National Environmental Monitoring Standard

# National Quality Code Schema

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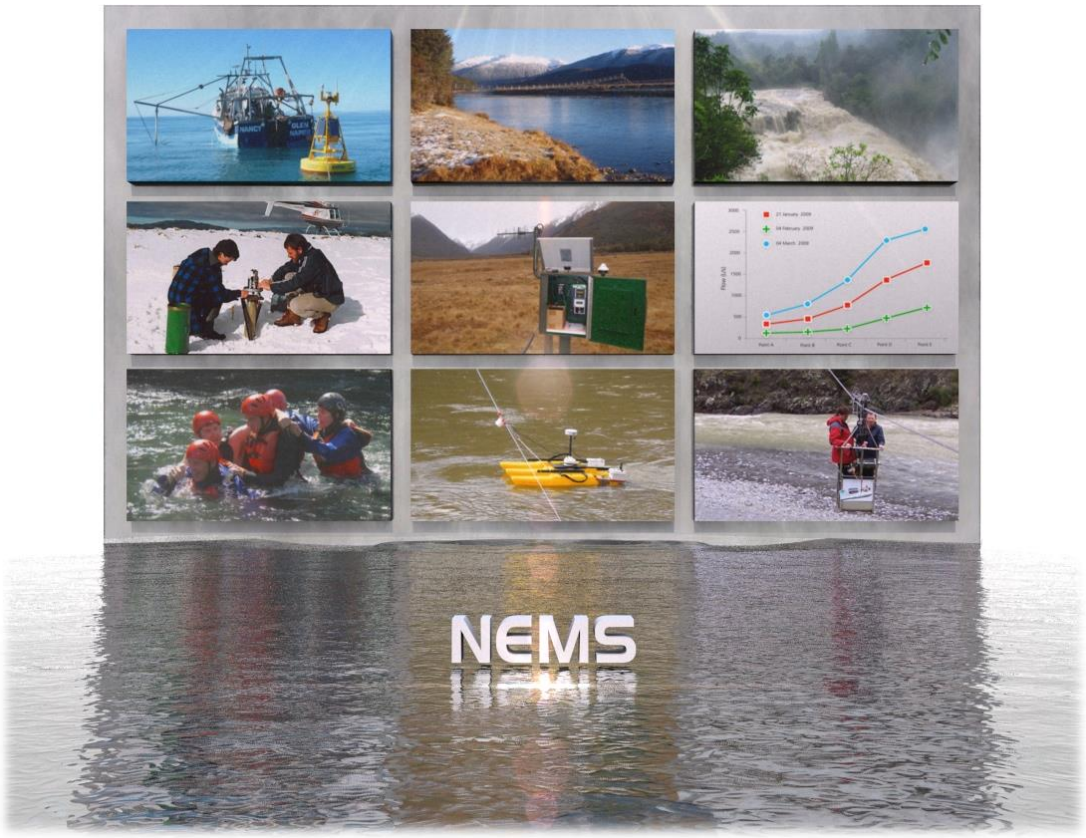

# National Environmental Monitoring Standards

The following National Environmental Monitoring Standards (NEMS) documents can be found at www.lawa.org.nz:

## Standards

- Dissolved Oxygen
  *Measuring, Processing and Archiving of Dissolved Oxygen Data*
- Open Channel Flow
  *Measuring, Processing and Archiving of Open Channel Flow Data*
- Rainfall
  *Measuring, Processing and Archiving of Rainfall Intensity Data for Hydrological Purposes*
- Rating Curves
  *Construction of Stage-Discharge and Velocity-Index Ratings*
- Soil Water
  *Measuring, Processing and Archiving of Soil Water Content Data*
- Turbidity
  *Measuring, Processing and Archiving of Turbidity Data*
- Water Level
  *Measuring, Processing and Archiving of Water Level Data*
- Water Meter Data
  *Measuring, Processing and Archiving of Water Meter Data for Hydrological Purposes*
- Water Temperature
  *Measuring, Processing and Archiving of Water Temperature Data*

## Codes of Practice

- Hydrological and Meteorological Structures
- Safe Acquisition of Field Data In and Around Fresh Water
- Site Surveys

## Supplementary Material

- Glossary
  *Terms, Definitions and Symbols*
- National Quality Code Schema (this document).

## Implementation

When implementing the Standards, current legislation relating to health and safety in New Zealand and subsequent amendments and the NEMS Codes of Practice shall be complied with.

## 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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# Development

The National Environmental Monitoring Standards (NEMS) steering group has prepared a series of environmental monitoring standards on authority from the Regional Chief Executive Officers (RCEOs) 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). From 2014, the implementation of the strategy has been overseen by a steering group, and the current steering group comprises Phillip Downes, Martin Doyle, Michael Ede, Glenn Ellery, Nicholas Holwerda, Jon Marks, Charles Pearson, Jochen Schmidt, Alison Stringer, Raelene Mercer (Project Manager) and Jeff Watson.

The development of these Standards involved consultation with regional and unitary councils across New Zealand, major 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 to facilitate data sharing. The degree of rigour with which the Standards and associated best practice may be applied, will depend on the quality of data sought.

This document has been prepared by the Local Authorities Environmental Monitoring Group (LAEMG) to help provide consistency in the application of work practices specific to environmental monitoring and data collection across New Zealand. The input of NEMS members into the development of this document is gratefully acknowledged; in particular, the review undertaken by the NEMS Steering Group and non-technical editing by writer Chris Heath of Heath Research Services.

## Funding

The project was funded by the following organisations:

- 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 and Employment – Science and 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 2018, and thereafter once every two years. Further details on the review process can be found at www.lawa.org.nz.

## Signatories

| | | |
|---|---|---|
| NEMS Project Director | NEMS Chair | MfE |

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# Terms, Definitions and Symbols

Relevant definitions and descriptions of symbols used in this Standard are contained within the NEMS Glossary available at www.lawa.org.nz.

## Normative References

This Standard should be read in conjunction with the following reference:

- NEMS *Glossary*.

# Introduction

It is critical that an understanding the data collection methodologies, data limitations and intended purpose of the original data sets 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, and
- insight and detail for the end user of the potential issues associated with provided data sets and highlights the need to review supplementary data comments and other provided metadata associated.

*Note: Internal linkages provide a potential reporting framework for organisational reporting.*

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

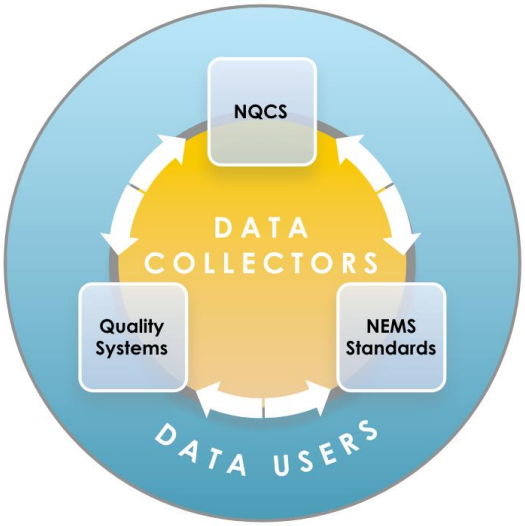



**Figure 1 – Quality interactions**

# Purpose and 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 *ISO 9001:2008.*
- form an integral part of the National Environmental Monitoring Standards (NEMS), and
- 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 and understandable map of data quality
- be no more than 10 quality steps
- make provision for different software
- be easily easy to implement by all organisations
- 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 Schem*a (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.

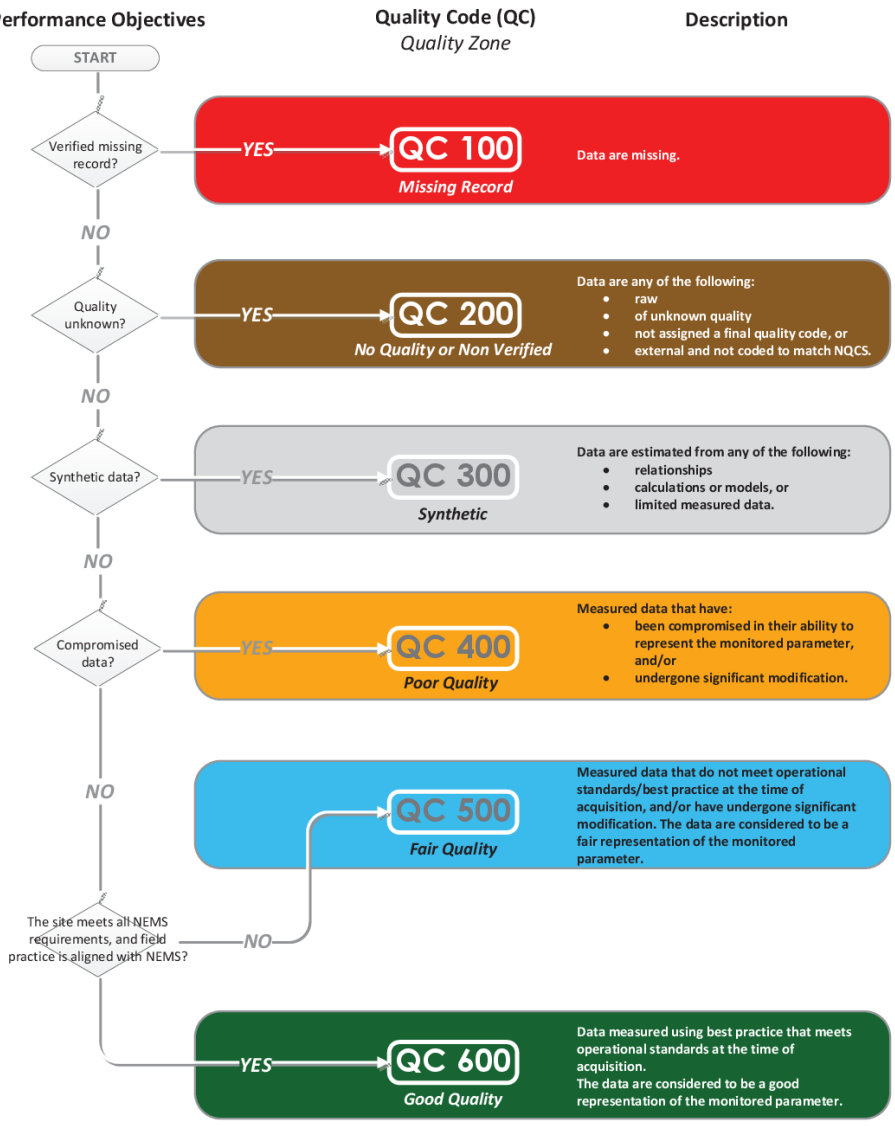



**Figure 2 – Generic quality flowchart**

# 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 include 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 | Grey | 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; for example, 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 child codes.

Table 2, below, shows how an agency can expand the QC 200 series to differentiate between data that are of known quality and data that are currently non verified (i.e. 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 | 210 | No Known Quality |
| | | 250 | Non Verified |

*Example: QC 200-150*

Where the NQCS is expanded upon, a clear documented structure should be produced and stored within the agency's 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 agency's 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

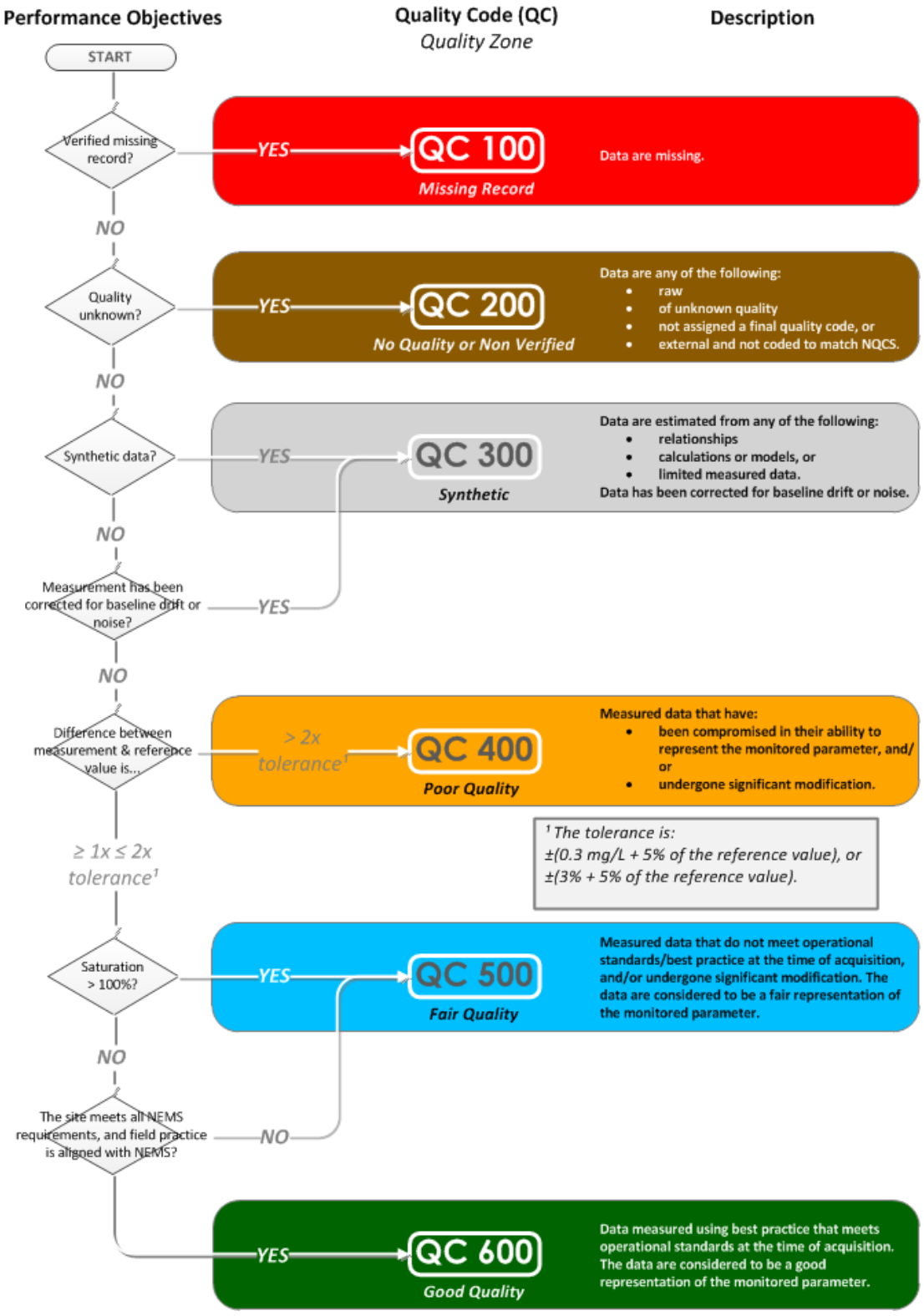



**Figure 3 – Flowchart for assigning quality codes to dissolved oxygen data**

# Annex B – Open Channel Flow

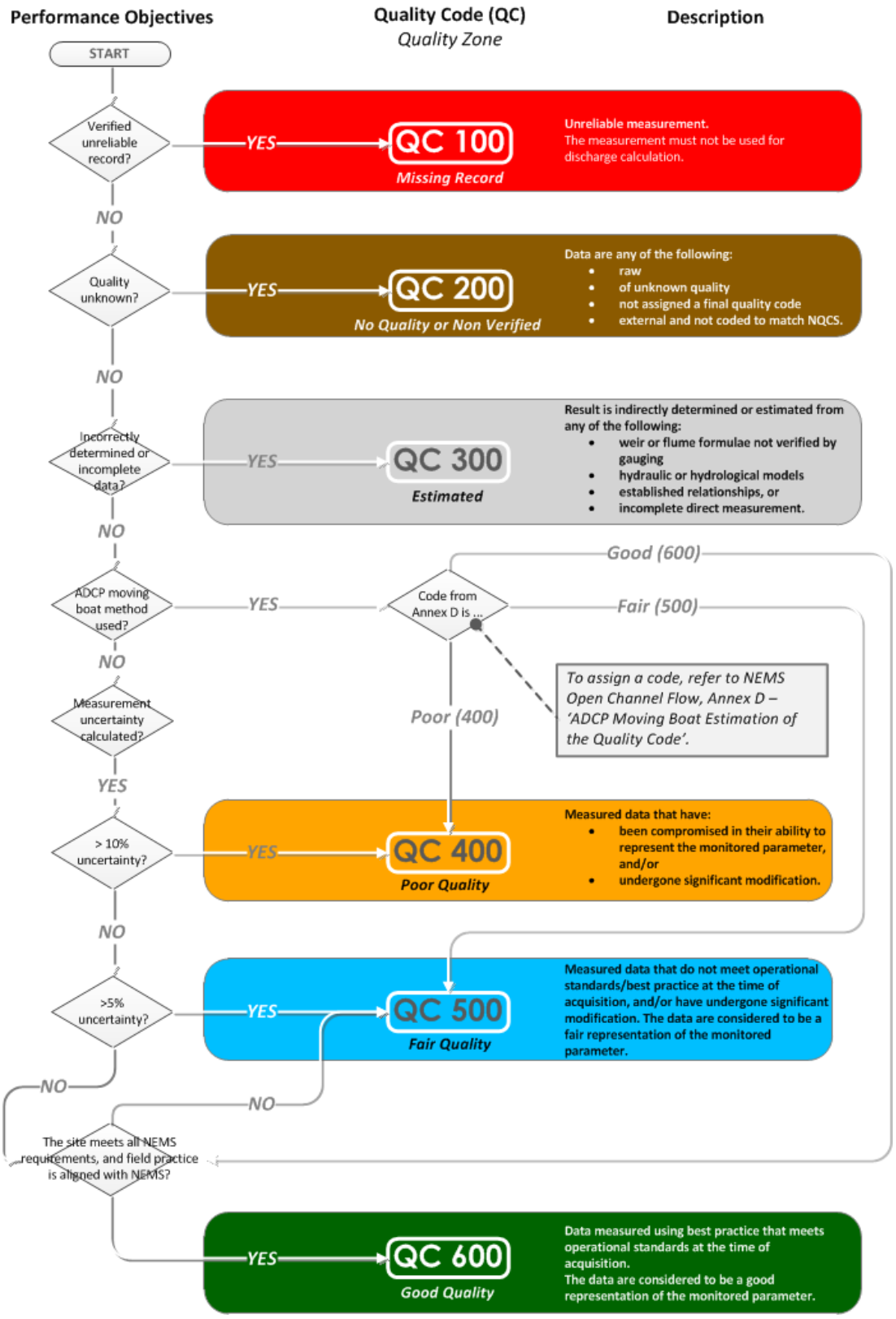



**Figure 4 – Flowchart for assigning quality codes to open channel flow data**

# Annex C – Rainfall

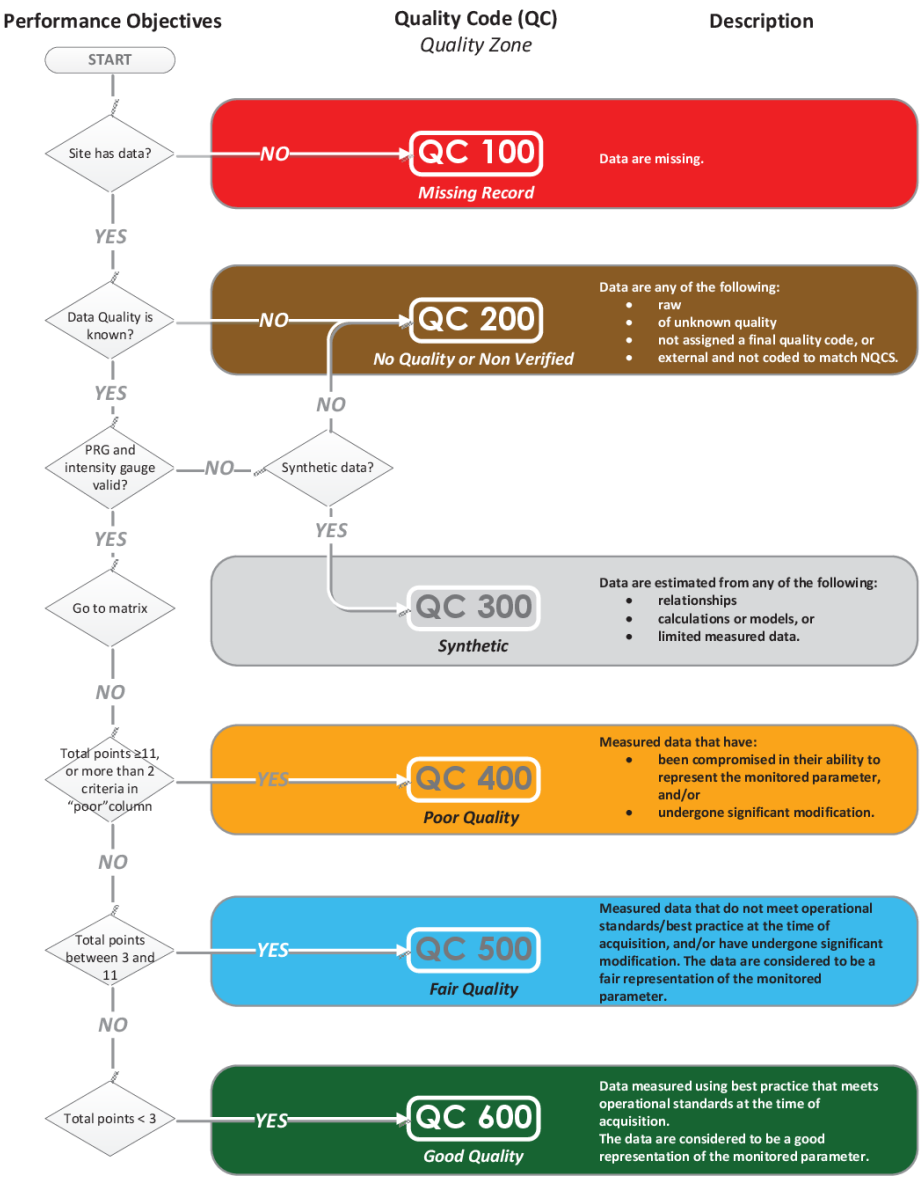



**Figure 5 – Flowchart for assigning quality codes to rainfall intensity data**

# Annex D – Soil Water

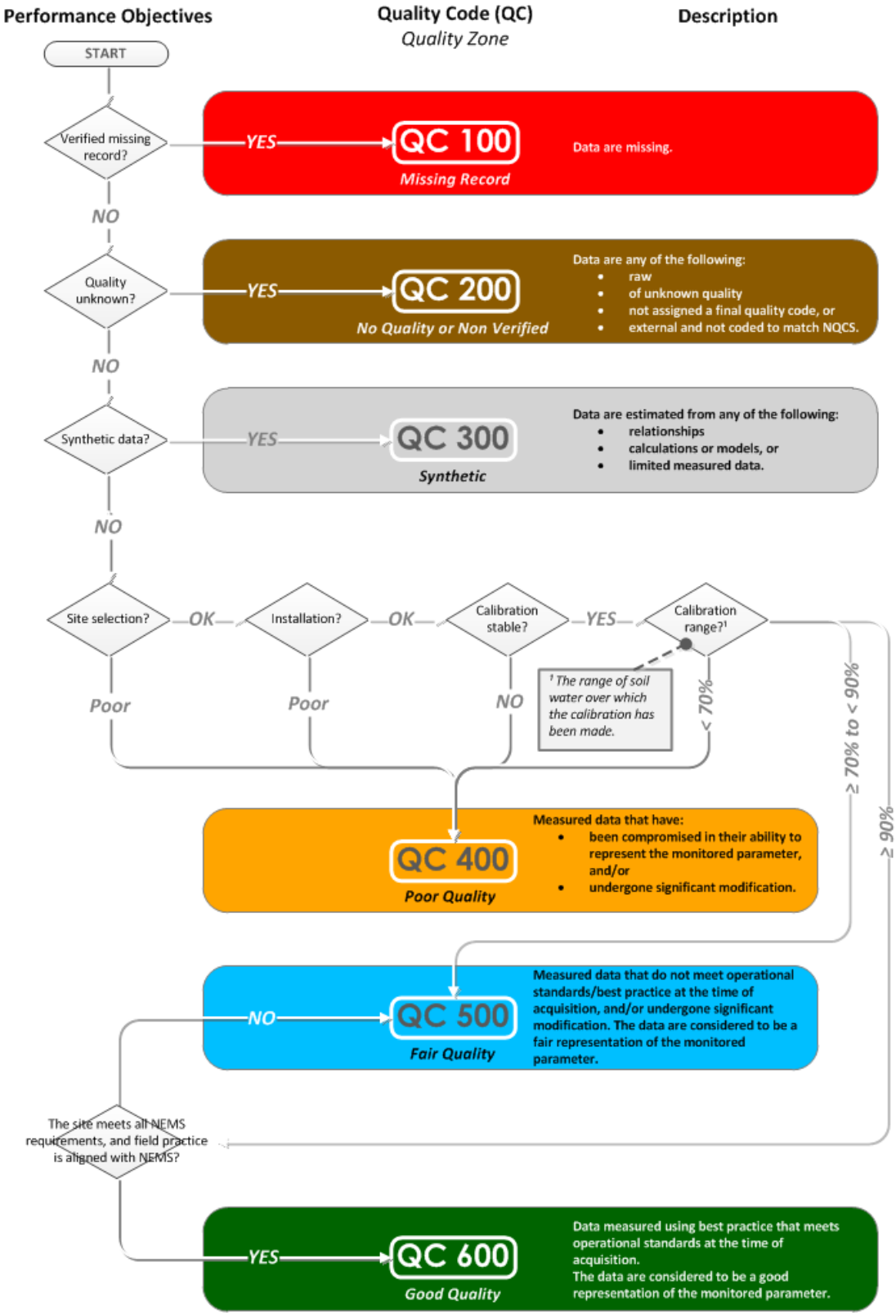



**Figure 6 – Flowchart for assigning quality codes to soil water content data**

# Annex E – Turbidity

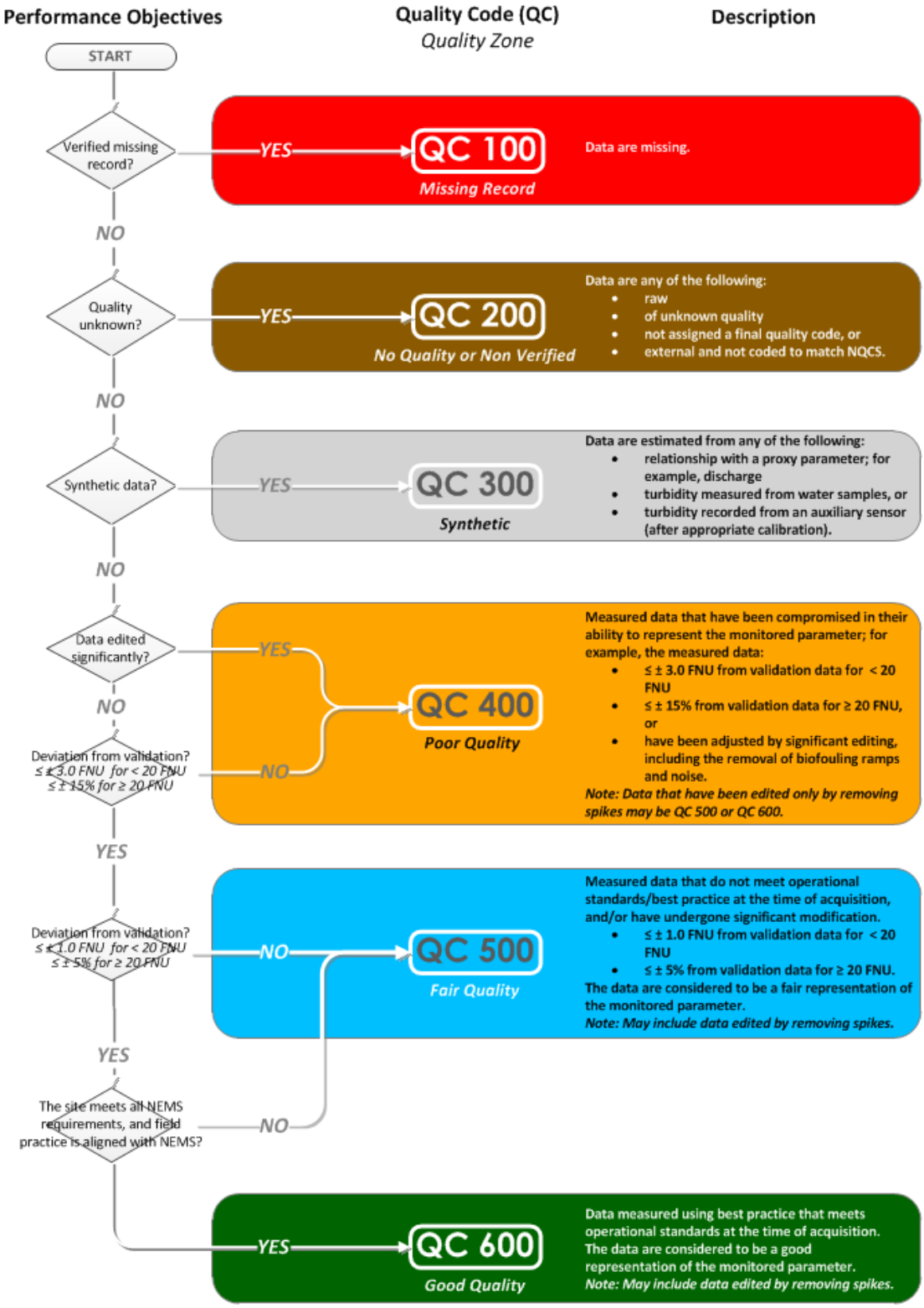



**Figure 7 – Flowchart for assigning quality codes to turbidity data**

# Annex F – Water Level

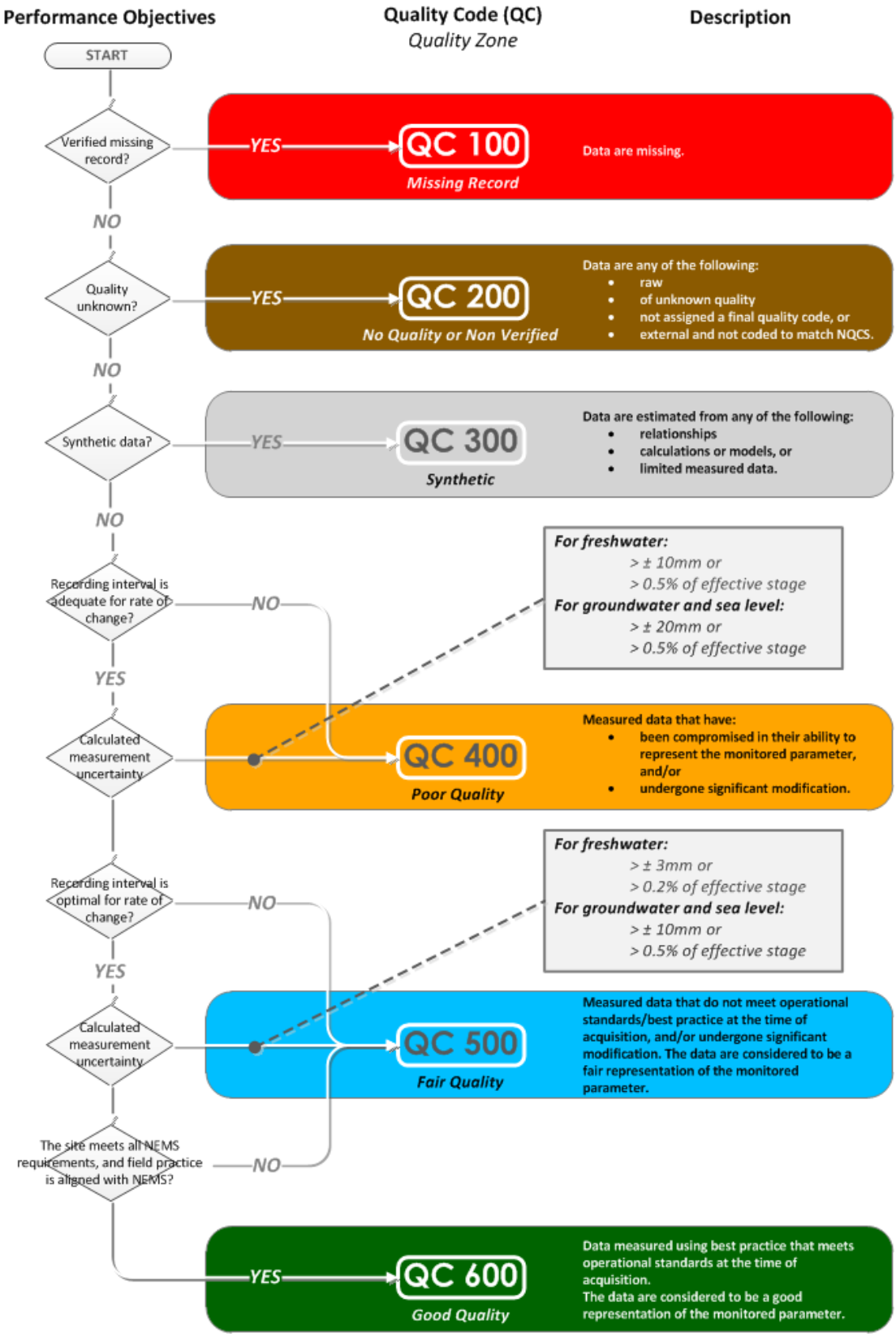



**Figure 8 – Flowchart for assigning quality codes to water level data**

# Annex G – Water Meter Data

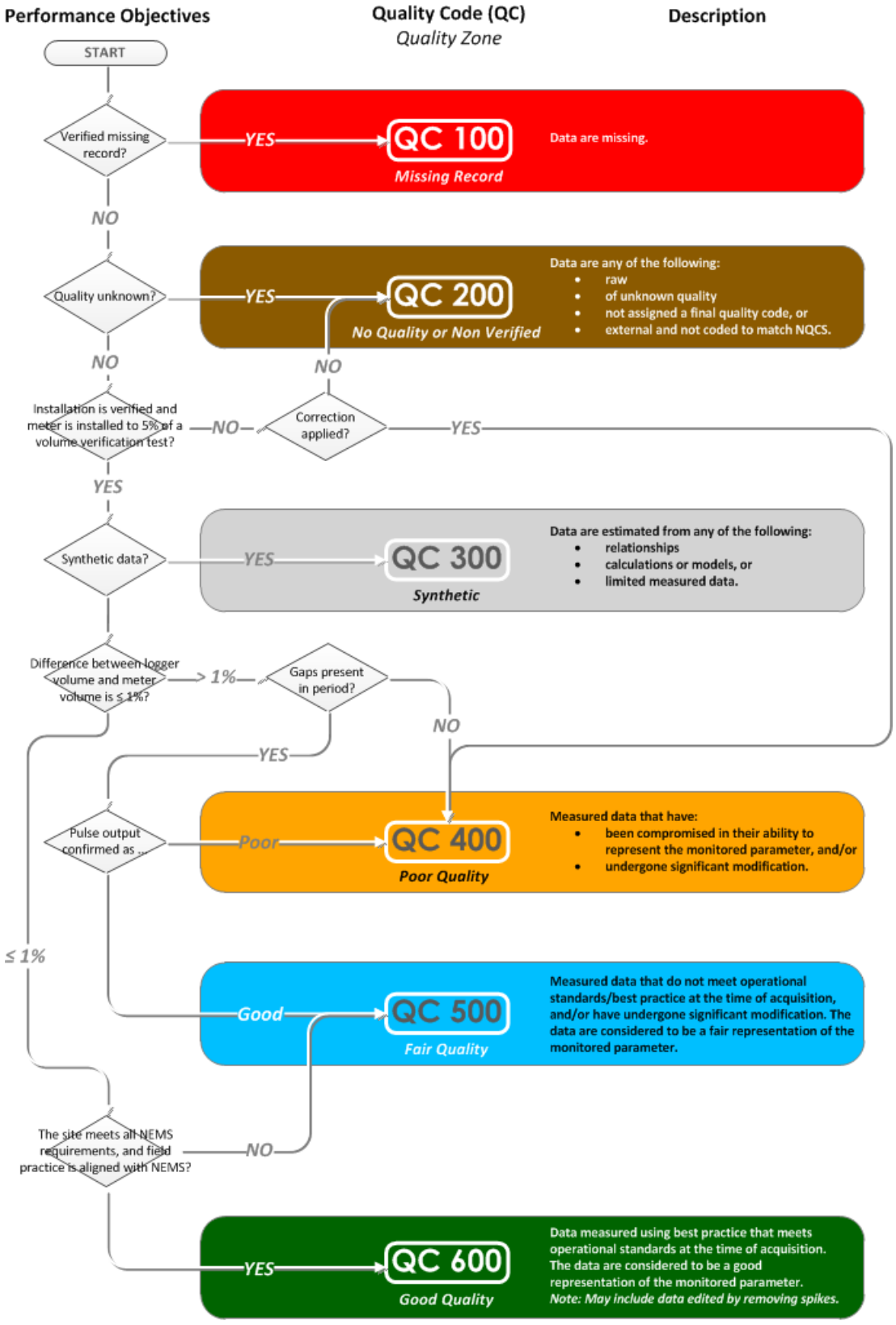



**Figure 9 – Flowchart for assigning quality codes to water meter data**

# Annex H – Water Temperature

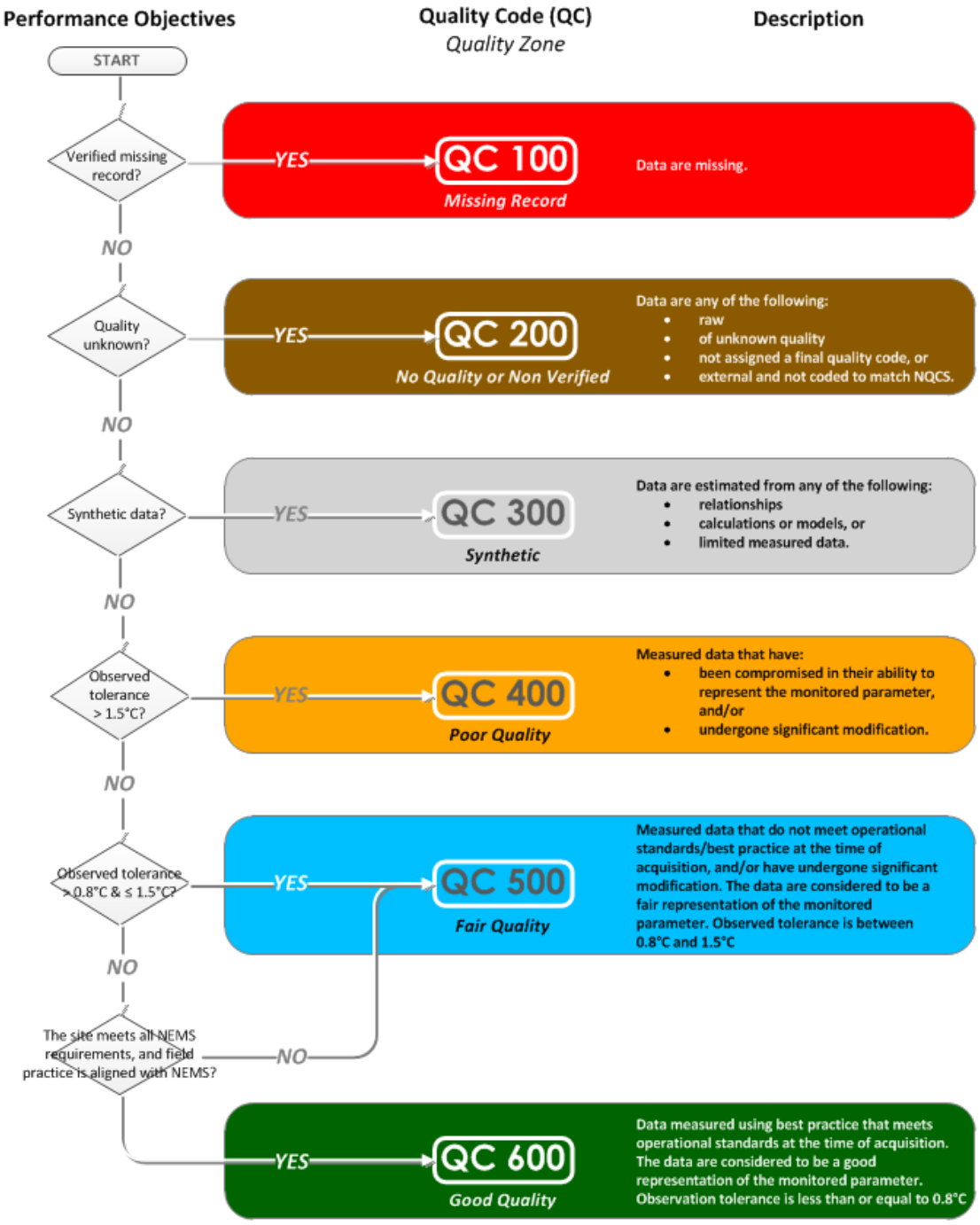
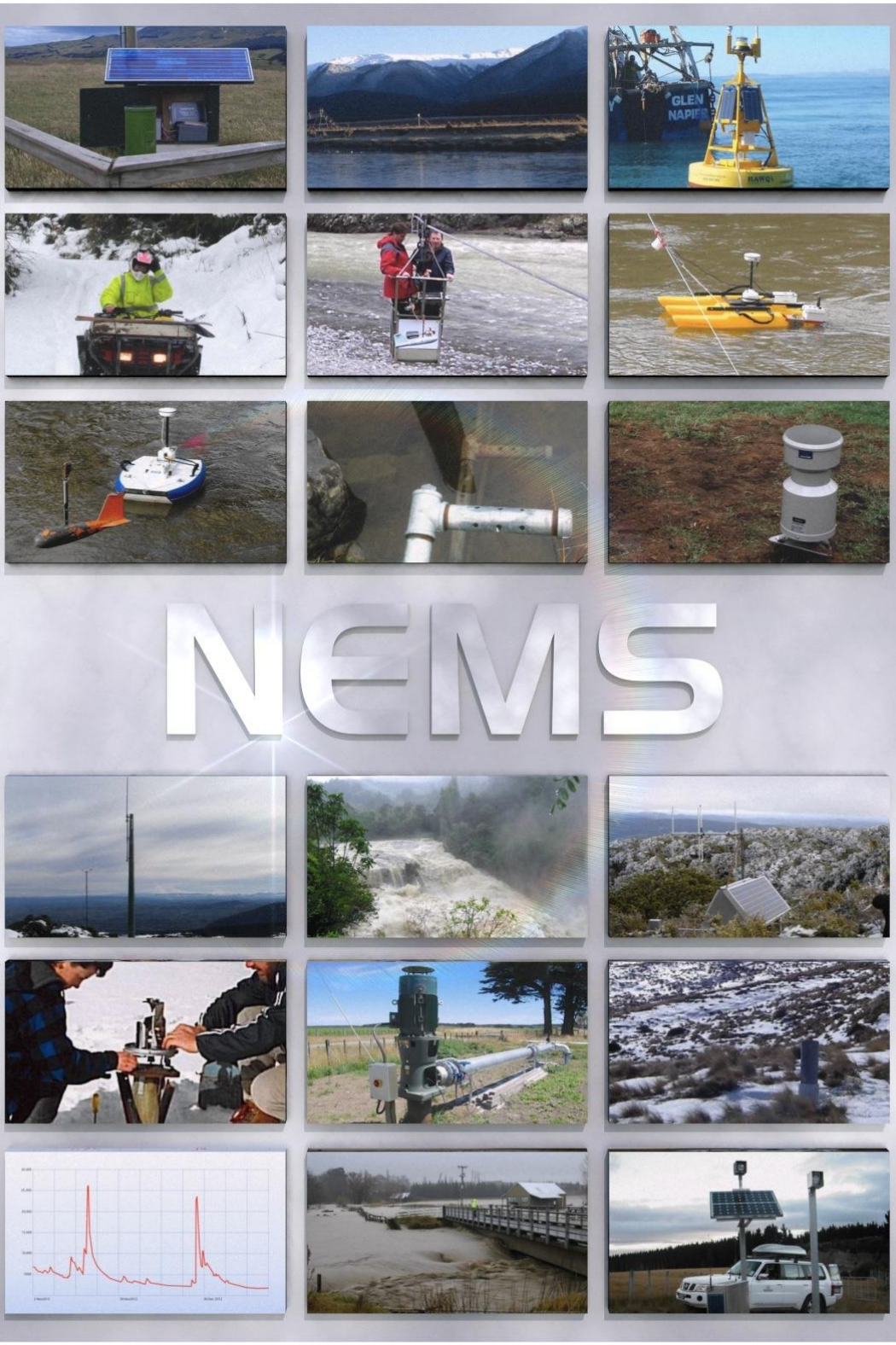



**Figure 10 – Flowchart for assigning quality codes to water temperature data**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