6	Clause 3.7	Clause 3.8
Number of copies required					
Preferred paper plot size					
Preferred reduction ratio					
Grid spacing					
General contour interval					
North point shown					

Notes:

⁽¹⁾ Control Network Drawings, SCD or SCS, in accordance with Clause 3.4.6.

⁽²⁾ Contours should be shown in detail survey drawing, or alternatively be shown on a separate drawing.

All feature line styles, symbols, codes, and the drawing title block must conform to Part 3.2 “Surveying” of the CADD Manual.

H2 AUTHORISATION

Sign and date the drawing(s) as authorised. Include scanned copies of the authorised drawings in the project deliverables.

H3 AMENDMENTS

If the drawings require amendments, update the Amendments Schedule in the final drawing. Indicate and authorise the nature of the amendment in the Schedule. Include scanned copies in the project deliverables.

H4 ELECTRONIC FILE FORMATS

Supply all CADD drawings in the electronic file format specified in Table G73/H.2.

Table G73/H.2 – Electronic file format for CADD Drawings

Electronic File Format	Control Network ⁽¹⁾	Detail Survey ⁽²⁾	Drainage Network	Utility	Cadastral Overlay
G73 clause reference	Clause 3.4	Clause 3.5	Clause 3.6	Clause 3.7	Clause 3.8
Portable document format (PDF)					
MicroStation design (DGN)					
Other (specify)					

Notes:

- ⁽¹⁾ Control Network Drawings, SCD or SCS, in accordance with Clause 3.4.6.
- ⁽²⁾ Detail survey drawing should include contours, or appear on a separate copy.

ANNEXURES G73/I TO G73/J – (NOT USED)

G73

Detail Survey

ANNEXURE G73/K – FORM – LOG OF CONTACT WITH PROPERTY OWNERS OR OCCUPIERS

Refer Clause 2.4.2 and Annexure G73/A2.2.

Project Reference Number and Name:

Surveying Personnel:

Date and Time	Owner / Occupier <i>(name)</i>	Property Location	Contact Location <i>(if different)</i>	Phone No.	Contact Mode*	Remarks

* **Contact Mode code**

P: in person **T:** by telephone **M:** by mail **O:** Other

Attach any additional records.

ANNEXURE G73/L – BRIDGE DESIGN DATA REQUIREMENTS

L1 INTRODUCTION

A bridge site survey for a stream, road or railway is undertaken after the bridge location has been approved and is for the purpose of supplying data for bridge design requirements.

TfNSW Form OTB-TP-202-F03 “Bridge Checklist for Bridge Design Data” (“the Form”) is mostly applicable to stream and river crossings, although some sections are relevant to all bridge sites.

To follow the Form exactly will probably provide all the information required. However, it is possible for unqualified information to be misleading, which could result in either extravagant or inadequate design. Therefore, the Form is to be considered as a GUIDE ONLY.

Where the Form is considered to be unsuitable, or the space provided is insufficient for insertion of all necessary details, or unusual conditions prevail, a separate supplementary report should be prepared and attached to the Form. The explanatory notes on the Form are to be read carefully. It is to be noted that parts of the required information may be more efficiently supplied by road design, geotechnical or specialist personnel.

It is important that TfNSW bridge designers involved with the proposed bridge are consulted to ensure that the survey meets their needs.

L2 BRIDGE SITE SURVEY

L2.1 Preliminary Investigation

It is most important for the Surveyor to carry out some research after receiving the instruction and before commencing the survey. The Surveyor is to endeavour to ascertain the type or types of structure being considered for the site, what investigation, if any, has already been carried out (such as bore holes), and if there are any factors or circumstances which have immediate bearing on the extent of the survey about to be undertaken.

For example, the deck height may have been determined in relation to known flood heights or in built-up areas, it may be fixed in relation to adjoining development. Alternatively, the deck height may be fixed by the grade of the approaches and be considerably above known flood heights. In any event it is better to know such details before commencing the survey.

Search of old files and survey field and level books will often reveal valuable information about previous floods, road blockages, etc. Quite often, there are old photographs of such events and these can be of valuable assistance in establishing a reliable High Flood Level.

L2.2 Site Data and Survey

The bridge site data required to complete adequate design of the proposed structure is listed in the Form. Any additional information which the Surveyor thinks may influence the final design must also be included.

The Form is a comprehensive checklist of the information required and the criteria for the Bridge Site Survey Plan. This list provides sufficient information upon which the Surveyor is to base the survey.

L2.3 Foundation Data

Preliminary foundation information can be obtained by a thorough inspection of the site for rock formation which might suggest the type of strata underlying the site.

Except in the case of very simple sites, it is probable that borehole samples of the substrata will be required. These points will need to be located in relation to the ground survey to enable the data to be linked.

L2.4 Waterway Data

The most important feature of the majority of bridge site surveys is the establishment of a reliable design High Flood Level (HFL). Often watercourses do not behave according to hydrologic predictions so the observed HFL is a check on these predictions. Frequently, the height of the deck will be designed solely in relation to observed HFL.

Comprehensive flood information is to be obtained from all available sources. Heights of more recent floods are usually obtainable from flood debris. Data on floods can be obtained from information supplied by local residents and regular road users. Information from each source is to be submitted separately, with the name of each informant.

The type of information required is as follows:

- (a) The frequency of floods at various heights with their respective durations particularly that of the maximum known and other high floods, stating the date when each occurred.
- (b) Where there is an existing bridge, the frequency and times of submergence at various heights should be stated.
- (c) Information on backwater from floods in adjacent watercourses is important and should be provided with as much detail and as accurately as possible.

The dates of major floods are usually well recorded in local newspapers. Photographic and other records around those dates may also be obtained from the same source.

L3 SURVEYOR'S REPORT

The Report which accompanies the Form should supplement the information given in the Form. Information in the Report may include:

- (i) azimuth and level datum;
- (ii) definition of road boundaries;
- (iii) property ownership;
- (iv) public utilities;
- (v) existing bridge;
- (vi) flood information;
- (vii) any other detail which the Surveyor considers relevant to the location of a new bridge.

Photographs can be extremely useful in illustrating the report.

ANNEXURE G73/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.4.

TfNSW Specifications

TfNSW G24 Work Health and Safety (Non-Construction Work)

TfNSW Specification Guides

TfNSW NG71 Guide to QA Specification G71 - Construction Surveys

TfNSW Manuals and Checklists

CADD Manual, Part 2.1 “CADD Data Exchange Policy”

CADD Manual, Part 3.2 “Surveying”

Traffic Control at Work Sites Manual

Australian Standards

AS 2210 Occupational protective footwear

AS 4602 High visibility safety garments

AS 5488 Classification of Subsurface Utility Information (SUI)

AS/NZS ISO 9000 Quality management systems – Fundamentals and vocabulary

AS/NZS ISO 9001 Quality management systems – Requirements

AS/NZS ISO 10005 Quality management systems – Guidelines for quality plans

Intergovernmental Committee on Surveying and Mapping (ICSM)

Special Publication No. 1 Version 1.7 Standards and Practices for Control Surveys

NSW Government Legislation

Surveying and Spatial Information Act 2002

Surveying and Spatial Information Regulation 2017

Surveyor General’s Directions

Directions No. 1 Approved Permanent Marks

Directions No. 2 Preparation of Locality Sketch Plans

Directions No. 5 Verification of Distance Measuring Equipment

Directions No. 9 GNSS for Cadastral Surveys

Directions No. 11 Preservation of Survey Infrastructure

Directions No. 12 Control Surveys and SCIMS