URS

St Mary's Quay

Design Criteria Report

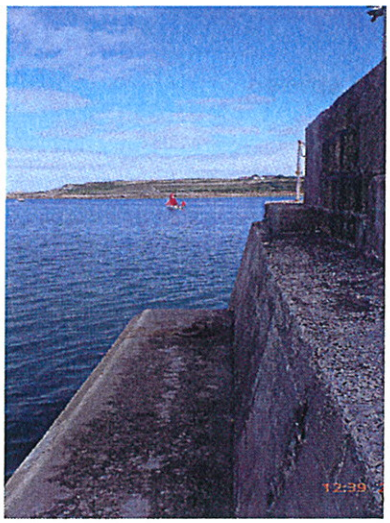
November 2013

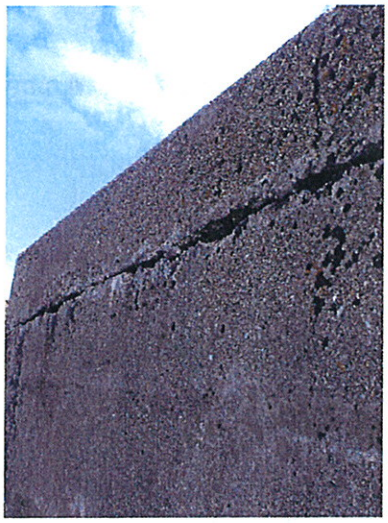
47067988

Prepared for:

Duchy of Cornwall

UNITED KINGDOM & IRELAND





DUCHY *of* CORNWALL

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1 INTRODUCTION

1.1 Introduction

1.1.1 *General*

The quay at St Mary's is located to the north of the island's major settlement of Hugh Town. St Mary's is the largest and most inhabited of the islands that comprise the Isles of Scilly.

The pier has undergone a number of extensions, the most recent being completed in 1994.

1.1.2 *Existing Arrangement*

The existing arrangement of the section of the quay being considered (the end section) is a concrete panel faced steel pile wall that has been built around an historic quay of masonry gravity walls.

Tie rods connect the sheet pile wall through the historic structure and terminate to a reinforced concrete anchor beam on the seaward side of the quay. On top of the anchor wall is a wave wall of reinforced concrete built around the original masonry wave wall.

The deck of the existing quay is laid with block paving, understood to be placed on a bedding material laid on top of the old quay.

1.2 Proposed Arrangement

1.2.1 *General*

The Duchy of Cornwall proposes a new wave wall to the seaward side of the existing quay and a new concrete deck slab to replace the existing block surface.

1.2.2 *Wave Wall*

The existing wave wall has been found to have deteriorated beyond economic repair. The proposed wave wall is to replace the existing wall.

1.2.3 *Quay Deck Slab*

The new concrete deck slab is to provide a continuous surface across the whole quay, replacing the blockwork surface of the existing deck. The slab is to include an appropriate gradient that falls away from the proposed wave wall.

1.3 Approvals and Licences

It is likely that planning permission will be required but this is outside the current scope of work.

2 DESIGN PARAMETERS

2.1 Design Life

2.1.1 *Wave Wall*

The design life of the new wave wall shall be 25 years (maximum design working life for category 2 structure as defined in Table 1 of BS6349-1:2013).

2.1.2 *Quay Deck*

The design life of the new concrete quay slab shall be 25 years (maximum design working life for category 2 structure as defined in Table 1 of BS6349-1:2013).

2.1.3 *Existing structure*

It should be noted that the design life of the new wave wall and slab will be dependent upon the existing structure for which there is no knowledge of remaining design life.

2.2 Reference Datum

All levels shall be relative to Chart Datum (CD). At St Mary's, Chart Datum is 2.91m above Ordnance Datum.

2.3 Water Levels

2.3.1 *Tide Levels*

Admiralty Tables state the following tide levels for St Mary's:

Highest Astronomical Tide (HAT)	+6.30m CD
Mean High Water Spring (MHWS)	+5.70m CD
Mean High Water Neap (MHWN)	+4.30m CD
Mean Sea Level (MSL)	+3.19m CD
Mean Low Water Neap (MLWN)	+2.00m CD
Mean Low Water Spring (MLWS)	+0.70m CD
Lowest Astronomical Tide (LAT)	-0.10m CD

2.3.2 *Sea Level Rise*

Sea level rise will be calculated for the maximum design life (25 years) and will be determined with the use of the Technical Guidance to the National Planning Policy Framework (March 2012) by the Department for Communities and Local Government together with the Coastal Flood Boundary Conditions for UK Mainland and Islands (February 2011) by the Environment Agency.

These are given to be a 344mm for 50 years and 978mm for 100 years. A conservative estimate of 200mm for the intended design life of 25 years will be used.

2.4 Design Codes

The following Codes and Standards shall be adopted for the design:

BS EN 1990 – Basis of Structural Design (inc. UK National Annex)
BS EN 1991 – Eurocode 1: Action on Structures (inc. UK National Annex)
BS EN 1992 – Eurocode 2: Design of Concrete Structures (inc. UK National Annex)
BS EN 1997 – Eurocode 7: Geotechnical Design (inc. UK National Annex)
BS 6349 – Code of Practice for Maritime Structures
BS 6399 – Loading for Buildings
BS 8110 – Structural Use of Concrete
Construction (Design & Management) Regulations 2007
CIRIA Report No. C660 – Early age thermal crack control in concrete

2.5 Meteorological Data

2.5.1 *Waves*

Wave data taken from Wave Analysis and Numerical Modelling Study by Halcrow Group Limited in 2009 gives the following figures for extreme wave height.

Return period (years)	Extreme wave height (m)
1	1.71
2	1.77
5	1.84
10	1.90
20	1.95
50	2.02
100	2.07

2.5.2 *Wind*

Wind loading shall be determined using the NA to BS EN 1991-1-4:2005. A value of $V_{b,map}$ of 25m/s will be used. The factors Sa, Sd, Ss and Sp will all be taken as 1.0.

2.6 Geotechnical Data

Six exploratory holes (trial pits) were excavated around the harbour building as part of a Ground Investigation Report by CORMAC Solutions Ltd in 2013.

The trial pit that falls within the extent of the proposed concrete deck slab shows 400mm of "block paving, underlain by sand, concrete and re-bar". A further 600mm depth of "dense, brown, gravelly silty sand with cobbles and boulders of granite". This ground composition was typical across the other holes but to varying depths.

3 FUNCTIONAL REQUIREMENTS

3.1 Wave Wall

The wall is required to be 1500mm high and replace the existing wall in the same location.

It should be designed to sufficiently withstand the dynamic impact of the waves at the location as well as the hydrostatic force of the sea over its full height.

The wall is to be constructed of reinforced concrete with an appropriate amount of cover to reinforcement and is to tie in with the present structure and the new reinforced concrete deck slab.

It is to form part of a continuous barrier which will include the taller wave wall to the south-west and the new wave wall that is part of the quay extension to the north-east. Refer to drawing no. 47067988/01 in Appendix A for the extent of the proposed wave wall.

3.2 Quay Deck

The current deck of interlocking blocks is to be replaced by a reinforced concrete slab.

It should be designed to sufficiently withstand any loading from vehicles or materials that will be stored on the deck. It should also be able to deal with any thermal expansion or shrinkage that it is likely to undergo.

The deck shall incorporate a fall of approximately 1:80 toward the harbour side of the pier to ensure water drains off of the deck. It is not proposed to make any adjustment to the existing copings.

Refer to drawing no. 47067988/01 in Appendix A for the extent of the proposed quay deck.

3.3 Imposed Loading

3.3.1 *Wave Wall*

The wave wall will receive hydrostatic and dynamic forces from wave action and wind loading, as well as handrail loads.

The design loads to be adopted shall be those given by Aecom in their Design Intent Report dated 2/10/12 (for the proposed quay extension) which states wave loading figures of 30.26 kN/m^2 and submerged loading of 80.6kN/m^2.

It will not be designed to withstand collision from either afloat vessels or vehicular traffic on the quay. However it wiill be designed to withstand crowd loading in accordance with EC1.

3.3.2 *Quay Deck*

The quay deck will receive loading from vehicles operating on the quay, cargo being loaded and unloaded onto moored up vessels and personnel.

The design loads given by Aecom in their Design Intent Report dated 2/10/12 (for the proposed quay extension) that states a maximum vertical imposed load of 10.0 kN/m^2.

3.4 Services & Pier Furniture

3.4.1 *General*

All present services are to be maintained with the exception of the drainage.

3.4.2 *Lighting*

It has been assumed that the existing lamp posts are to be maintained in their current positions. New foundations should be included to ensure lamp posts are installed at their current height relative to the level of the new concrete deck slab.

3.4.3 *Drainage*

There is currently a system of drainage gullies along the inside face of the existing wave wall. The purpose of which is to carry water that would otherwise pool along the lower levels of the quay in that location.

Given the adjustments that are being made to the surface fall of the deck the gullies would become redundant and would be removed as part of the slab works. The manholes and drainage system would be expensive to remove so would remain in place with adjustments in the cover levels to suit the new deck profile.

3.4.4 *Handrails*

It has been assumed that all existing handrails are to be maintained in their current position and will sited on the timber sleepers as existing. No allowance will be made for the re-fixing of the timber sleepers for the new slab.

3.4.5 *Bollards*

All of the existing bollards (except one) within the area of the proposed resurfacing are situated on the existing coping on the harbour side of the quay. The new surfacing will not impact upon these bollards and therefore they are to be maintained undisturbed in their current position. However there is one bollard currently sited on the seaward side of the end of the quay that will need to be removed as part of this work or the quay extension project (assuming that the quay extension work is undertaken).

Photo showing End Bollard

3.5 Levels

3.5.1 *General*

A topographic survey was undertaken by Geographical Information Surveys Ltd on behalf of Birse Coastal in August 2008. A copy of this drawing is contained in Appendix B.

3.5.2 *Coping*

The level of the coping around the existing pier varies from +7.38m CD to +7.41m CD. For design purposes, the level shall be assumed to be +7.40m CD.

3.5.3 *Quay deck*

The levels of the existing quay deck falls at a reasonably consistent fall between adjacent coping level and the adjacent wave wall. The fall transitions from a fall away from the wave wall close to the harbour building, to a fall toward the wave wall as you approach the end of the quay.

In order to achieve the necessary fall in the desired direction, the levels adjacent to the wave wall will have to be raised. The coping levels cannot easily be altered, so will serve as the datum. Using this datum, the minimum level adjacent to the wave wall can be calculated by taking the coping level and using the width of the quay at that location to add the required fall.

3.5.4 *Wave wall*

The levels along the base of the existing wave wall vary from +7.11m CD at its lowest to +7.62m CD at its high point. The top of the wave wall varies from +8.40m CD to +8.64m CD. The exact height of the wave wall varies along its length, but is approximately 1100mm tall.

The level of the top of the proposed wave wall should be 1500mm above the lowest level of the quay deck adjacent to the wave wall. This will be when the quay is at its narrowest.

3.5.5 *At extent of quay deck slab*

It will be necessary for the levels of the quay deck slab to tie in seamlessly with the levels at the extent of the slab adjacent to the harbour building and ticket office. These vary from +7.59m CD adjacent to the wave wall to +7.48m CD next to the harbour building down to +7.38m at the coping.

Appendix A

Drawing Of Proposed Extent of Work

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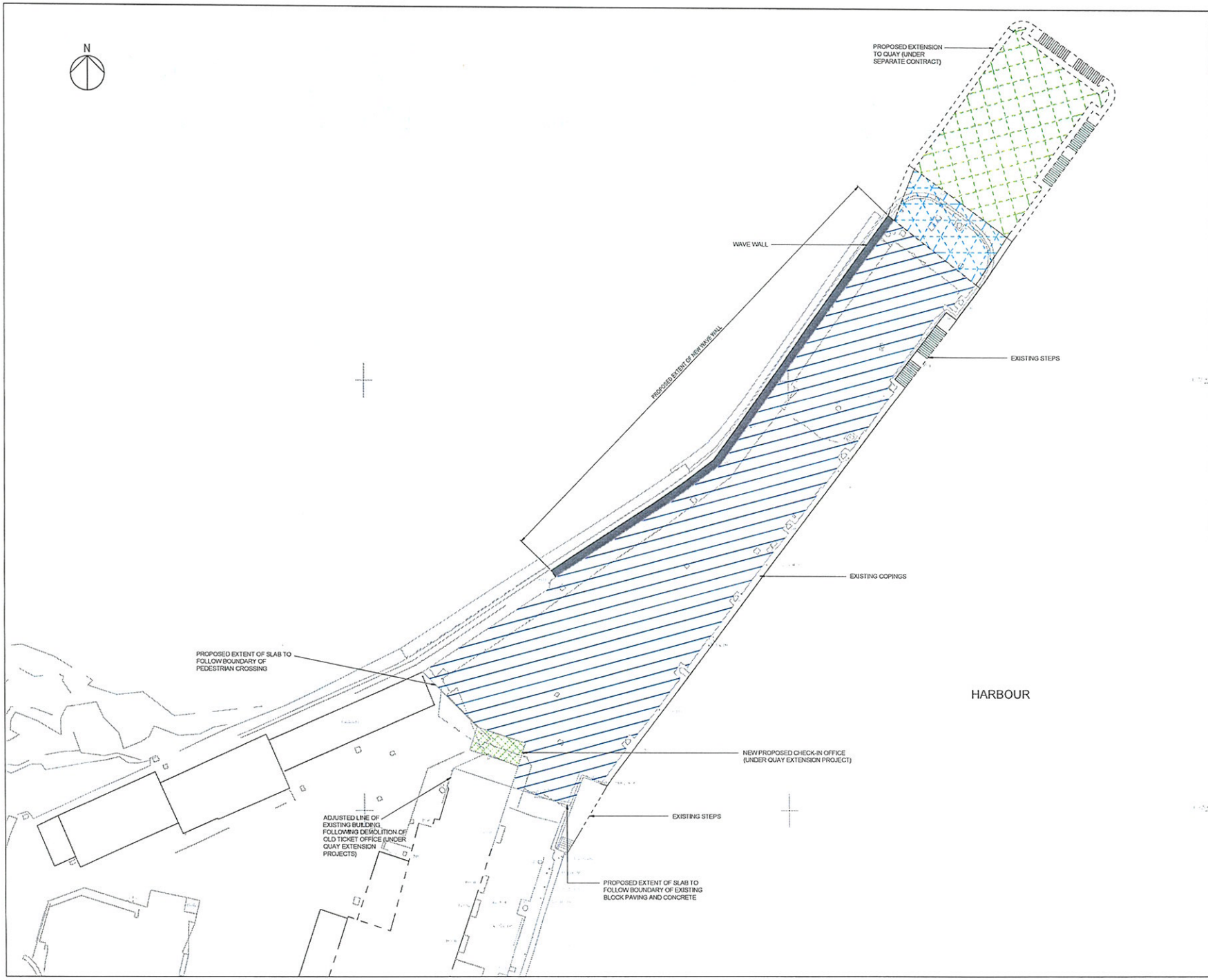

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

IT IS ASSUMED THAT ALL WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROPRIATE METHOD STATEMENT.

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS OTHERWISE STATED.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

PROPOSED EXTENT OF NEW REINFORCED SLAB

PROPOSED TRANSITION SLAB (SEPARATE CONTRACT)

NEW PROPOSED REINFORCED CONCRETE CAISSON (SEPARATE CONTRACT)

ORIGINAL ISSUE		EB / RP	22/11/13	0
Revision Details		By / Check	Date	Suffix

Purpose of issue: FOR APPROVAL

Client: DUCHY OF CORNWALL

Project Title: ST MARY'S QUAY

Drawing Title: PROPOSED EXTENT OF NEW REINFORCED CONCRETE SLAB AND WAVE WALL

Designed	Drawn	Checked	Approved	Date
-	RR	RP	RP	16/11/2013

URS Internal Project No.: 47057988

Suitability:

Scale @ A1: 1:200

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Drawing Number: STMA-URS-XX-00-DR-SE-PL002

File: 0

Appendix B

Topographic Drawing

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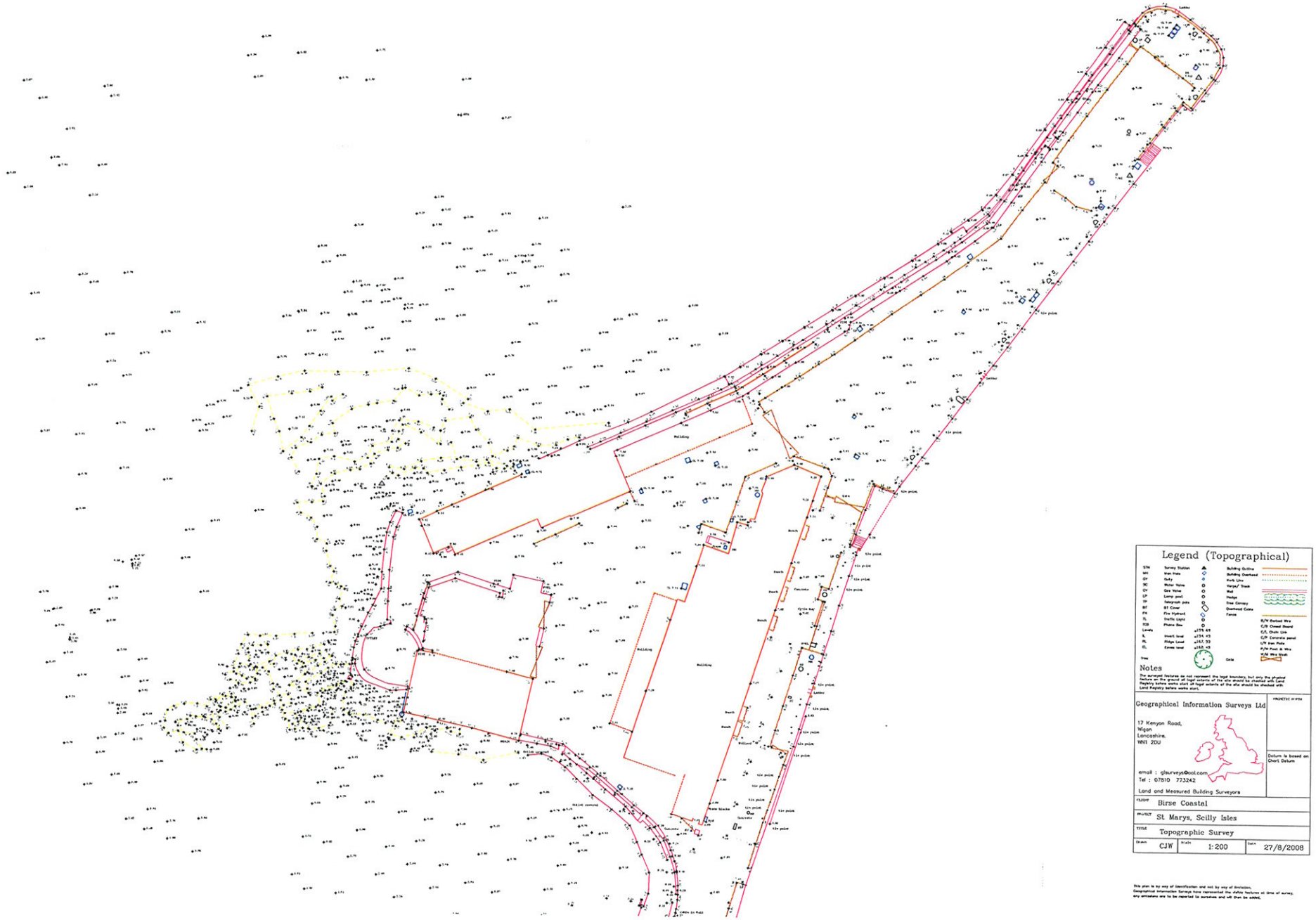

Legend (Topographical)

STN	Survey Station		Building Outline
WV	Wash Valve		Building Overhead
GY	Gully		Kerb Line
WC	Water Valve		Verge/ Track
GV	Gas Valve		Wall
LP	Lamp post		Hedge
TP	Telegraph pole		Tree Canopy
BT	BT Cover		Overhead Cable
FH	Fire Hydrant		Fence
TL	Traffic Light		
TCB	Phone Box		
Levels			R/W Barbed Wire
IL	Invert level	+175.69	C/B Chisel Board
SL	Sleeper level	+154.45	C/L Chain Link
RL	Ridge Level	+167.33	C/P Concrete panel
EL	Eaves level	+165.45	I/R Iron Plate
Tree			P/W Post & Wire
		Gate	R/W Wire Mesh

Notes

The surveyed features do not represent the legal boundary, but only the physical features on the ground all legal extents of the site should be checked with Land Registry before works start all legal extents of the site should be checked with Land Registry before works start.

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email : gisurveys@aol.com
Tel : 07810 773242

Land and Measured Building Surveyors

PROJECTED IN WGS84

Datum is based on Chart Datum

FLOW	Birse Coastal
PROJECT	St Marys, Scilly Isles
TITLE	Topographic Survey
Drawn: CJW	Scale: 1:200
Date: 27/8/2008	

This plan is by way of identification and not by way of limitation. Geographical Information Surveys have represented the visible features at time of survey, any omissions are to be reported to ourselves and will then be added.