National Environmental Monitoring Standards

National Quality Code Schema

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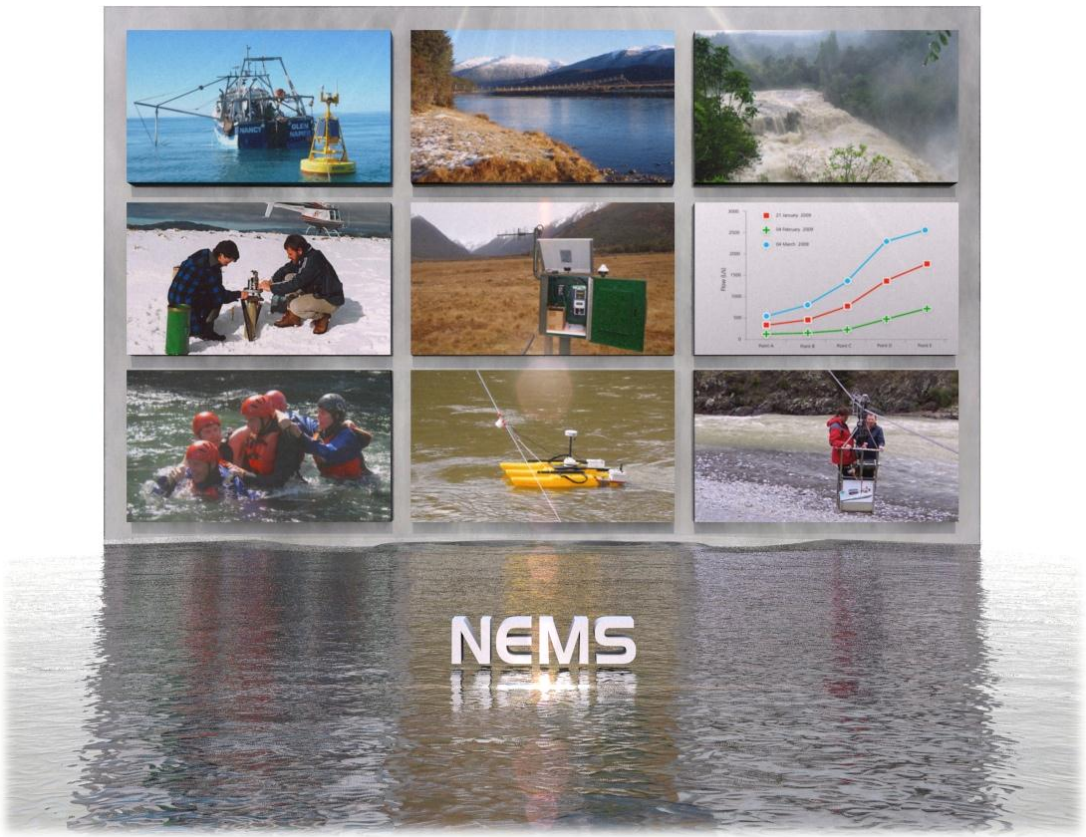

NEMS Standards Documents

The following standards can be found at www.landandwater.co.nz.

- National Quality Coding Schema
- Safe Acquisition of Field Data In and Around Fresh Water
  Code of Practice
- Dissolved Oxygen Recording
  Measurement, Processing and Archiving of Dissolved Oxygen Data
- Open Channel Flow Measurement
  Measurement, Processing and Archiving of Open Channel Flow Data
- Rainfall Recording
  Measurement, Processing and Archiving of Rainfall Intensity Data
- Soil Water Measurement
  Measurement, Processing and Archiving of Soil Water Content Data
- Turbidity Recording
  Measurement, Processing and Archiving of Turbidity Data.
- Water Level Recording
  Measurement, Processing and Archiving of Water Level Data
- Water Meter Data
  Acquisition of Electronic Data from Water Meters for Water Resource Management
- Water Temperature Recording
  Measurement, Processing and Archiving of Water Temperature Data

Limitations

It is assumed that as a minimum the reader of these documents has undertaken industry based training and has a basic understanding of environmental monitoring techniques. Instructions for manufacturer specific instrumentation and methodologies are not included in this document.

The information contained in these NEMS documents relies upon material and data derived from a number of third party sources.

The documents do not relieve the user (or a person on whose behalf it is used) of any obligation or duty that might arise under any legislation, and any regulations and rules under those acts, covering the activities to which this document has been or is to be applied.

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When implementing these standards, the following act, regulations and code of practice shall be complied with:

- Health and Safety in Employment Act 1992
- Health and Safety in Employment Regulations 1995
- NEMS Safe Acquisition of Field Data In and Around Fresh Water, Code of Practice 2012

National Environmental Monitoring Standards (NEMS)

The National Environmental Monitoring Standards steering group (NEMS) has prepared a series of environmental monitoring standards on authority from the Regional Chief Executive Officers (RCEO) and the Ministry for the Environment (MFE). The strategy that led to the development of these standards was established by Jeff Watson (Chairman) and Rob Christie (Project Director). The implementation of the strategy has been overseen by a steering group consisting of Jeff Watson, Rob Christie, Jochen Schmidt, Martin Doyle, Phil White, Mike Ede, Glenn Ellery, Lian Potter, Lucy Baker, Eddie Stead and David Payne.

The development of these standards involved consultation with regional and unitary councils across New Zealand, electricity generation industry representatives and the National Institute for Water and Atmospheric Research Ltd (NIWA). These agencies are responsible for the majority of hydrological and continuous environmental related measurements within New Zealand. It is recommended that these standards are adopted throughout New Zealand and all data collected be processed and quality coded appropriately. The degree of rigour in which the standard is applied, will depend on the quality of data sought.

The document was initially prepared by Brent Watson of Horizons Regional Council and Phil White of Auckland Regional Council. The input of LAEMG members into the development of this document is gratefully acknowledged. In particular the review and editing undertaken by Martin Doyle of Tasman District Council, Jeff Watson of Horizons Regional Council. Mike Ede of Marlborough District Council and Doug Stewart of Environment Waikato have been particularly helpful in the finalising the form and content of this standard. This document was edited (non-technical) by Chris Heath of Heath Research Services.

Funding

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- Auckland Council
- Bay of Plenty Regional Council
- Contact Energy
- Environment Canterbury Regional Council
- Environment Southland
- Genesis Energy
- Greater Wellington Regional Council
- Hawke's Bay Regional Council
- Horizons Regional Council
- Marlborough District Council
- Meridian Energy
- Mighty River Power
- Ministry for the Environment
- Ministry of Business, Innovation & Employment – Science & Innovation Group
- National Institute of Water and Atmospheric Research Ltd (NIWA)
- Northland Regional Council
- Otago Regional Council
- Taranaki Regional Council
- Tasman District Council
- West Coast Regional Council
- Waikato Regional Council

Review

This document will be reviewed by the NEMS steering group in February 2014, and thereafter once every two years.

Signatories

NEMS Project Director	NEMS Chairman	MFE	NIWA	Workgroup Leader

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Introduction

It is critical that an understanding the data collection methodologies, data limitations and intended purpose of the original datasets is known by end users, now and in the future.

This quality coding schema provides:

- the internal linkages between the organisations quality management systems and nationally developed monitoring standards. These linkages provide a potential reporting framework for organisational reporting.
- insight and detail for the end user of the potential issues associated with provided datasets and highlights the need to review supplementary data comments and other provided metadata associated

Provision of a nationally consistent quality code schema will enable end users to consistently utilise and/or review environmental data sourced from multiple organisations.

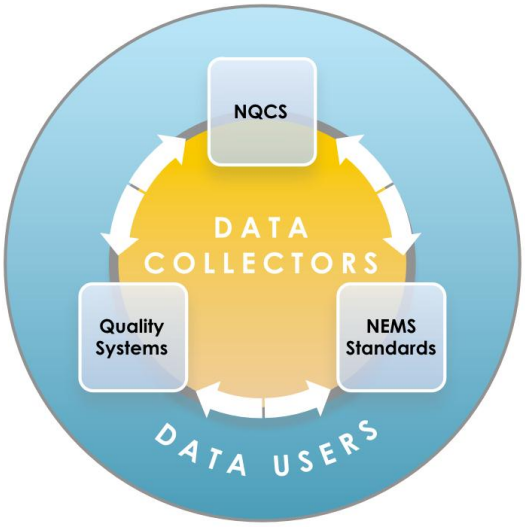

Figure 1 – Quality Interactions

Purpose & Principles

Purpose

The purpose of this National Environmental Monitoring Standard (NEMS) is to provide a nationally consistent quality coding schema; covering a series of fundamental underlying principles of quality management:

The schema shall be:

- understandable
- consistent in application, and
- reproducible.

The schema shall:

- support the centralisation or federation of environmental data (National Archive)
- focus on environmental data quality; not Instrumentation limitations
- link to internal interactions with Quality Management Systems (i.e. ISO 9001:2008).
- form an integral part of the National Environmental Monitoring Standards (NEMS).
- make provision of information relating to data quality for both data collectors and the end users of the data.

The national schema shall:

- provide a simple & understandable map of data quality
- be no more than ten quality steps
- make provision for different software
- be easily easy to implement by all organisation
- be suitable for all measured parameters, and
- be numerically based.

With the above ideals, the schema shall be robust and make provision for:

- future improvements of environmental monitoring practices
- regional sub-codes or sub-standards of data quality
- historic data quality (in terms of 'Quality at the Time of Collection')
- the development of National Environmental Monitoring Standards (NEMS) of each measured parameter, and
- the support of open data sharing models.

The following National Environmental Monitoring Standard: National Quality Code Schema (NQCS) framework is an application of the above purpose and principles.

Framework

The adoption of best practices, both nationally and internationally, highlights that NQCS must contain “Zones of Quality” with a numeric index that increases with improved quality.

Each quality zone requires a summary of the expected quality of the environmental data coded at the zone. Missing Record is the poorest quality data because it affects both the data collectors and end users. This fact needed to be reflected by being assigning the lowest zone and code to the data.

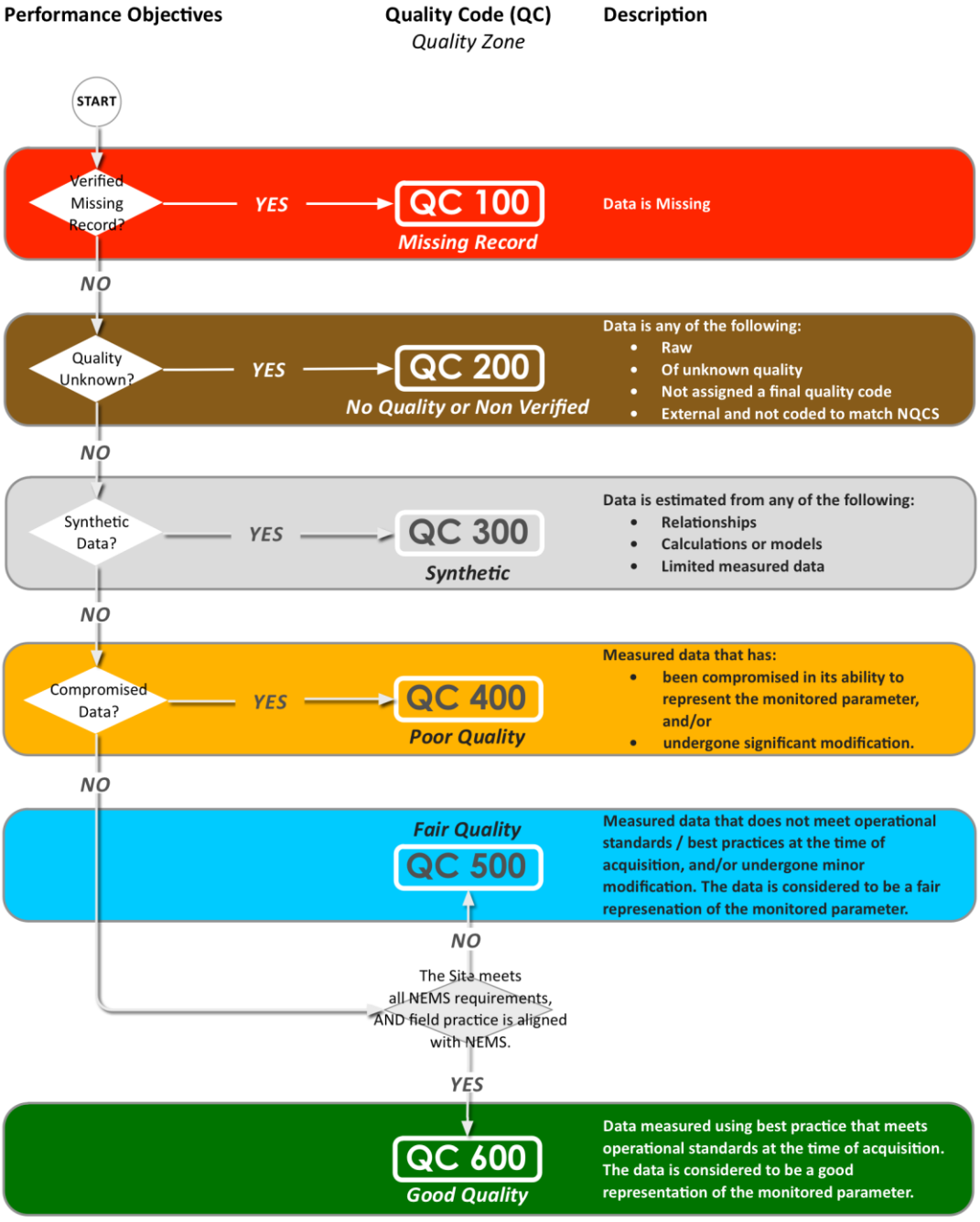

Figure 2 – Generic Quality Flowchart

System Integration

This NQCS provides the minimum nationally required parent coding framework for all environmental data. This schema is fixed to ensure a nationally standardised framework. The parent quality code value is the maximum value for that quality zone.

Agencies that currently operate with a data quality code schema may not have the resources to modify historic data and/or in-house schemas to match the NQCS. To overcome this issue, each agency will develop a quality code map, to allow conversion of the existing operational in-house codes to the NQCS.

Quality Map

Each agency will produce a quality map and store this quality map within their data management documentation and provide it with environmental data provided to any external agencies.

It is intended that each organisation will utilise, as closely as possible the colours used in this schema. It is recognised that different printers will produce subtly different colours, however the standardisation of colours assigned to quality codes will further assist standardisation of the Quality Coding Schema.

Quality Code Colours

The following colour codes are provided as a guide for use in software applications, web pages and print.

Table 1 – Quality Code Colours

NQCS Quality Code	Colour Name	RGB	Hex	Pantone	CMYK
QC 100	Red	255, 0, 0	#FF0000	Pantone 186	0, 100, 81, 4
QC 200	Clay (Orange 4)	139, 90, 0	#8B5A00	Pantone 730	0 39, 76, 29
QC 300	Light Gray	211, 211, 211	#D3D3D3	–	0,0,0,40
QC 400	Orange	255, 165, 0	#FFA500	Pantone 138	0,42,100,1
QC 500	Deep Sky Blue	0, 191, 255	#00BFFF	Process Cyan	100, 0, 0, 0
QC 600	Dark Green	0, 100, 0	#006400	Pantone 3415	100, 0, 77, 22

The text shall be black or white; whichever provides maximum contrast and readability for the medium used (screen or print).

Note: The colour codes (RGB, Hex, Pantone and CMYK) are supplied to reduce the risk of colour shifts from one device or medium to another.

Note: The colours displayed or printed in this document may not be an accurate representation of the colour codes because MS Word, which was used to author this document, is not capable of colour management.

Supplementary Quality Codes (Child Coding)

The NQCS can be introduced in its basic parent form or it can be expanded upon to provide more data quality detail by agencies where a greater level of detail is required; detail relating to data quality and operational requirements and standards.

This expansion to the NQCS is called child coding. These child codes are currently allocated in-house, however, a nationally agreed set of child codes will be developed. When developed these child codes shall form an annex to this document.

The NQCS parent codes can be easily expanded upon with children codes.

Table 2 below, shows how an agency can expand the QC 200 series to differentiate between data that is of known quality and data that is currently non-verified, that is, raw telemetered data).

When reporting child codes externally, the National Quality Coding Schema shall be the default quality coding series.

Table 2 – Parent Code Expanded with Child Codes

NQCS Quality Code	NQCS Quality Zone *Parent*	Child Code	Child Summary
QC 200	No Quality or Non Verified	150	No Known Quality
		200	Non Verified

Example: QC 200-150

Where the NQCS is expanded upon, a clear documented structure should be produced and stored within the agencies' data management documentation. This documentation will clearly detail the linkages between the NQCS parent codes and the child codes; this linkage will also be reflected in the agencies' data quality map.

Annexes – Application of the Quality Code Schema

These annexes identify the parent quality codes associated with various National Environmental Monitoring Standards (NEMS) and outline how the NQCS should be applied to data.

As further standards are developed a new version of this document will become available.

Annex A – Dissolved Oxygen Recording

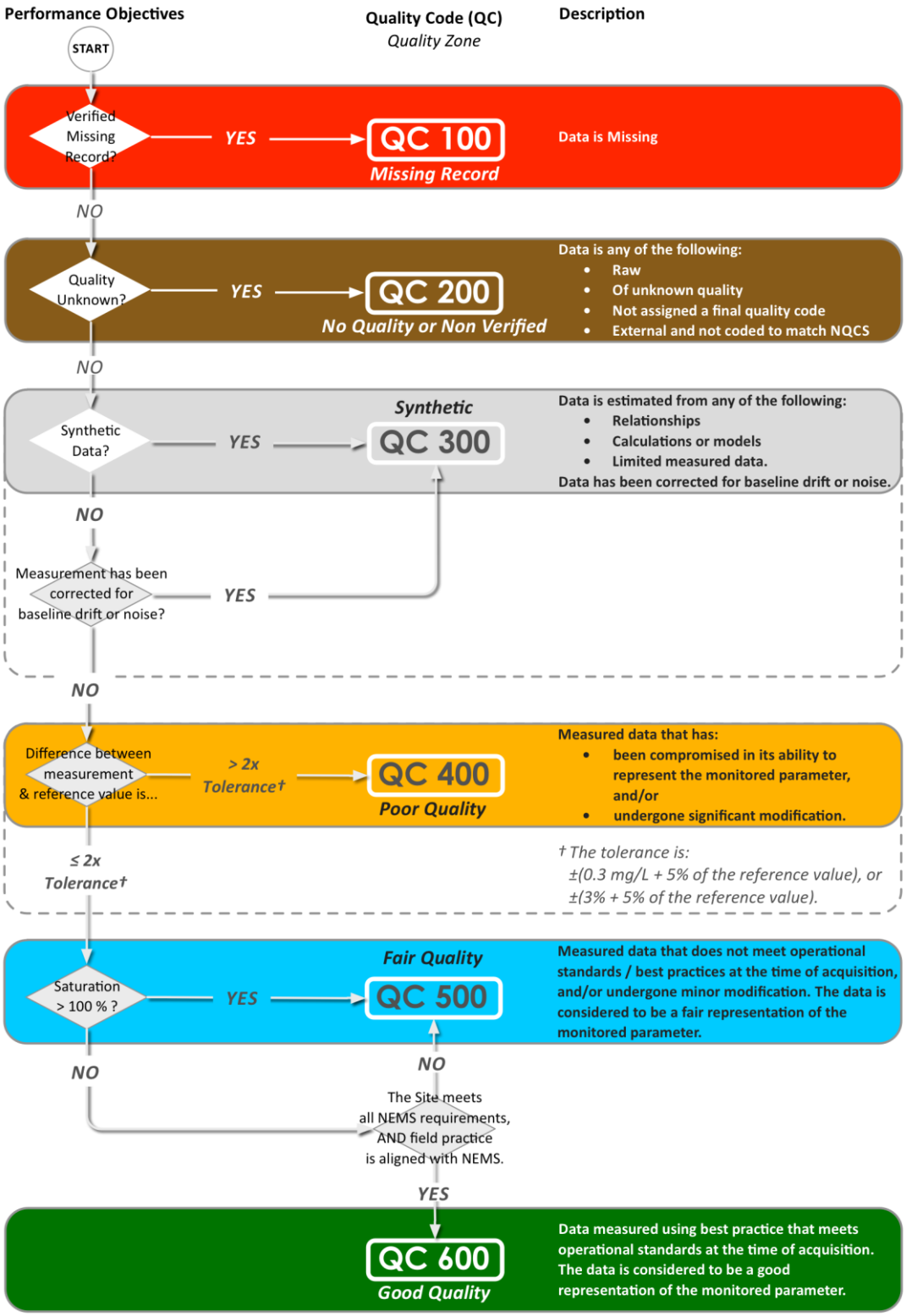

Figure 3 – Flowchart for Assigning Quality Codes to Dissolved Oxygen Data

Annex B – Open Channel Flow Measurement

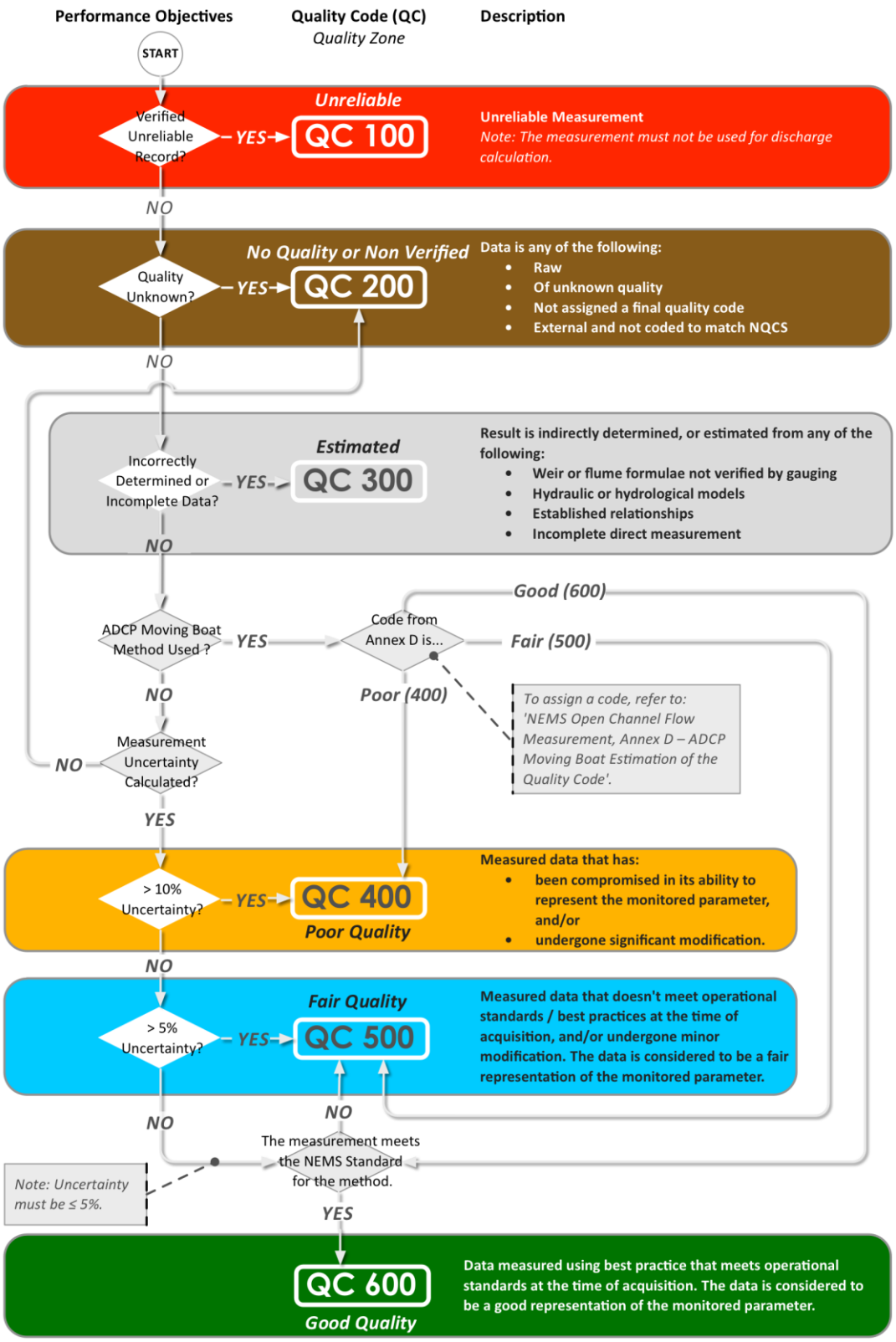

Figure 4 – Flowchart for Assigning Quality Codes to Open Channel Flow Data

Annex C – Rainfall Recording

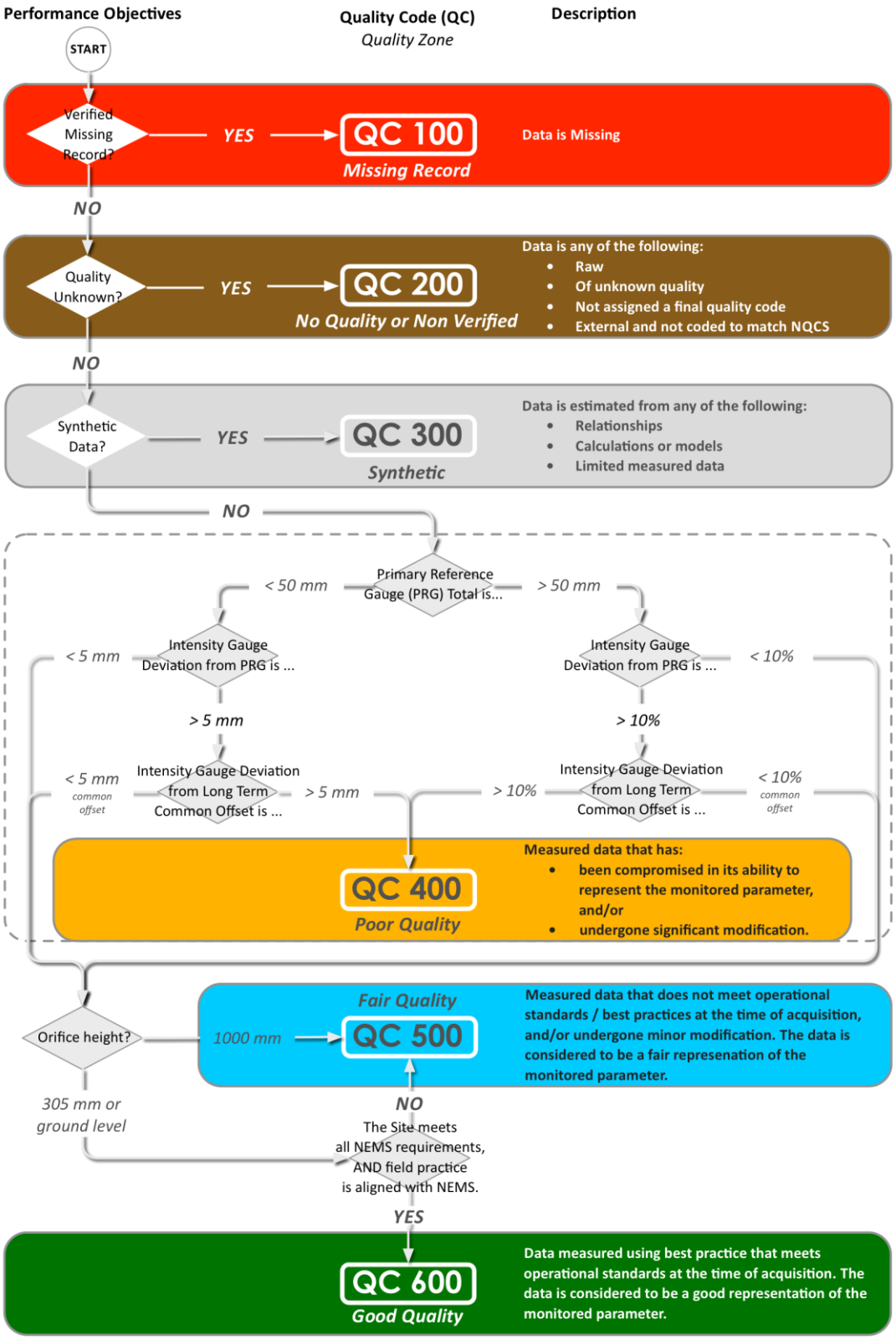

Figure 5 – Flowchart for Assigning Quality Codes to Rainfall Intensity Data

Annex D – Soil Water Measurement

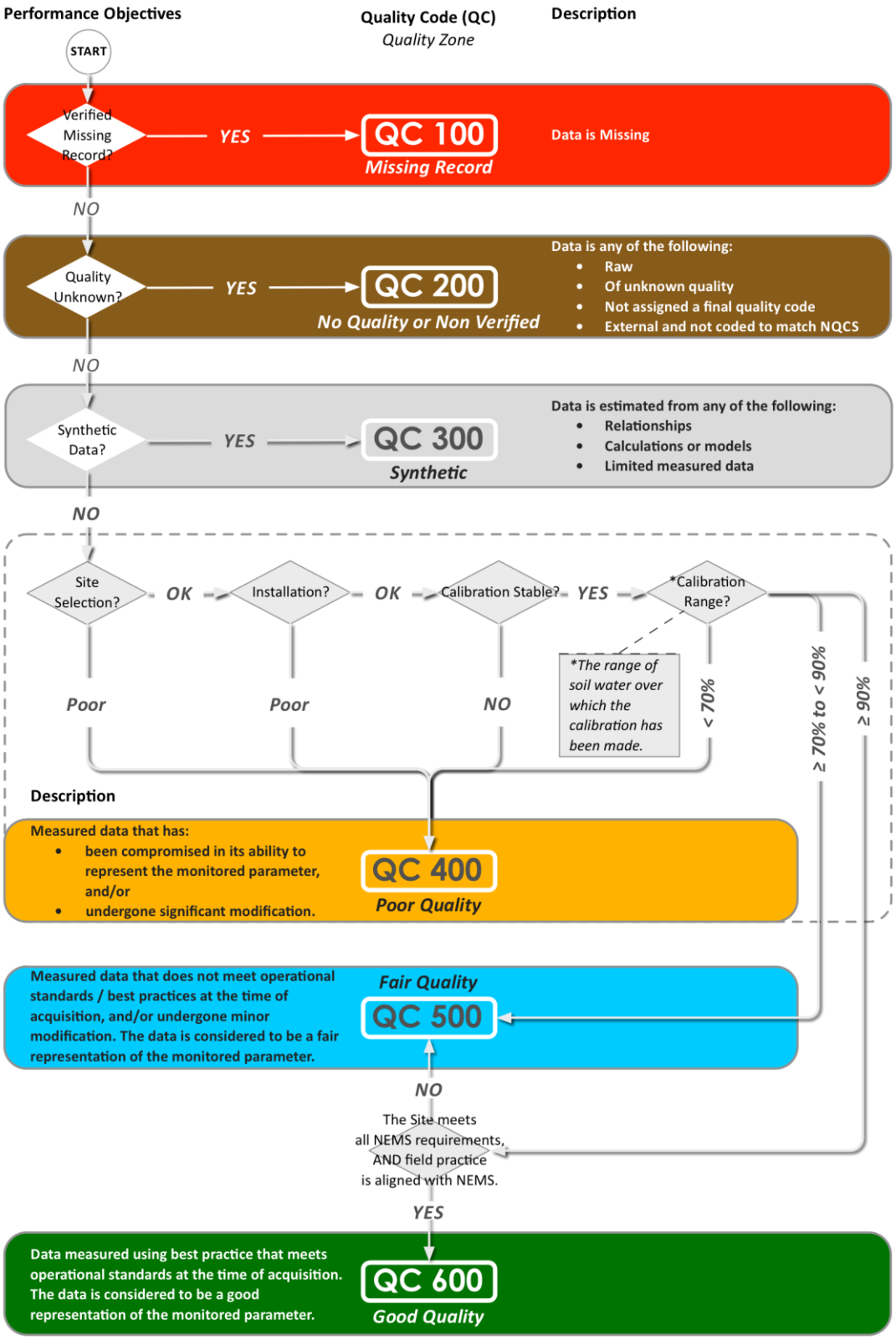

Figure 6 – Flowchart for Assigning Quality Codes to Soil Water Content Data

Annex E – Turbidity Recording

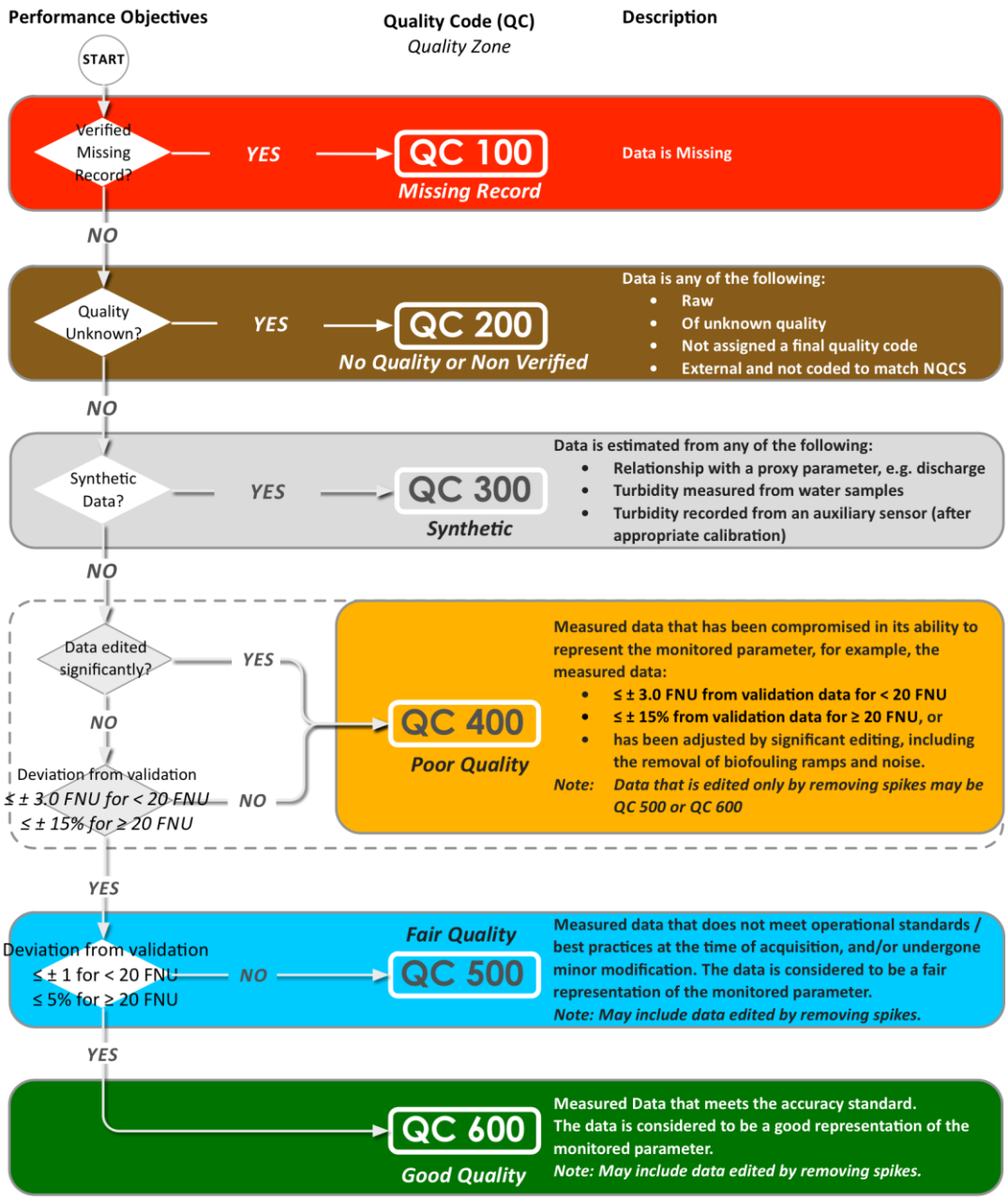

Figure 7 – Flowchart for Assigning Quality Codes to Turbidity Data

Annex F – Water Level Recording

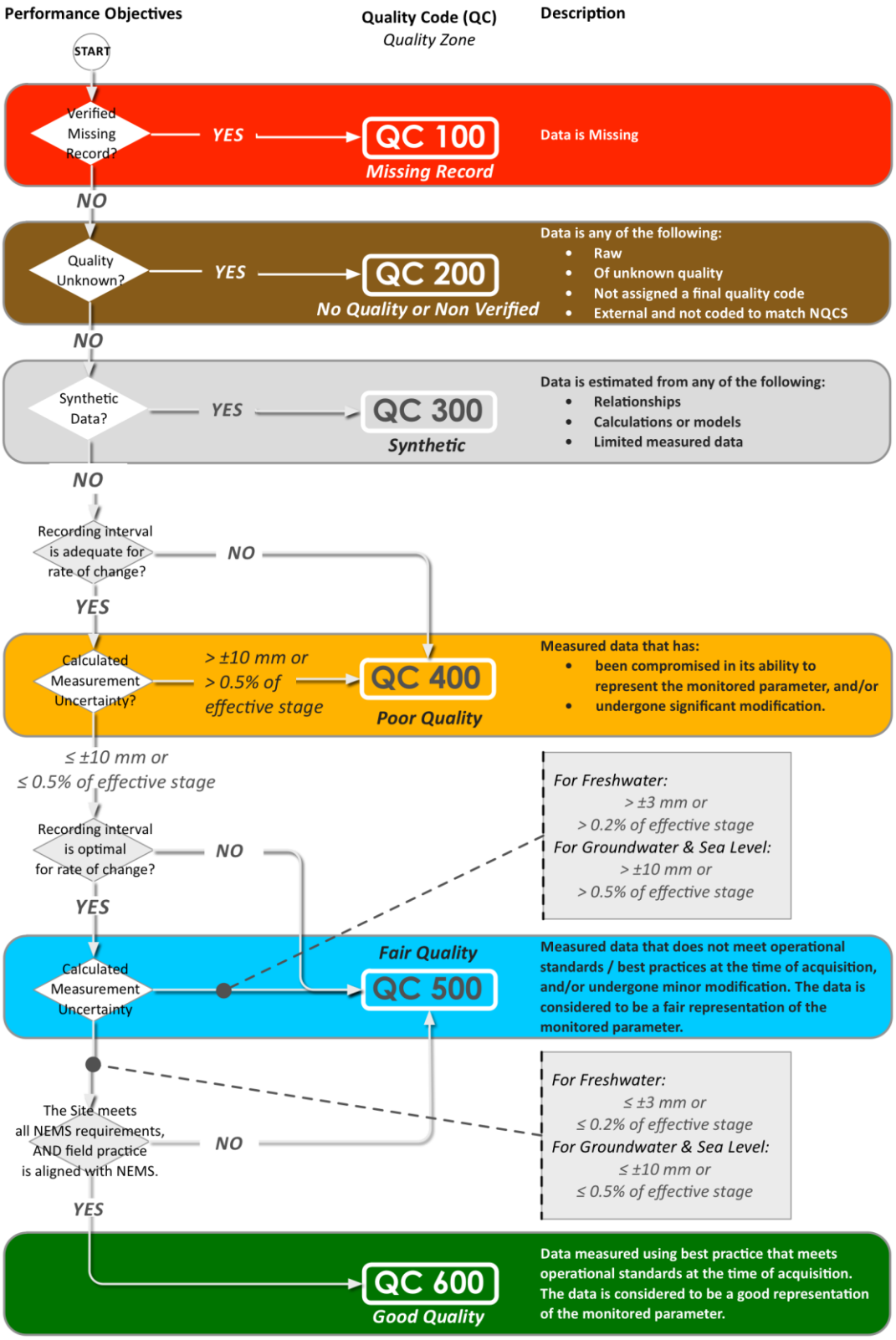

Figure 8 – Flowchart for Assigning Quality Codes to Water level Data

Annex G – Water Meter Data

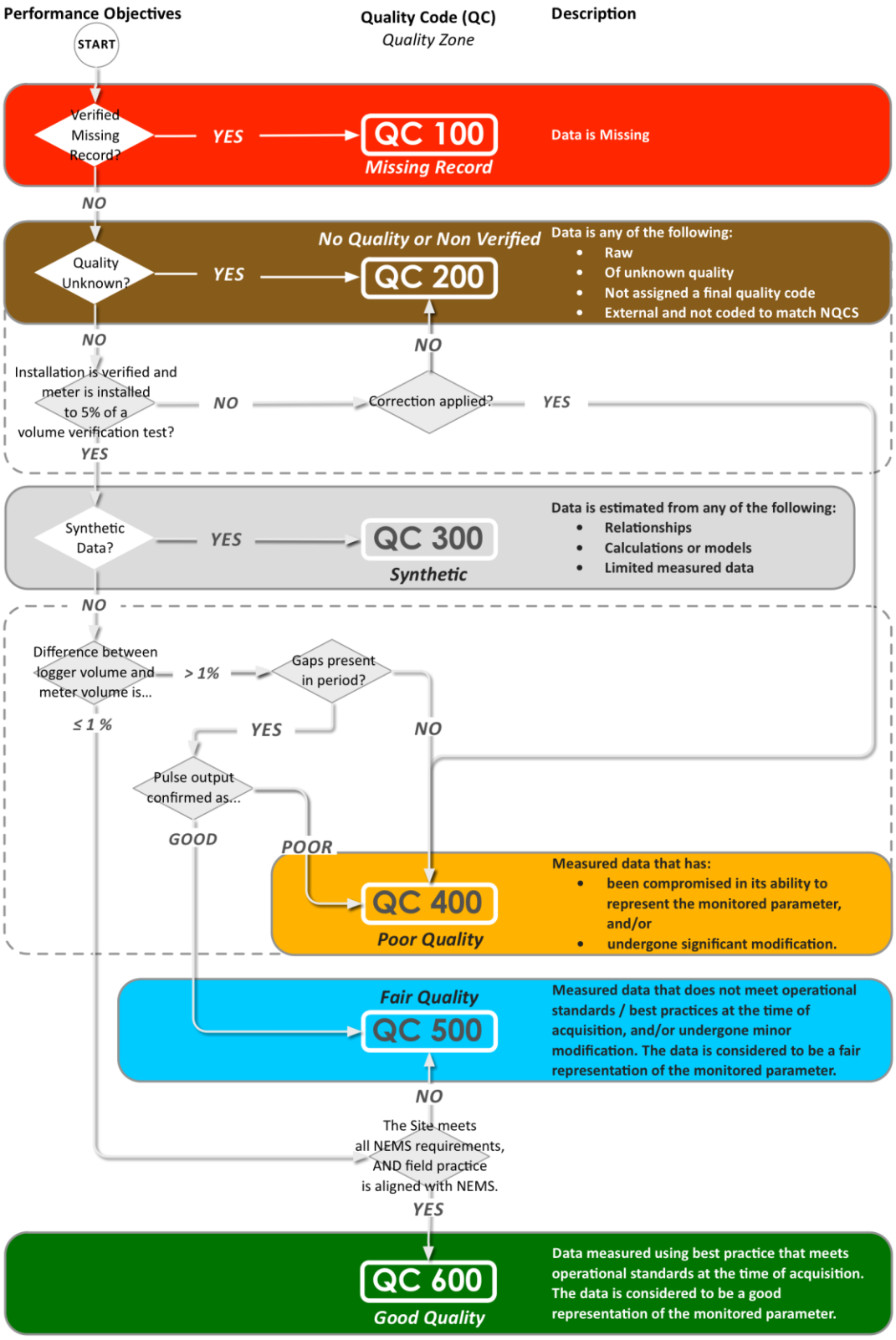

Figure 9 – Flowchart for Assigning Quality Codes to Water Meter Data

Annex H – Water Temperature Recording

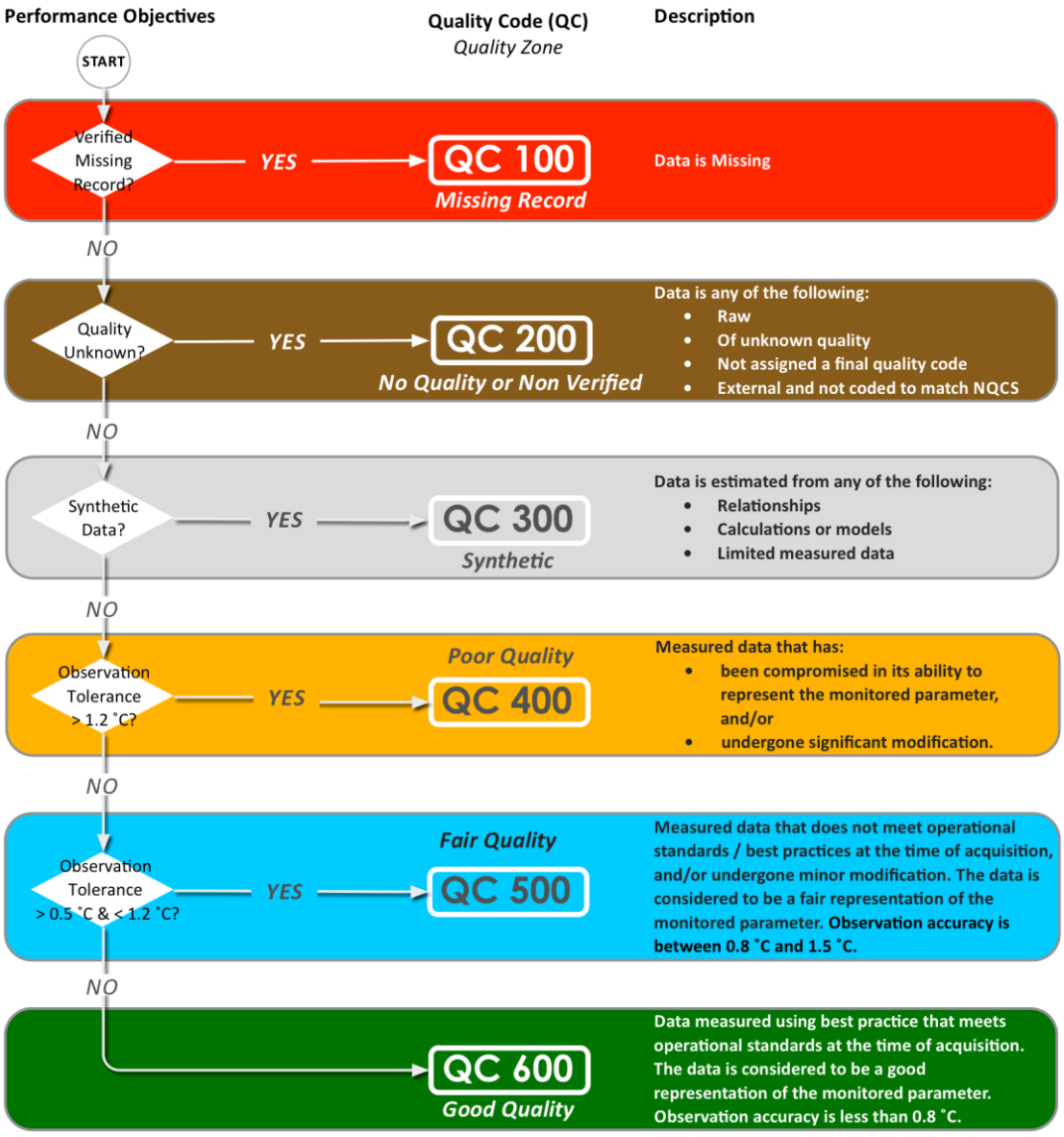

Figure 10 – Flowchart for Assigning Quality Codes to Water Temperature Data


GLEN
NAPIER
NEMS