

How do we achieve Net Zero within our church buildings?

Some Do's and Don'ts



Grant Elliott, RIBA, CA

May 2023

**Le Page Architects**

## Introduction



St Petroc, Bodmin – Light and Sound – *Le Page Architects*

**Le Page Architects**

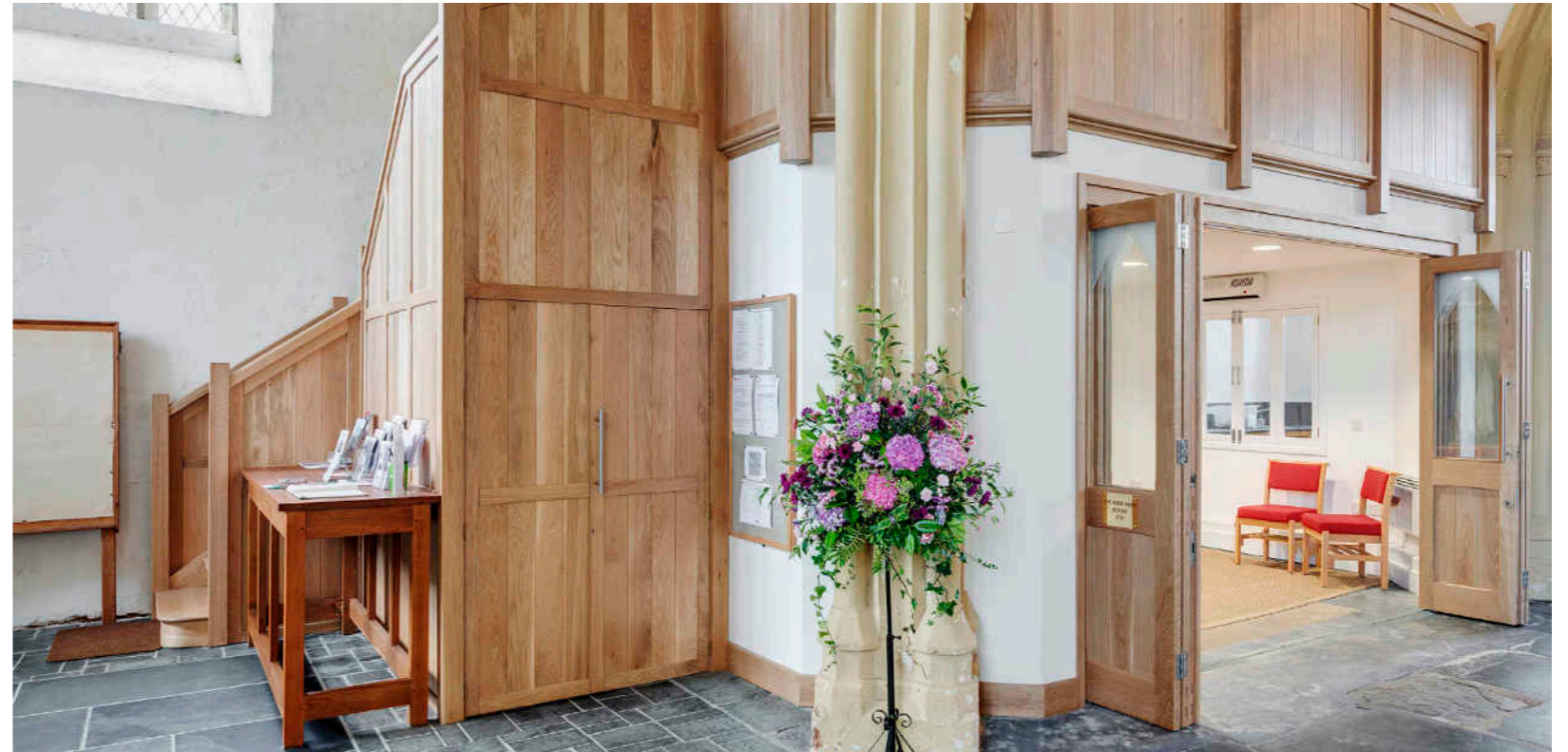
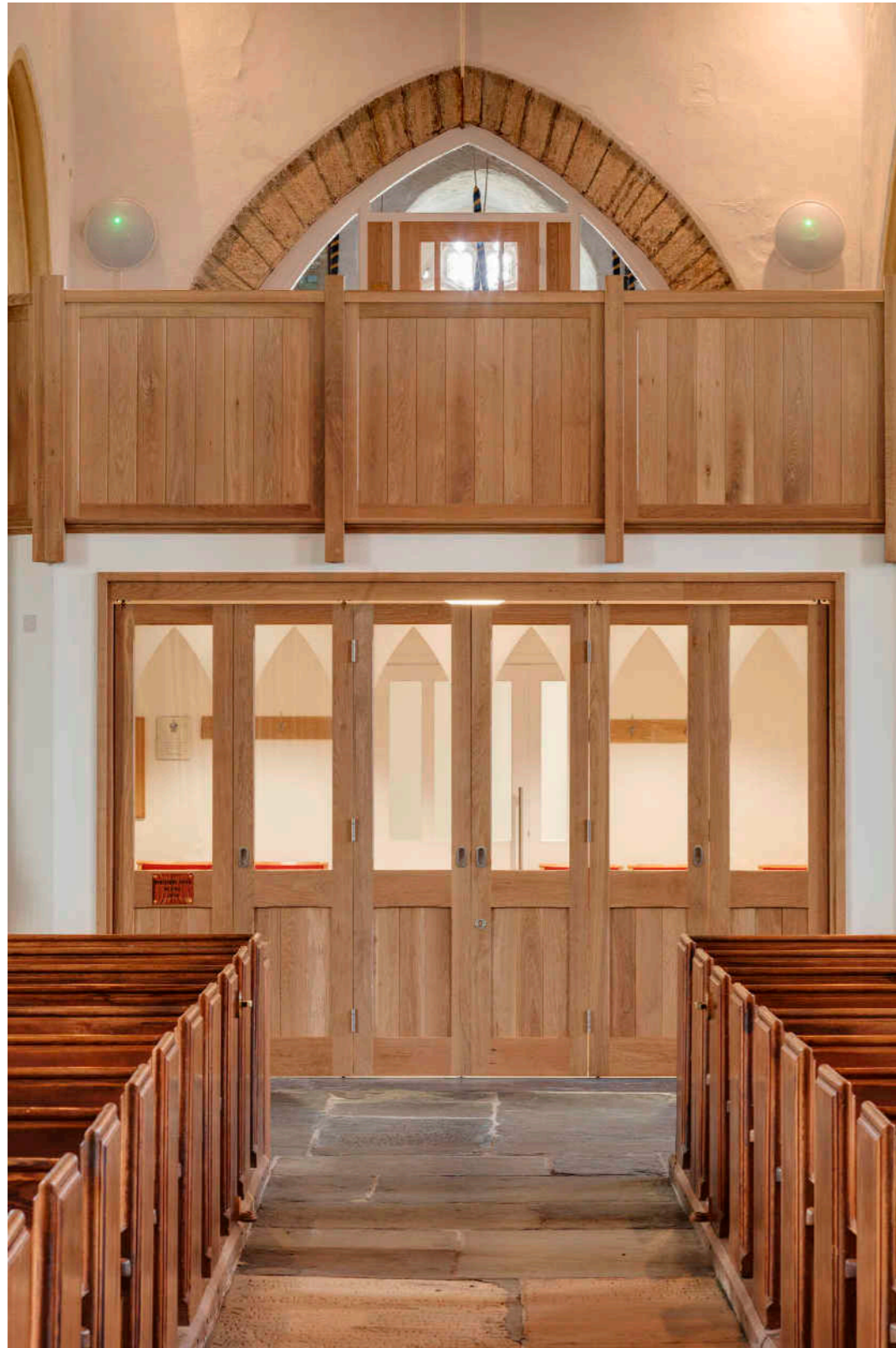
## Introduction



St Andrew with St Luke, Stoke Damerel, Plymouth – ReOrdering and Underfloor Heating – *Le Page Architects*

**Le Page Architects**

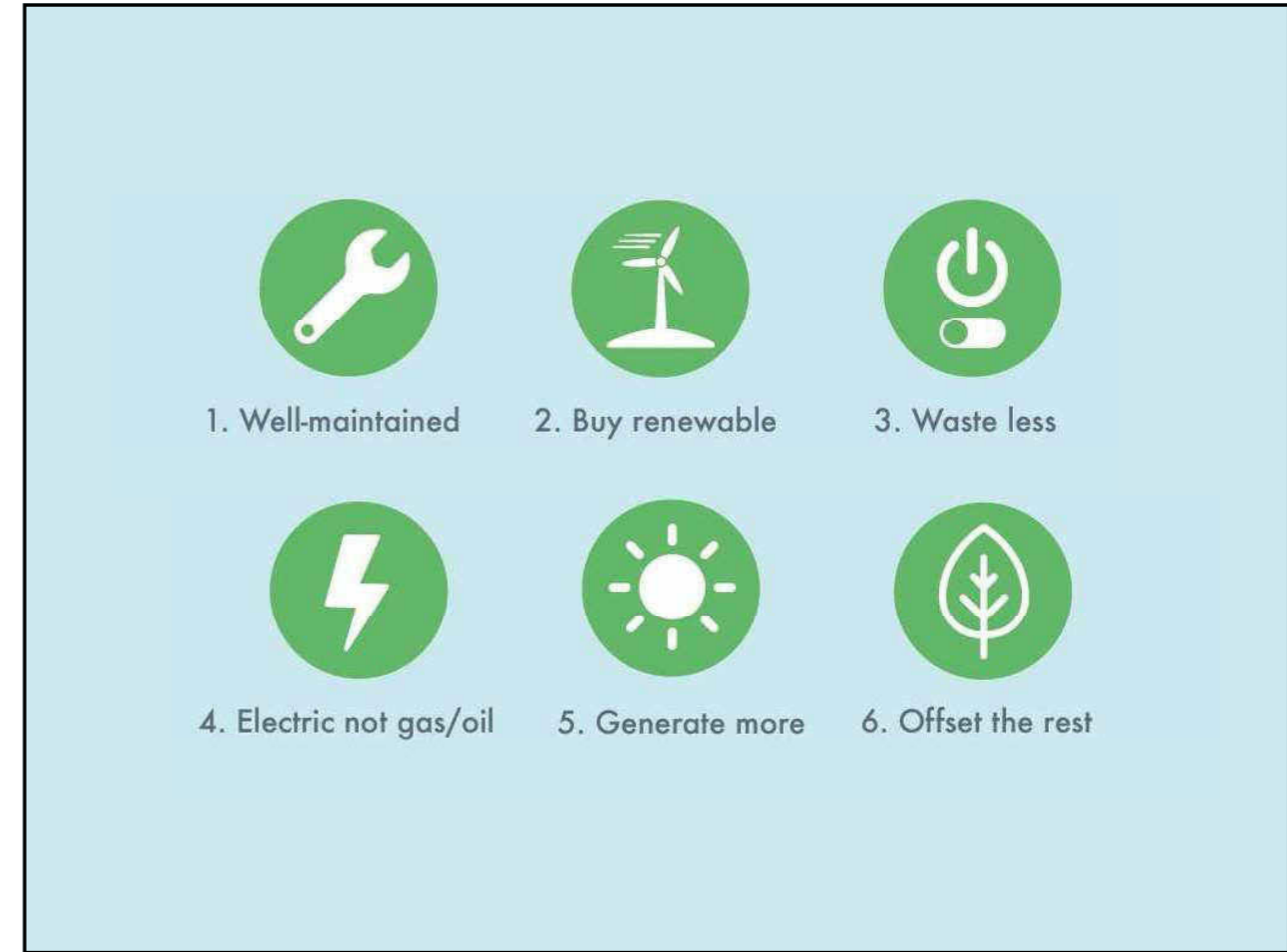
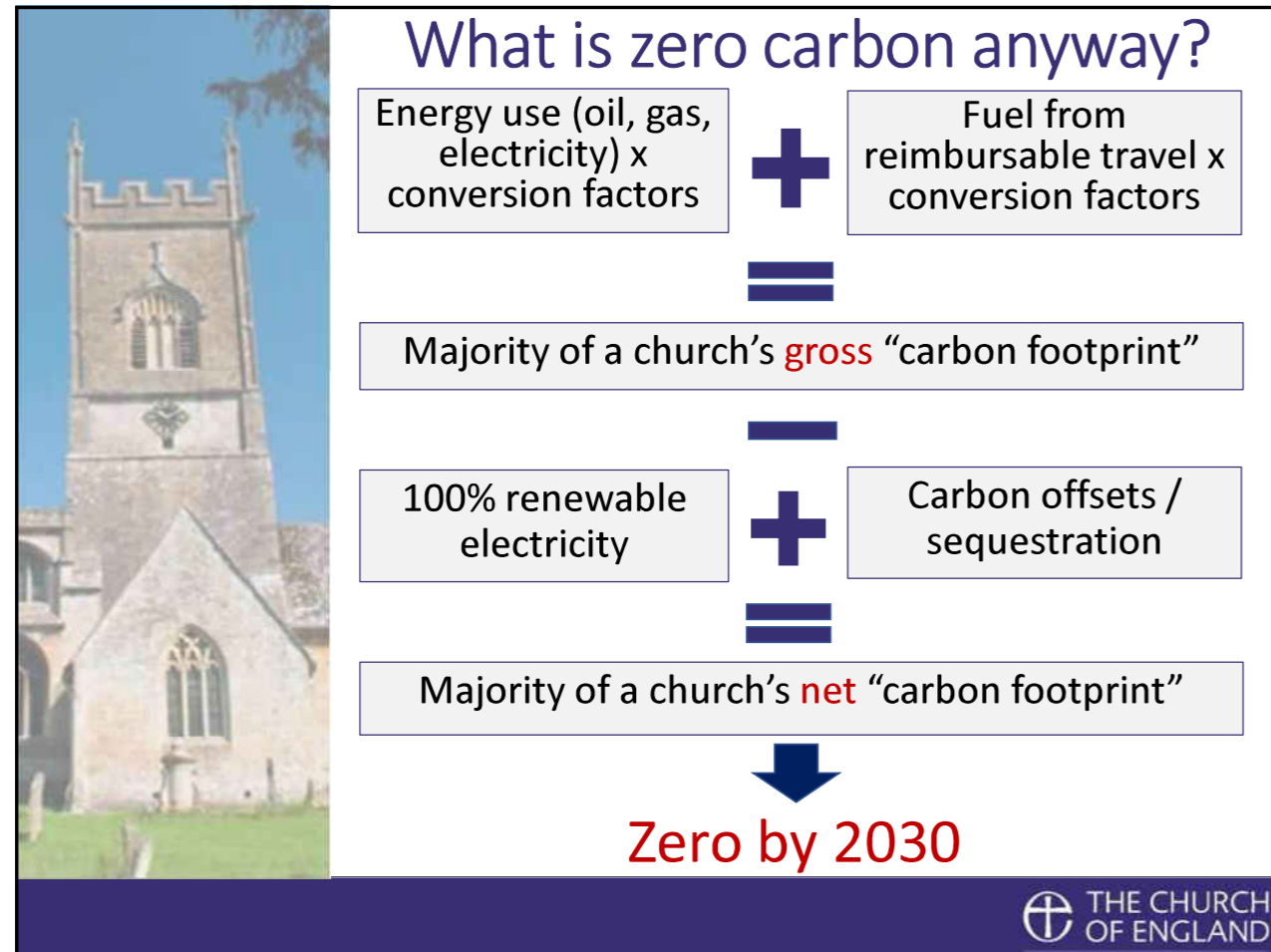
## Introduction



All Saints, Marlborough – Re Ordering – *Le Page Architects*

**Le Page Architects**

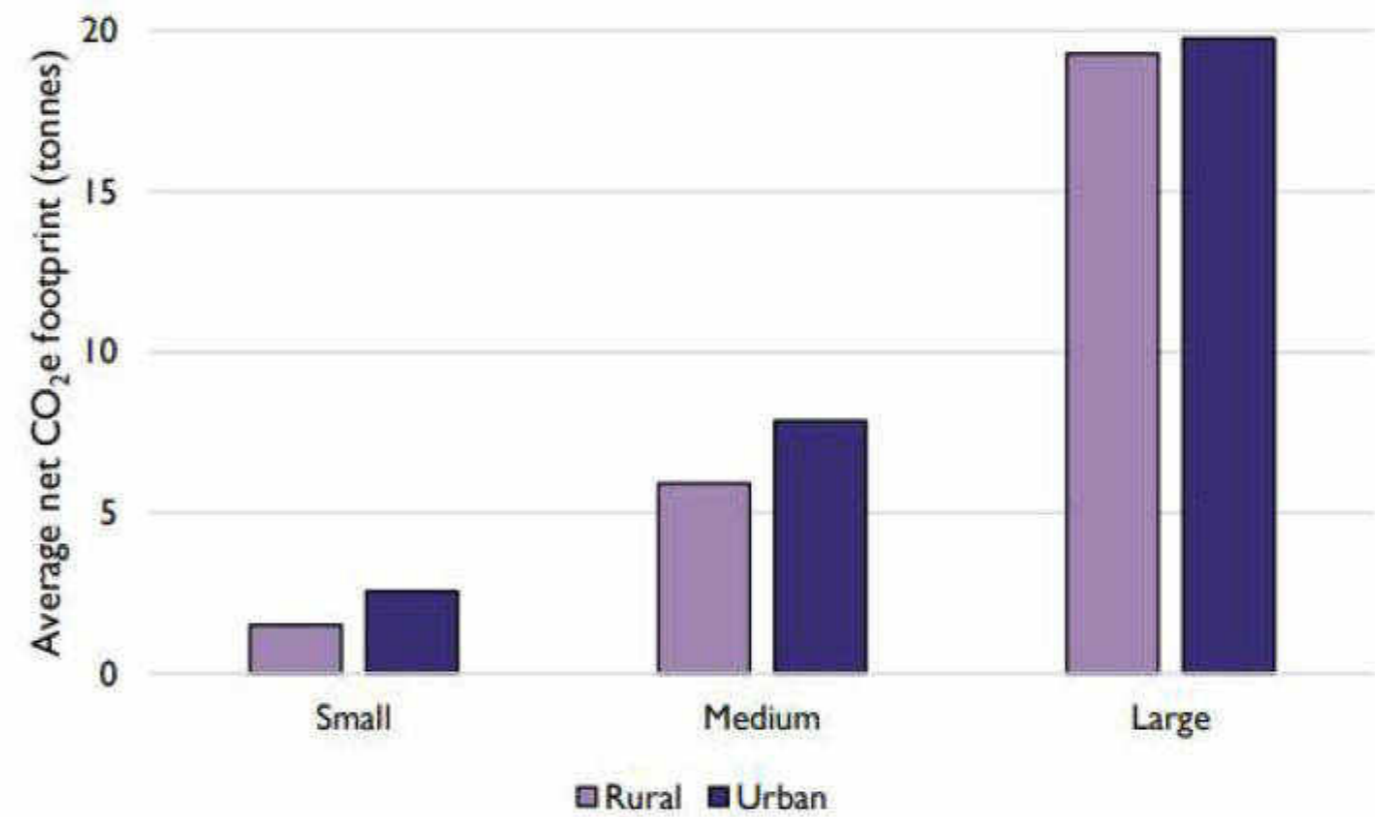
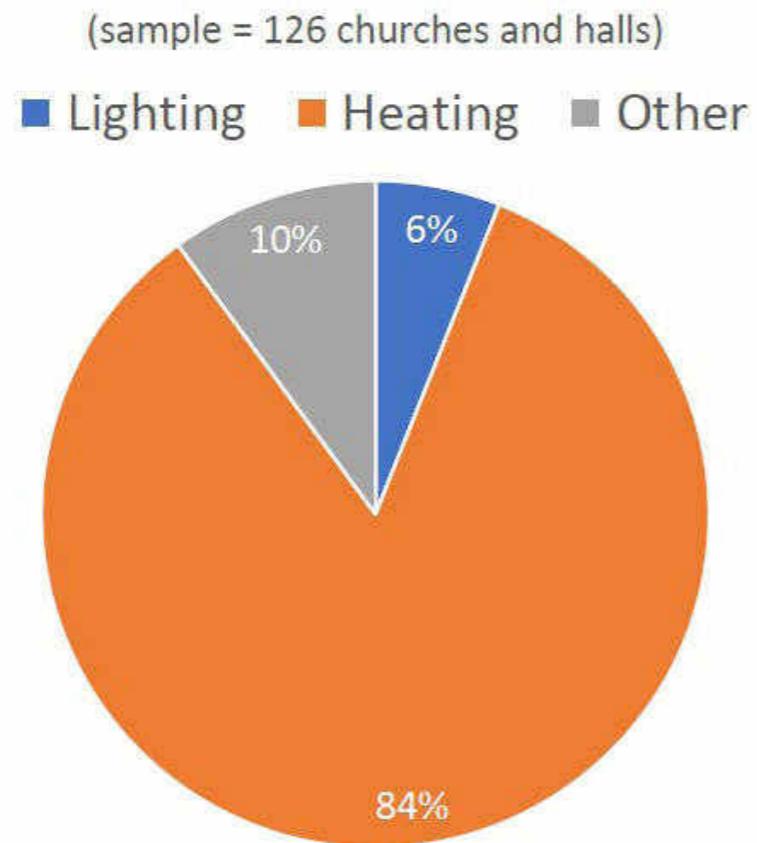
## Zero Carbon & Key Principles



7% of churches are already net zero carbon  
Source: Catherine Ross, Church of England Environment Programme

## Heating

Heating makes up the majority of church energy use, so it needs to be the focus for action. Larger, busier churches with the heating on for much of the week will have higher emissions and need different technical solutions.



Source: Catherine Ross, Church of England Environment Programme

## Quick Wins

Match heating timing to use

Turn off heating before end of service

Complete the Energy Footprint Tool each year and communicate the results

Create an energy champion to review use

Encourage people to turn things off

Move PCC meetings elsewhere during cold months

Install a smart meter

Vary service times in winter

Maintain the roof and gutters

Fix broken window panes

Insulate around heating pipes

Draught proof around gaps

As lights fail, replace with LED bulbs where suitable

*Source: Catherine Ross, Church of England Environment Programme*

## **Next Steps**

Insulate easy to access lofts

Install a draught lobby

Use data loggers and smart meters

Improve zoning, install TRVs

Set boiler temperatures correctly

Install thermal or motion sensors

Replace gas / oil space heating with electric pew / panel heaters

*Source: Catherine Ross, Church of England Environment Programme*



## Getting to Zero

Draught proofing to windows

Secondary / double glazing to suitable windows in busy areas, eg office / hall

Draft-proof the tower ceiling

Insulate under pew platforms

Internally insulate suitable areas

Reinstate ceilings where appropriate

New lighting systems

Solar PV panels

*Source: Catherine Ross, Church of England Environment Programme*

## Only If

If re-roofing > insulate and solar?

If suitable and very busy > external renders

If used all week > heat pumps

If used all week and lifting the floor anyway > underfloor heating

If nothing else viable > new gas boiler

If lots of car use > EV charging points

*Source: Catherine Ross, Church of England Environment Programme*

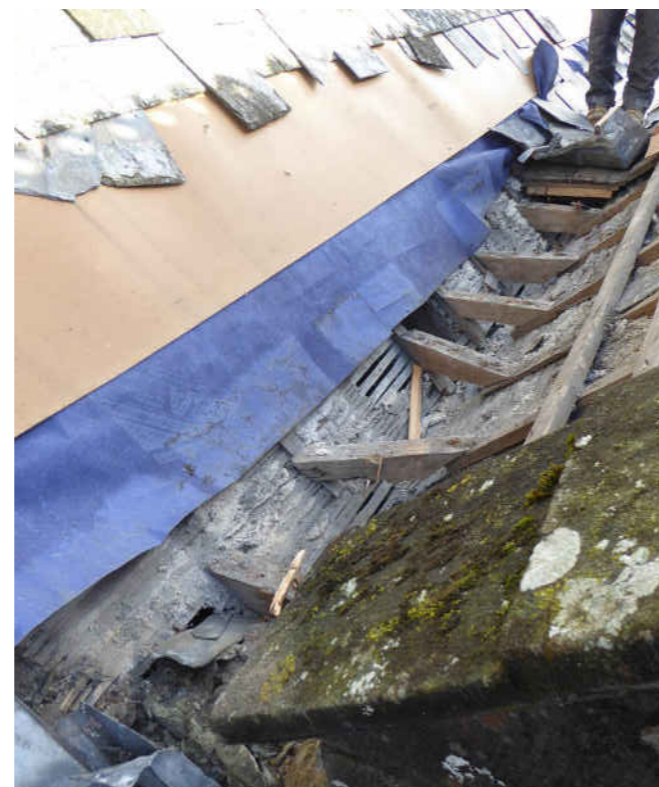
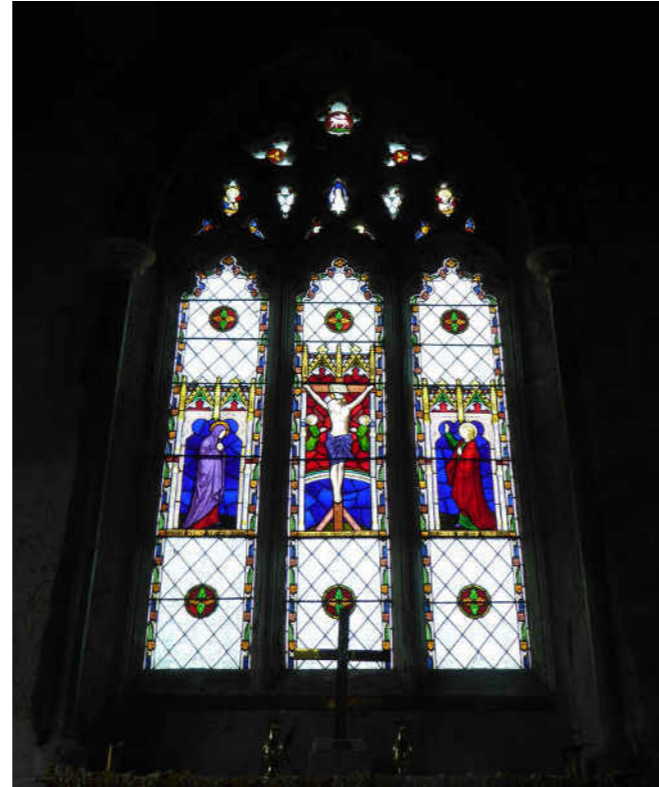
## Case Study 1, St Sampson, South Hill



St Sampson, South Hill

**Le Page Architects**

## St Sampson, Repairs



replacement is required. Their life could be prolonged by removing and decorating them with a suitable paint system.

### Condition summary:

- There has been some structural movement, as evidenced by the crack to the stone sill of b-light, which has caused the glazing to spread, pulling away the s perimeter lead and causing the panel to separate on the s side of Christ's body (RH image below).
- The ferrous bars are rusting and loose at the tips to panel 2b.
- At second row of bars, ties are situated above the inscriptions which is encouraging the panels to fold inward at that line.
- The ribbon pointing is failing at the jambs.
- Panel 2b is especially flexible and has insufficient ties.
- Localised but quite severe paint-loss to Christ's face (LH image below), Mary's face, the pelican.
- Several open joints externally at the tracery, numerous mortar repairs.
- One piece of tracery stone has de-laminated externally, though this is not a structural problem.
- The division leads are in poor condition.



### Recommendations:

#### High Priority

- Remove b-light and 1a and 1c. Board openings. Take careful stone measurements.
- Stone mason to remove external guards, rake out defective mortar and re-point tracery.
- Rub down and decorate wire guards using suitable paint system.
- Re-align leading where panel has spread, allow to re-lead locally if necessary.

THIS DRAWING MUST BE READ IN CONJUNCTION WITH OTHER ARCHITECT'S, CONSULTANT'S, SUB-CONTRACTOR'S AND SPECIALIST DRAWINGS.

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

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Rev	Date	Revision	By	Chk
A	20/05/22	Faculty Issue	MS	ALP

Notes  
Text

**FACULTY ISSUE**

**Le Page Architects**

Le Page Architects Limited  
Plumer House  
Tallyour Road  
Crownhill  
Plymouth  
PL6 5DH  
Tel: +44 (0)1752 849 880

Email: enquiries@lepagearchitects.com  
Web: http://www.lepagearchitects.com

Client

PCC

Project Name  
St Sampson's, South Hill

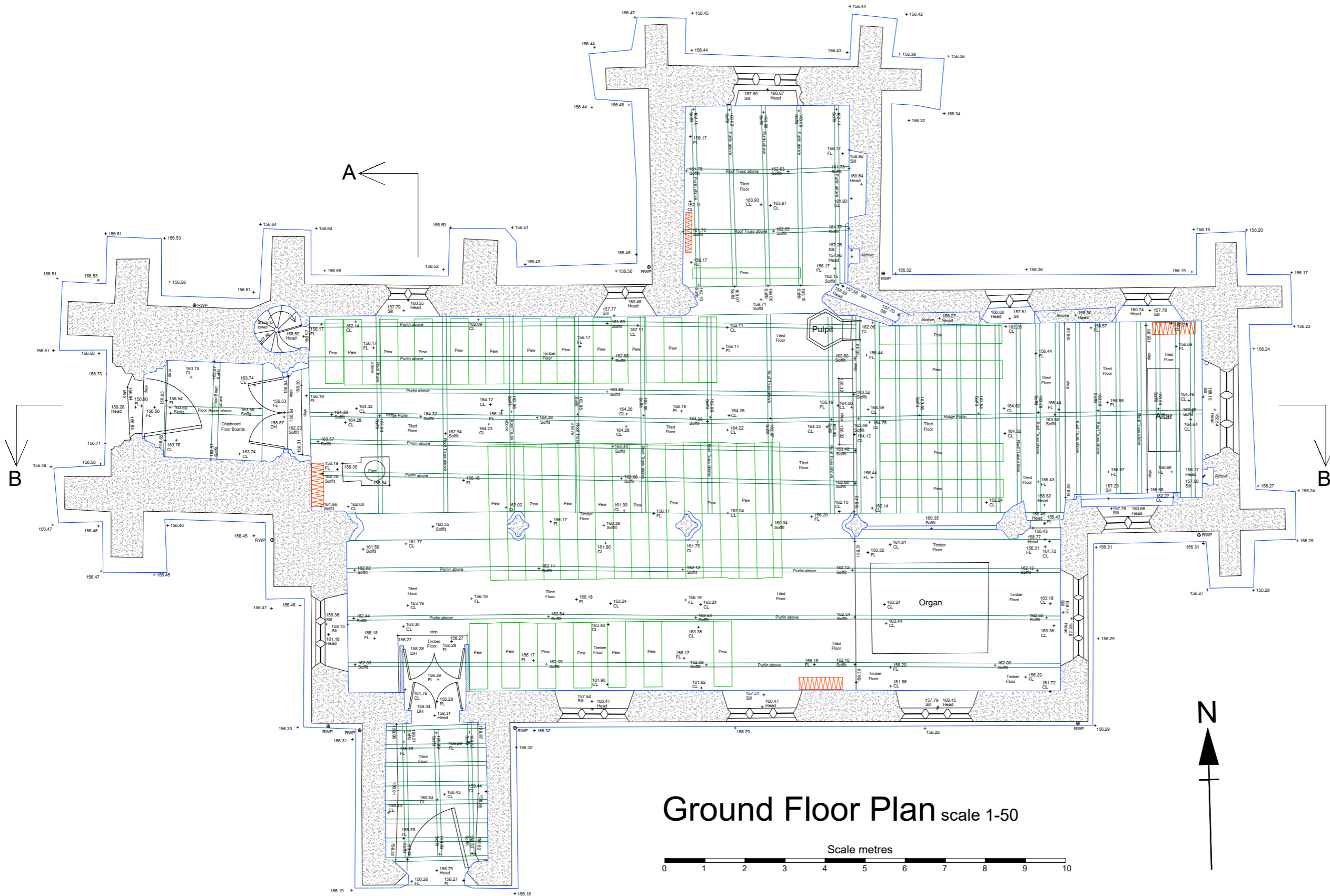
Drawing  
Existing Ground Floor Survey Plan

Scale  
1:50 @ A1

Drawn by  
JP/MS  
Checked by  
Date  
Date

Project No.  
Drawing No.  
Revision

J20.038 AS.02 A



**St Sampson, Repairs**



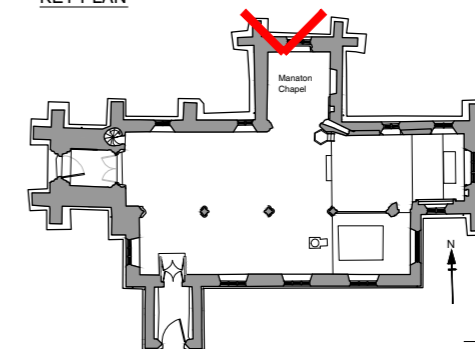
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KEY PLAN



Rev	Date	Revision	By	Chk
A	20/05/22	List B Application	MS	ALP
B	22/07/22	List B Application	GE	SC
C	13/09/22	Updated following client review	ST	GE

Notes

177.0
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**LIST B APPLICATION**

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Plumer House  
Tailyour Road  
Crownhill  
Plymouth  
PL6 5DH  
Tel: +44 (0)1752 849 880

Email: [enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)  
Web: <http://www.lepagearchitects.com>

Client  
**St Sampson Church PCC**

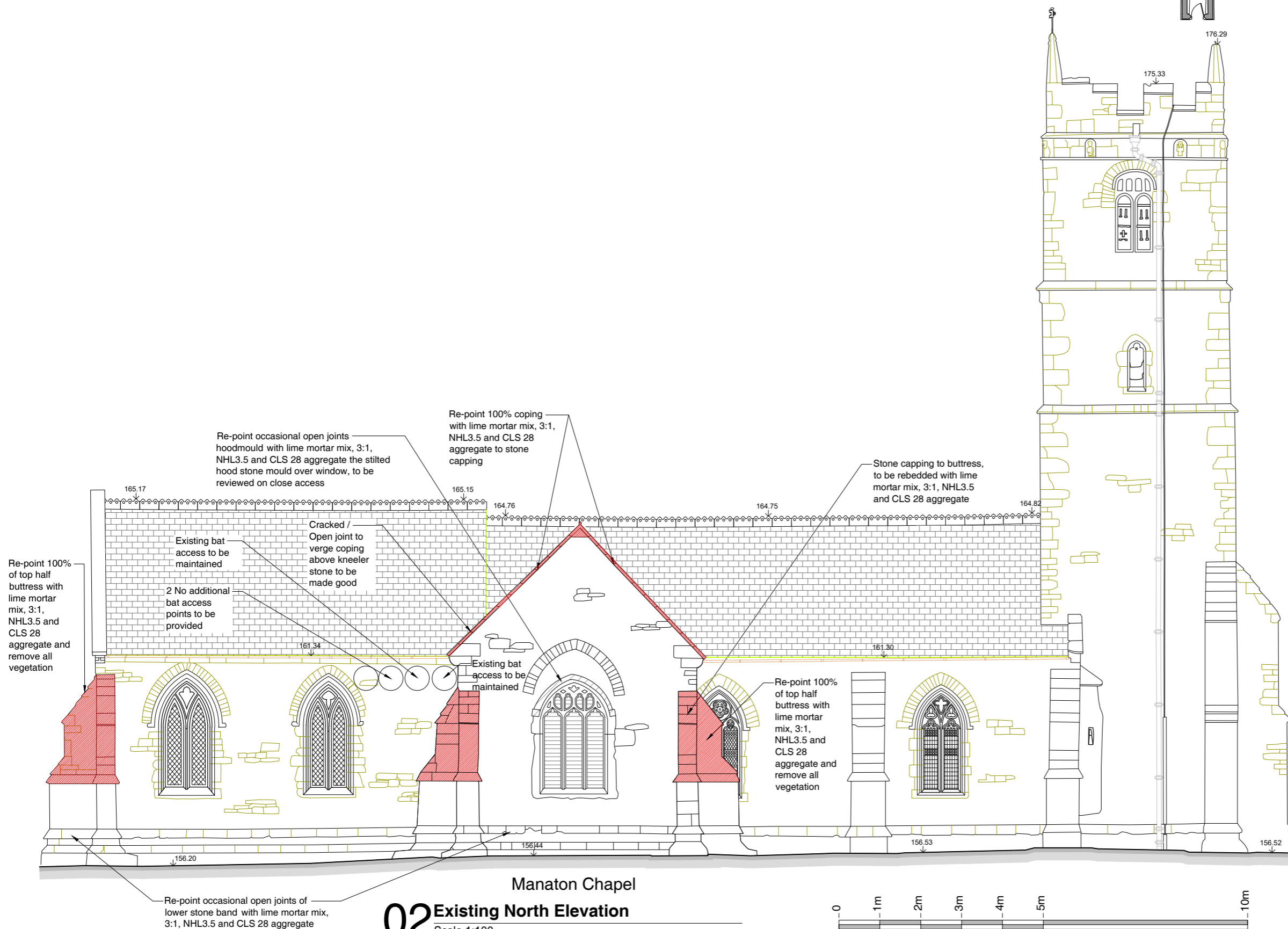
Project Name  
**St Sampson Church  
Re-Pointing Manaton Chapel External Walls**  
Drawing  
**Proposed Re-Pointing North Elevation**

Scale  
1:100 @ A3

Drawn by  
MS  
Checked by  
ALP  
Date  
October 2021  
October 2021

Project No. Drawing No Revision

**J20.029 SS.MC AB.03 C**



**02 Existing North Elevation**  
Scale 1:100

Manaton Chapel

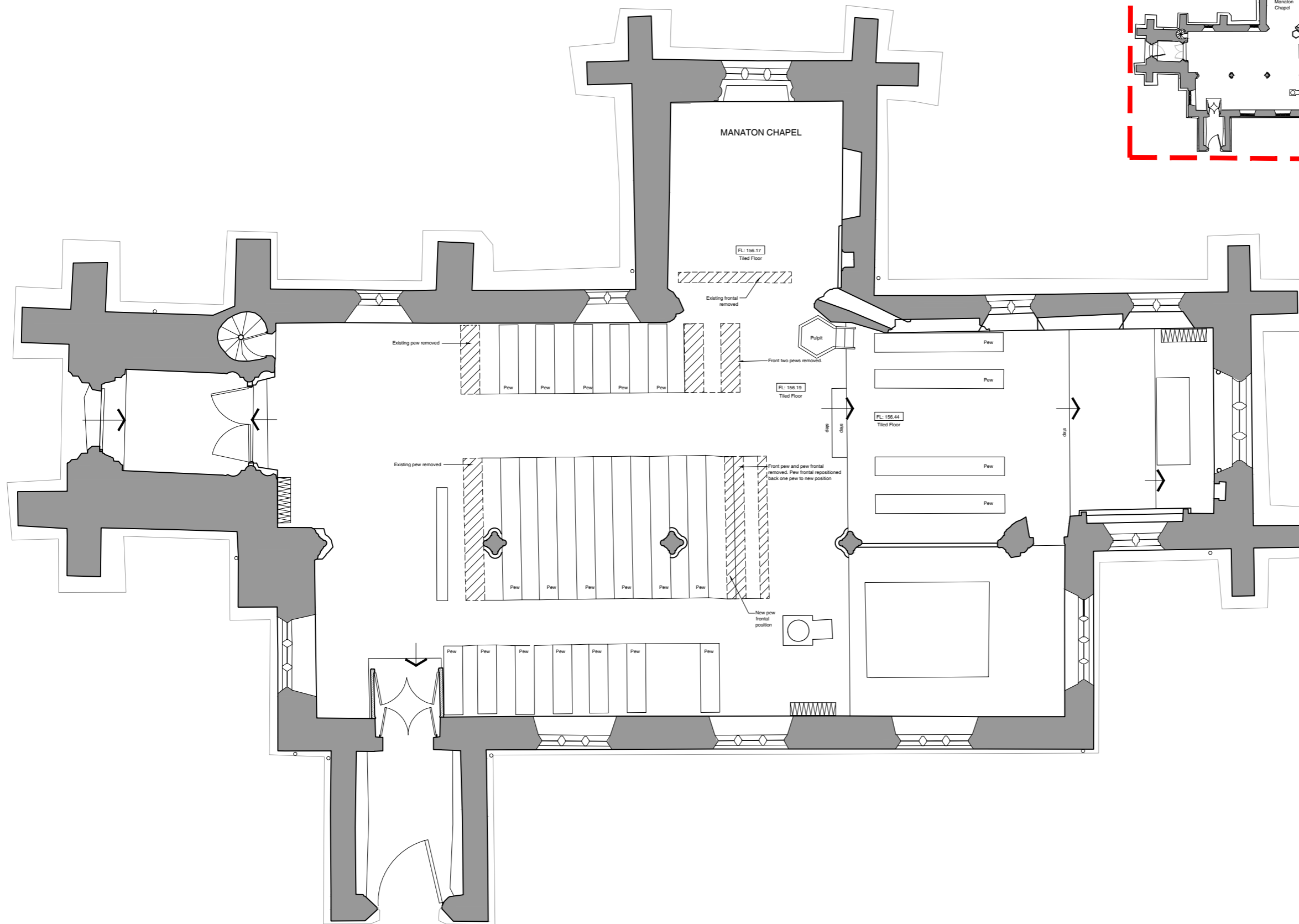
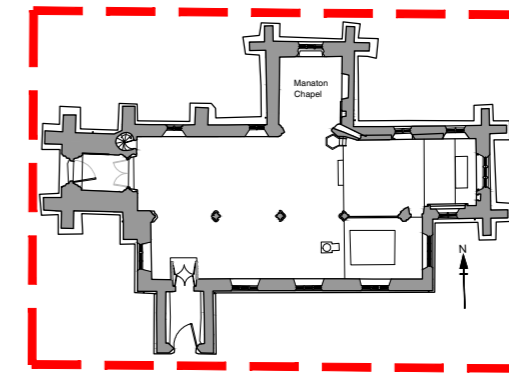
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A	29/07/22	Updated following client review	GE	ST

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 Plumer House  
 Tailour Road  
 Crownhill  
 Plymouth  
 PL6 5DH  
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Client

St Sampson PCC

Project Name

St Sampson Church, Re-Order

Acces.WC, Kitchenette, Screen, Chapel

Drawing

Proposed Pew Removal Plan

Scale

1:100 @ A3

Drawn by

GE Jul 2021

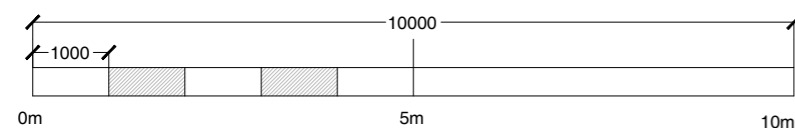
Checked by

SC Jul 2021

Project No. Drawing No Revision

J20.029 SS.MC AB.52 A

**01 Proposed Pew Removal Plan**  
 Scale 1:100





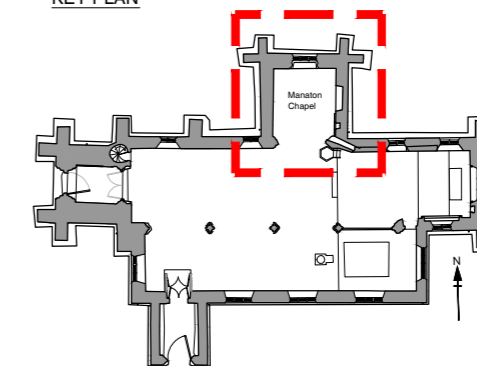
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Rev	Date	Revision	By	Chk
A	00/00/21	Informal Advice Issue	ST	ALP
B	22/05/22	Faculty Issue	MS	ALP
C	22/07/22	Faculty Issue	GE	SC
D	29/07/22	Updated following client review	GE	ST

Notes

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Le Page Architects Limited  
Plumer House  
Tailyour Road  
Crownhill  
Plymouth  
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Client

St Sampson PCC

Project Name  
St Sampson Church, Re-Order  
Acces.WC, Kitchenette, Screen, Chapel

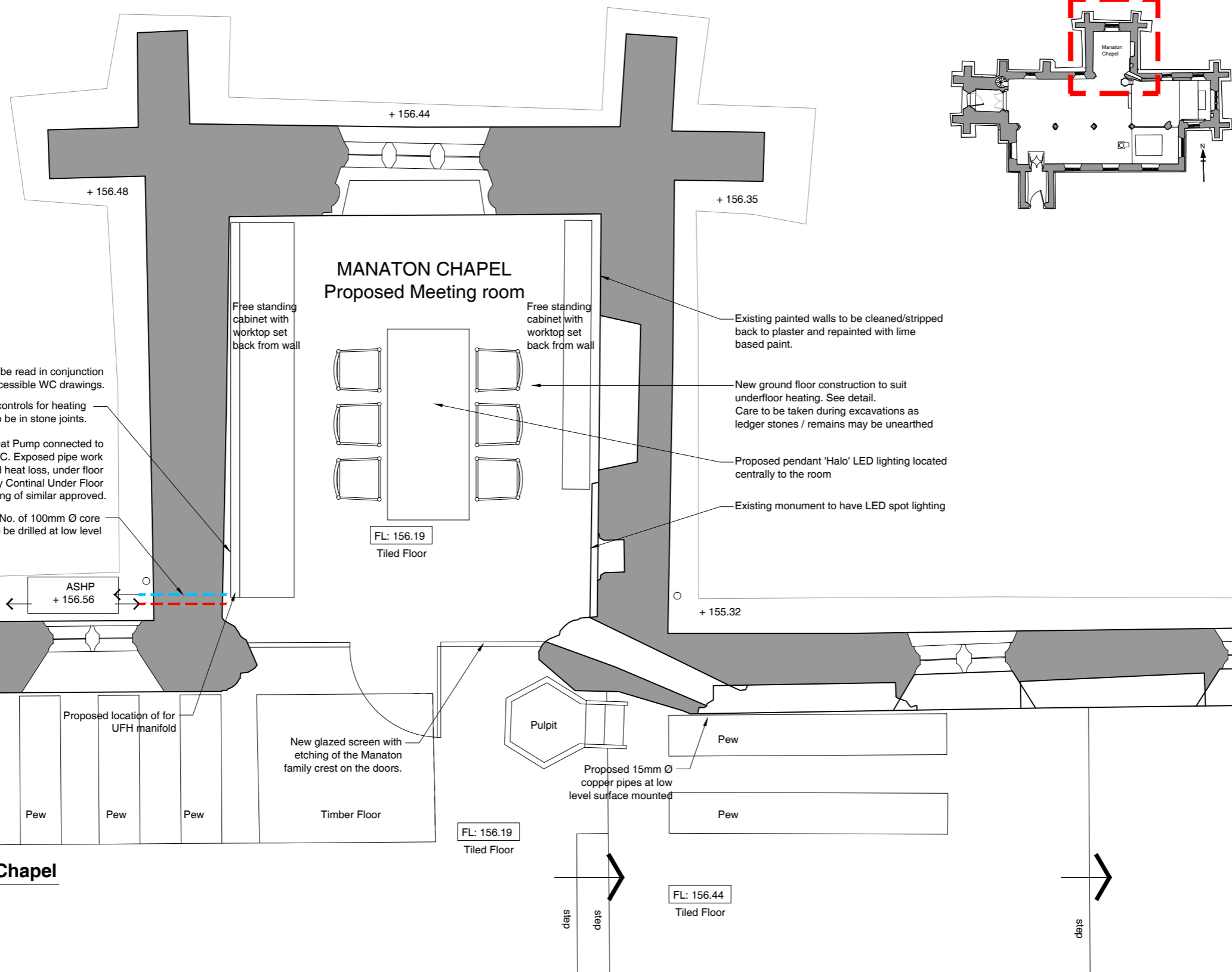
Drawing  
Proposed Manaton Chapel  
Meeting Room Floor Plan

Scale 1:50 @ A3

Drawn by ST Date Jan 2021  
Checked by ALP Date Jan 2021

Project No. Drawing No Revision

J20.029 SS.MC.AB.50 D



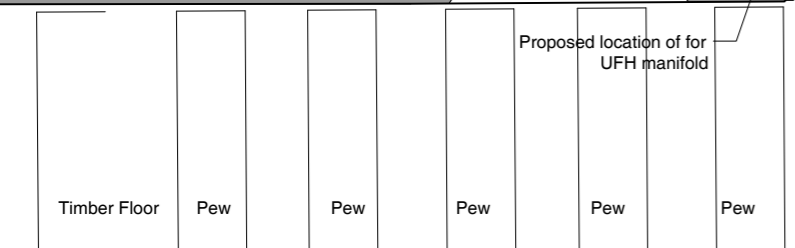
The heating Engineers document is to be read in conjunction with Manaton Chapel and Accessible WC drawings.

Proposed location of for wall mounted automatic controls for heating systems. If mechanically fixed to the wall, it's to be in stone joints.

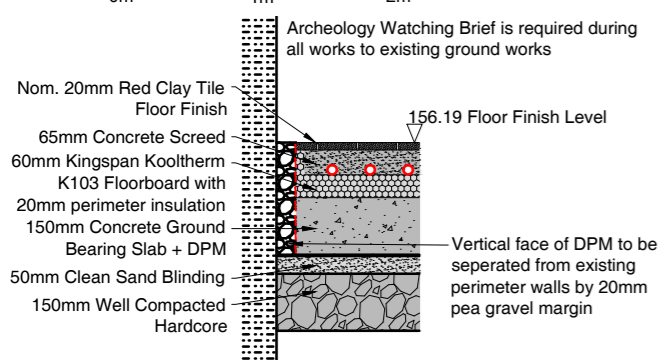
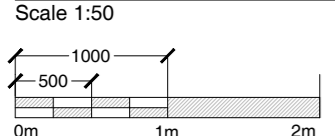
Proposed location of Air Source Heat Pump connected to UFH to Manaton Chapel and Tower/WC. Exposed pipe work to be lagged with insulation to avoid heat loss, under floor heating system to be provided by Continal Under Floor Heating of similar approved.

Proposed location for 2No. of 100mm Ø core holes to be drilled at low level

ASHP + 156.56



**01 Proposed Multi Functional Chapel**



**02 Typical Ground Bearing Floor/UFH Detail**

Scale 1:20

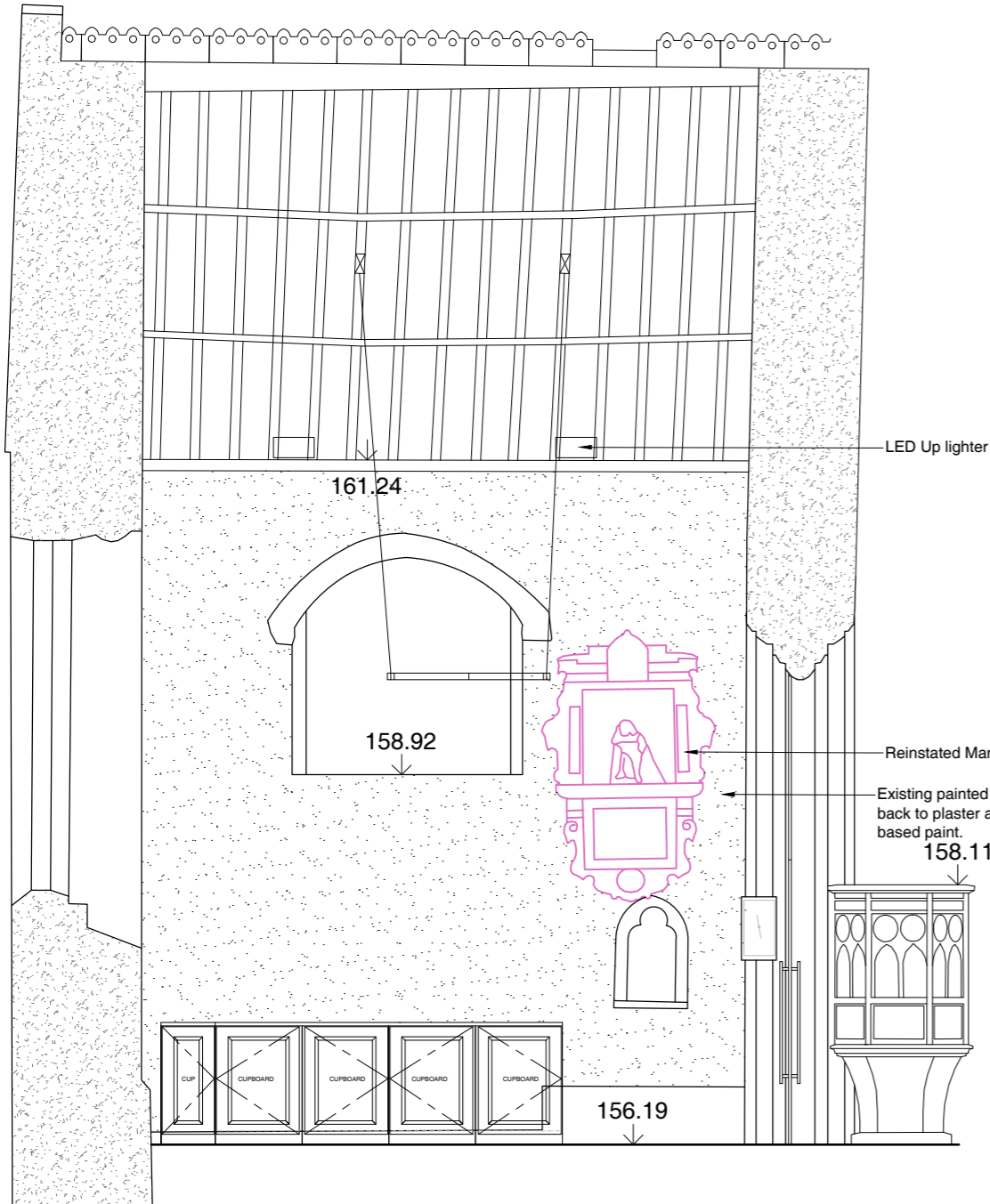
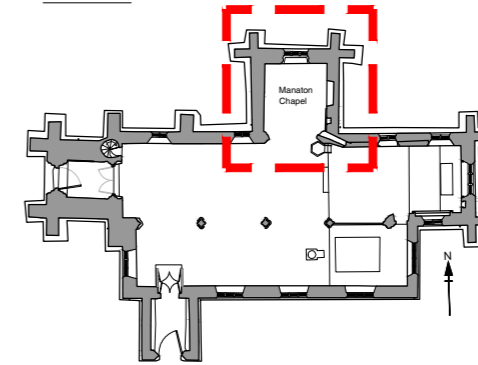
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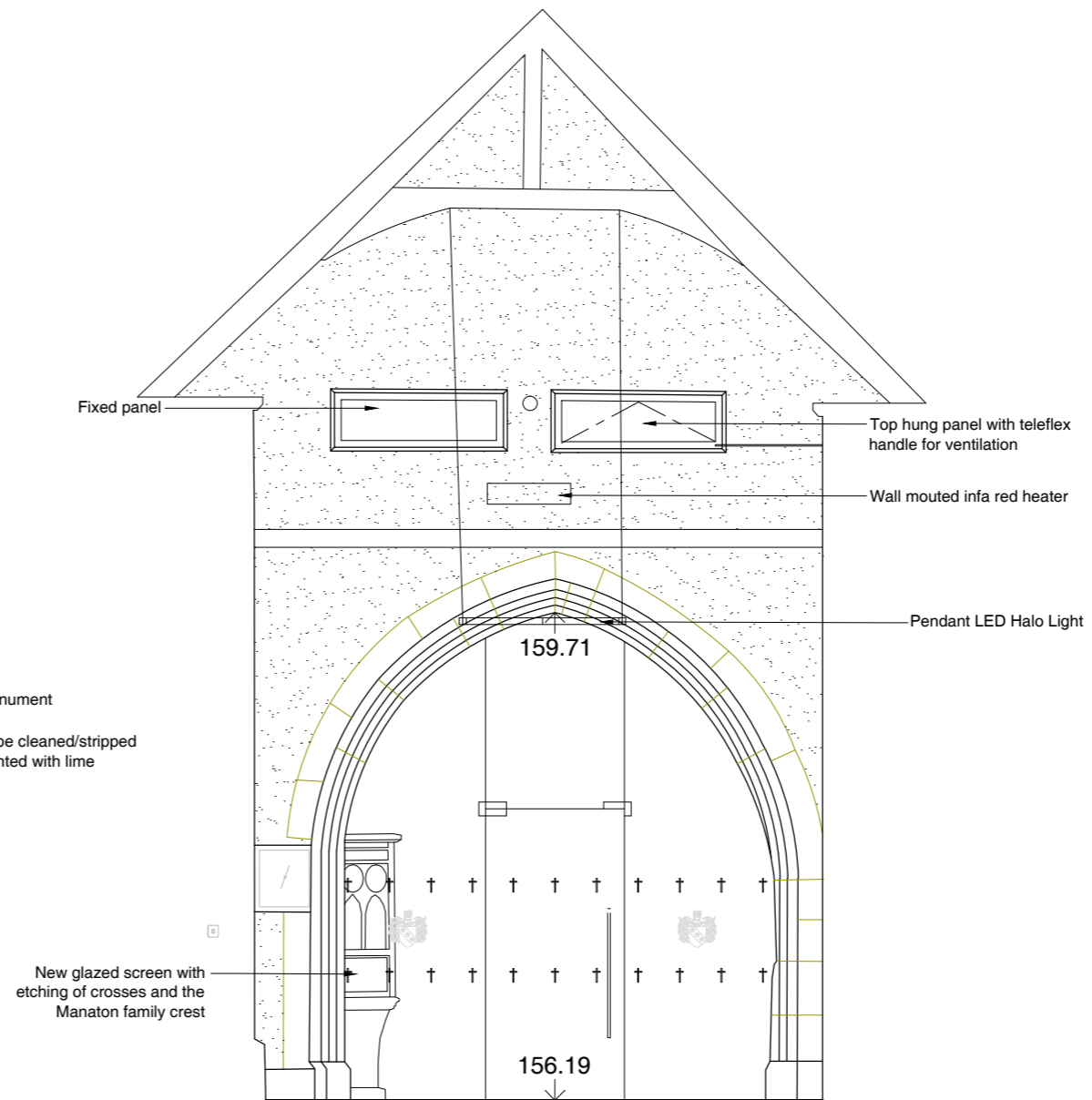
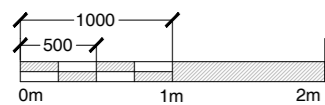
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KEY PLAN



**01 Proposed East Elevation**

Scale 1:50



**02 Proposed South Elevation**

Scale 1:50

Rev	Date	Revision	By	Chk
-	19/07/22	Faculty Issue	GE	SC
-	29/07/22	Updated following client review	GE	ST

Notes

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 Plumer House  
 Tailour Road  
 Crownhill  
 Plymouth  
 PL6 5DH  
 Tel: +44 (0)1752 849 880

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 Web: <http://www.lepagearchitects.com>

Client

**St Sampson PCC**

Project Name  
**St Sampson Church, Re-Order**  
 Acces.WC, Kitchenette, Screen, Chapel

Drawing  
**Proposed Manaton Chapel**  
**Internal Elevations, Sheet 1**

Scale  
 1:50 @ A3

Drawn by  
 GE Jul 2022

Checked by  
 SC Jul 2022

Project No. Drawing No Revision

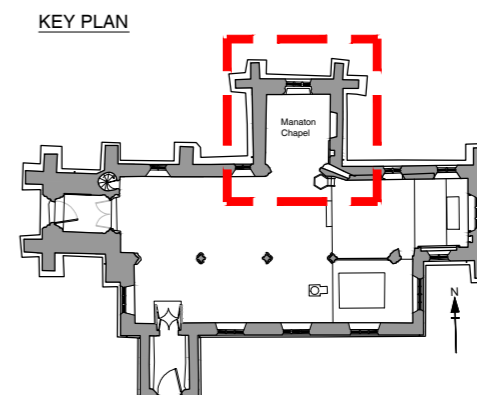
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Client  
**St Sampson PCC**

Project Name  
**St Sampson Church, Re-Order**  
 Acces.WC, Kitchenette, Screen, Chapel  
 Drawing

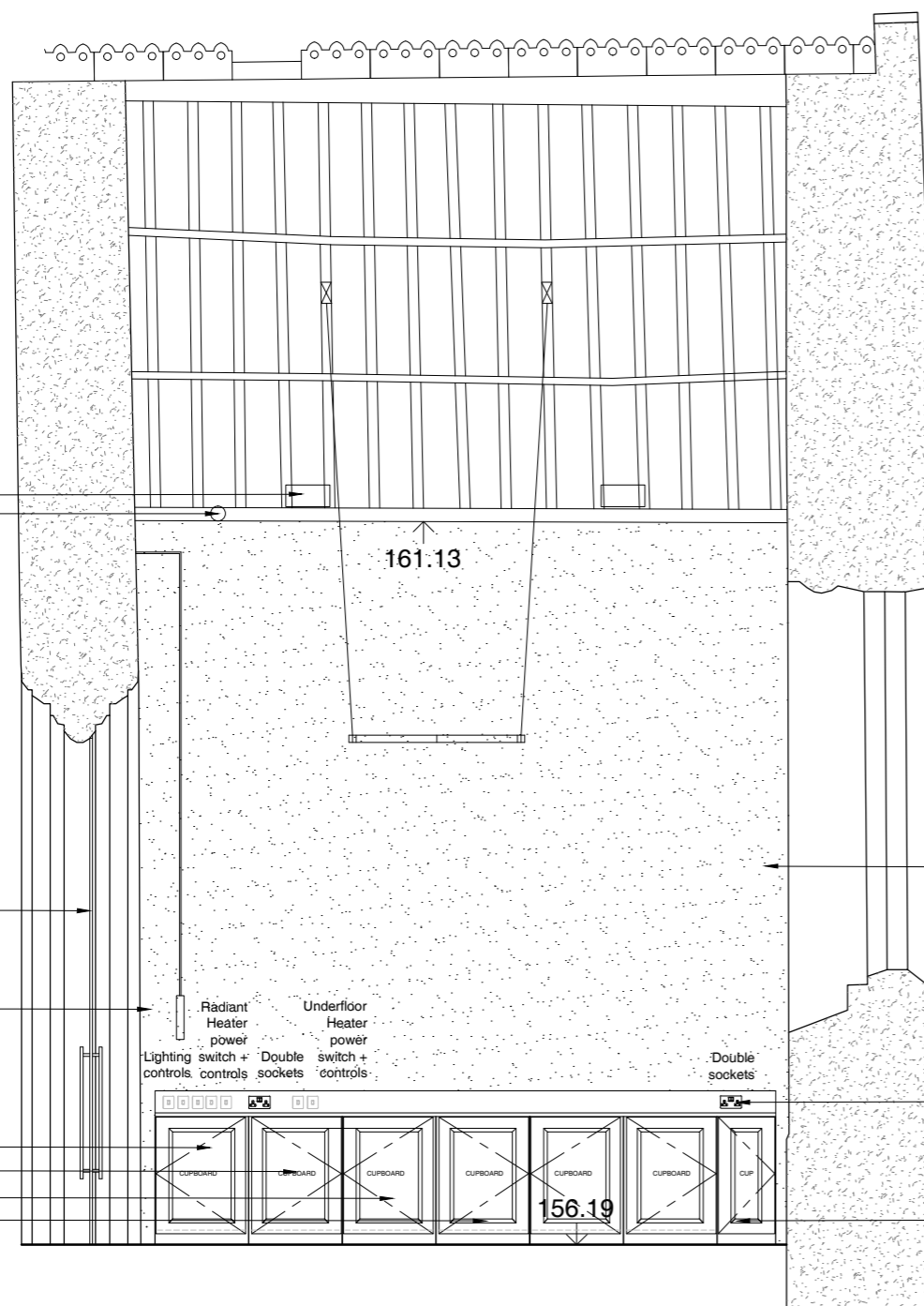
**Proposed Manaton Chapel**  
**Internal Elevations, Sheet 2**

Scale  
 1:50 @ A3

Drawn by  
 GE  
 Date  
 Jul 2022  
 Checked by  
 SC  
 Date  
 Jul 2022

Project No. Drawing No Revision

**J20.029 SS.MC AB.54 A**



LED Up Lighter  
 LED spotlight focused on monument

161.13

New glazed screen with etching of the Manaton family crest

Teleflex winding handle for openable vent

Radiant Heater power  
 Underfloor Heater power  
 Lighting switch + controls  
 Double switch + sockets  
 Double sockets

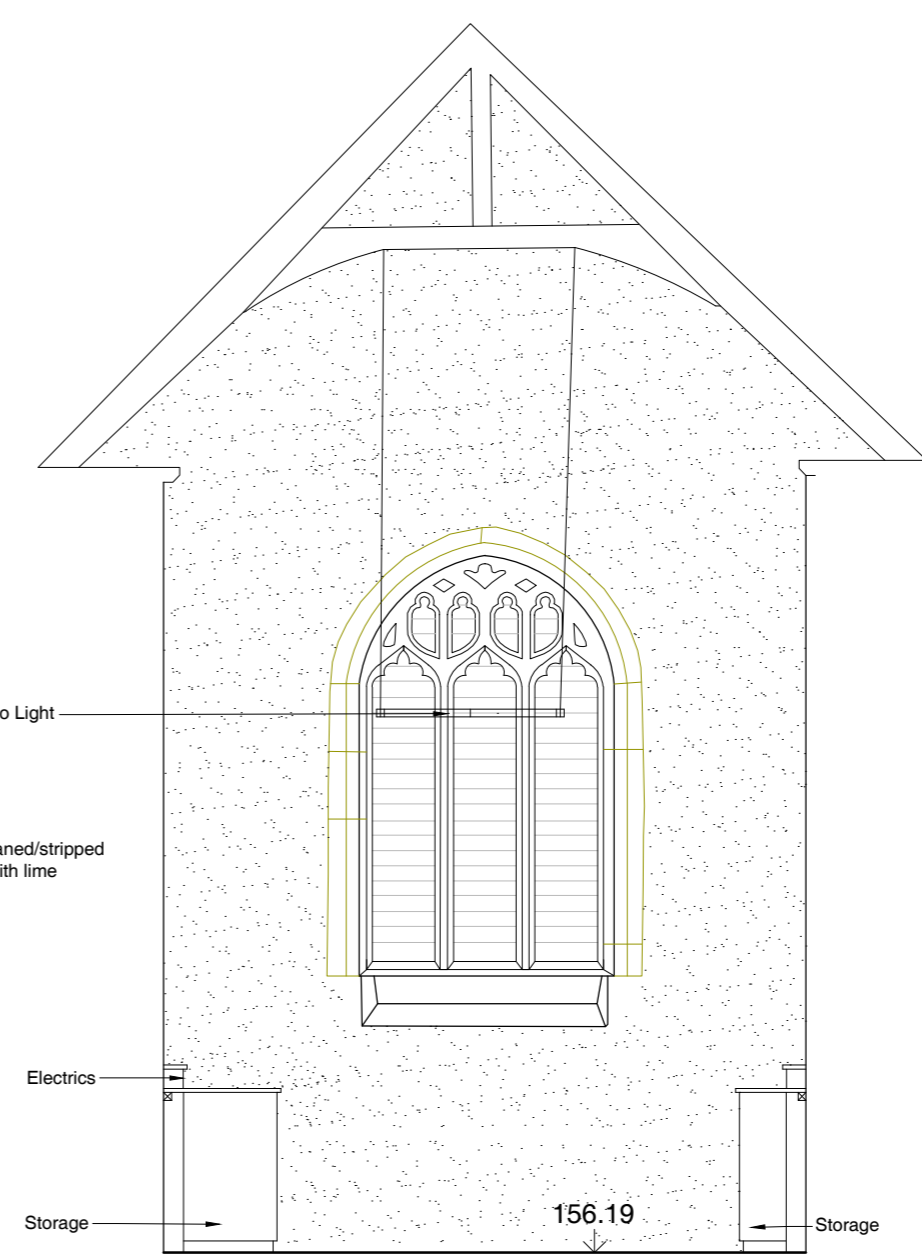
Buffer tank  
 Heating pump  
 Feed and expansion vessel  
 Underfloor heating manifold

156.19

Existing painted walls to be cleaned/stripped back to plaster and repainted with lime based paint.

All fixings to be fixed into stone joints and not face of stones

Storage



Pendant LED Halo Light

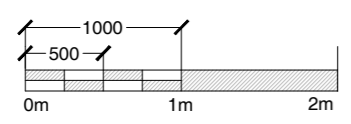
Electrics

Storage

156.19

Storage

**01 Proposed West Elevation**  
 Scale 1:50



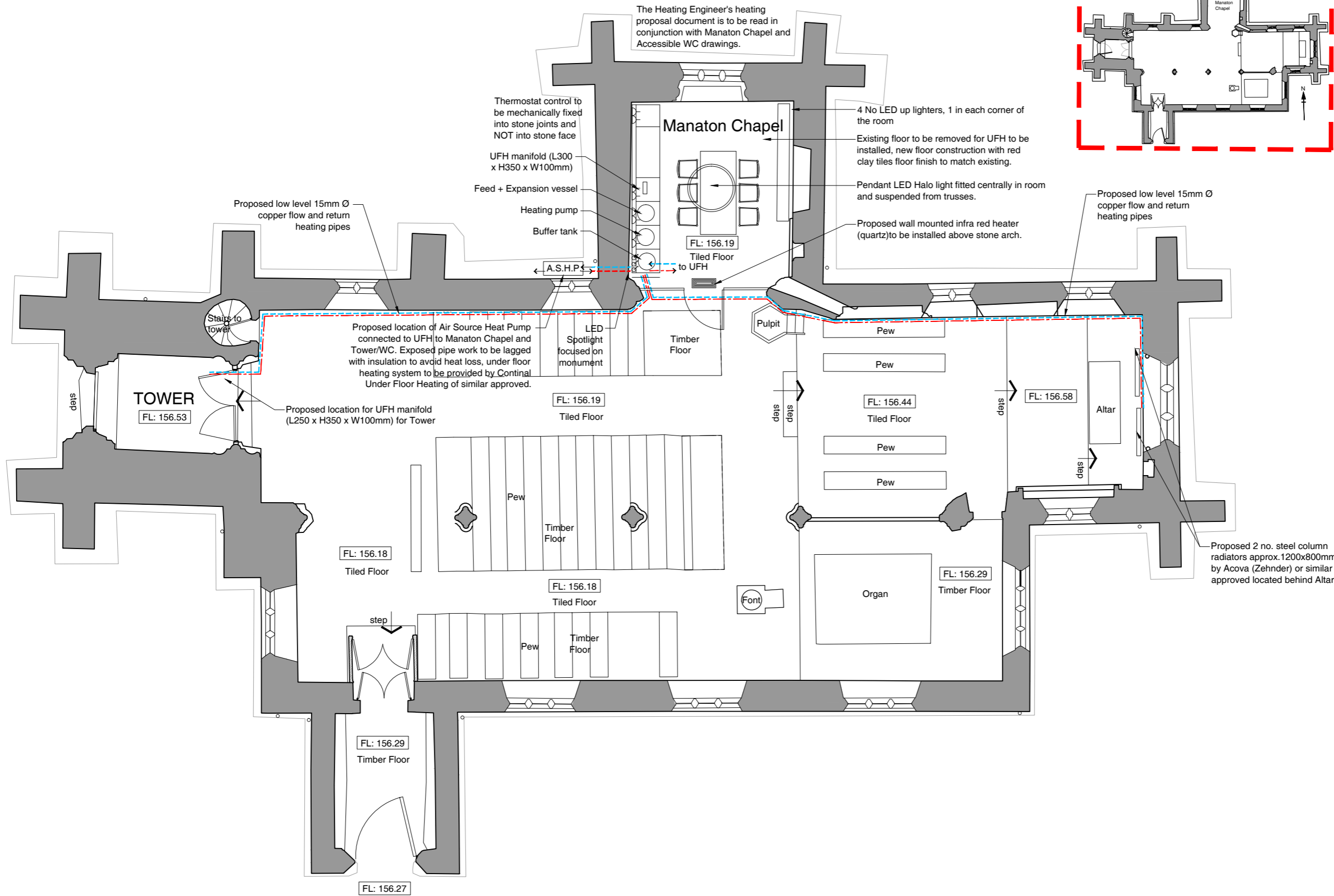
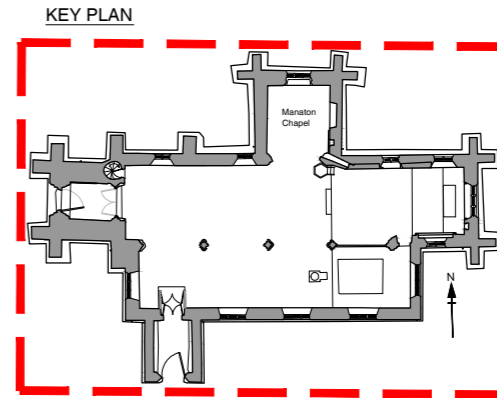
**02 Proposed North Elevation**  
 Scale 1:50

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Client  
**St Sampson PCC**

Project Name  
**St Sampson Church, Re-Order**  
 Acces.WC, Kitchenette, Screen, Chapel  
 Drawing  
**Proposed Heating & Lighting Plan**

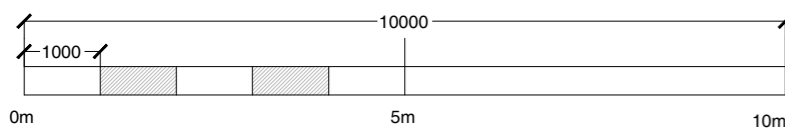
Scale  
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Drawn by  
 ST  
 Date  
 Jan 2021  
 Checked by  
 ALP  
 Date  
 Jan 2021

Project No. Drawing No Revision

**J20.029 SS.MC AB.51 C**

**01 Proposed Heating & Lighting Plan**  
 Scale 1:100



# Cornwall Council

Correspondence Address: Cornwall Council Planning, PO Box 676, Threemilestone, Truro, TR1 9EQ  
Email: [planning@cornwall.gov.uk](mailto:planning@cornwall.gov.uk)  
Tel: 0300 1234151  
Web: [www.cornwall.gov.uk](http://www.cornwall.gov.uk)



**Application number:** PA22/10123

**Agent:**  
Mr Grant Elliott  
Le Page Architects Ltd  
Plumer House  
Tailyour Road  
Plymouth  
PL6 5DH

**Applicant:**  
Mrs Miranda Lawrence-Owen  
Pillarsalders  
Trevigro  
Callington  
PL17 7JS  
United Kingdom

**Town And Country Planning Act 1990 (As Amended)**  
**Town And Country Planning (Development Management Procedure) (England)**  
**Order 2015**

## Grant of Conditional Planning Permission

**CORNWALL COUNCIL**, being the Local Planning Authority, **HEREBY GRANTS CONDITIONAL PERMISSION**, subject to the conditions set out on the attached schedule, for the development proposed in the following application received on 11 November 2022 and accompanying plan(s):

**Description of Development:** Installation of air source heat pump  
**Location of Development:** St Sampsons Church South Hill Callington Cornwall PL17 7LP  
**Parish:** South Hill

**YOUR ATTENTION IS DRAWN TO THE ATTACHED NOTES.**

**DATED: 18 January 2023**

*Louise Wood* - Service Director Planning and Housing (Chief Planner Officer)

ACFULZ

## Conservation of Habitats and Species Regulations 2017 (as amended)

### LICENCE – Mitigation

**This licence authorises acts that would otherwise be offences under the above legislation**

Any request for information in this licence will be considered under the Freedom of Information Act 2000 as appropriate.

Wildlife Licensing Service  
Natural England  
Horizon House  
Deanery Road  
Bristol  
BS1 5AH  
Tel: 0208 026 1089  
Email: [wildlife@naturalengland.org.uk](mailto:wildlife@naturalengland.org.uk)

**Licence number:** 2021-54322-EPS-MIT-1

Under the Conservation of Habitats and Species Regulations 2017 (as amended) Natural England has granted this licence for Bat for the purpose of:

**Imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment under section 55(2)(e)**

Name (in full)	Mrs Judith Ayers
Address	Southview Barn 83 Launceston Road Callington Cornwall PL17 8DS
Project description:	Licensable activities associated with development works consented under reference number 2020-055036 & 2020-051504.

**Between the dates of:** 07/04/2022 **and** 01/10/2027

**inclusive, subject to the conditions specified.**

**At locations:**

Site/Location Name	County	OS Grid Reference
St Sampson's Church	Cornwall	SX329726

WML-L13 (02/2022)

Natural England Ref: 2021-54322-EPS-MIT-1



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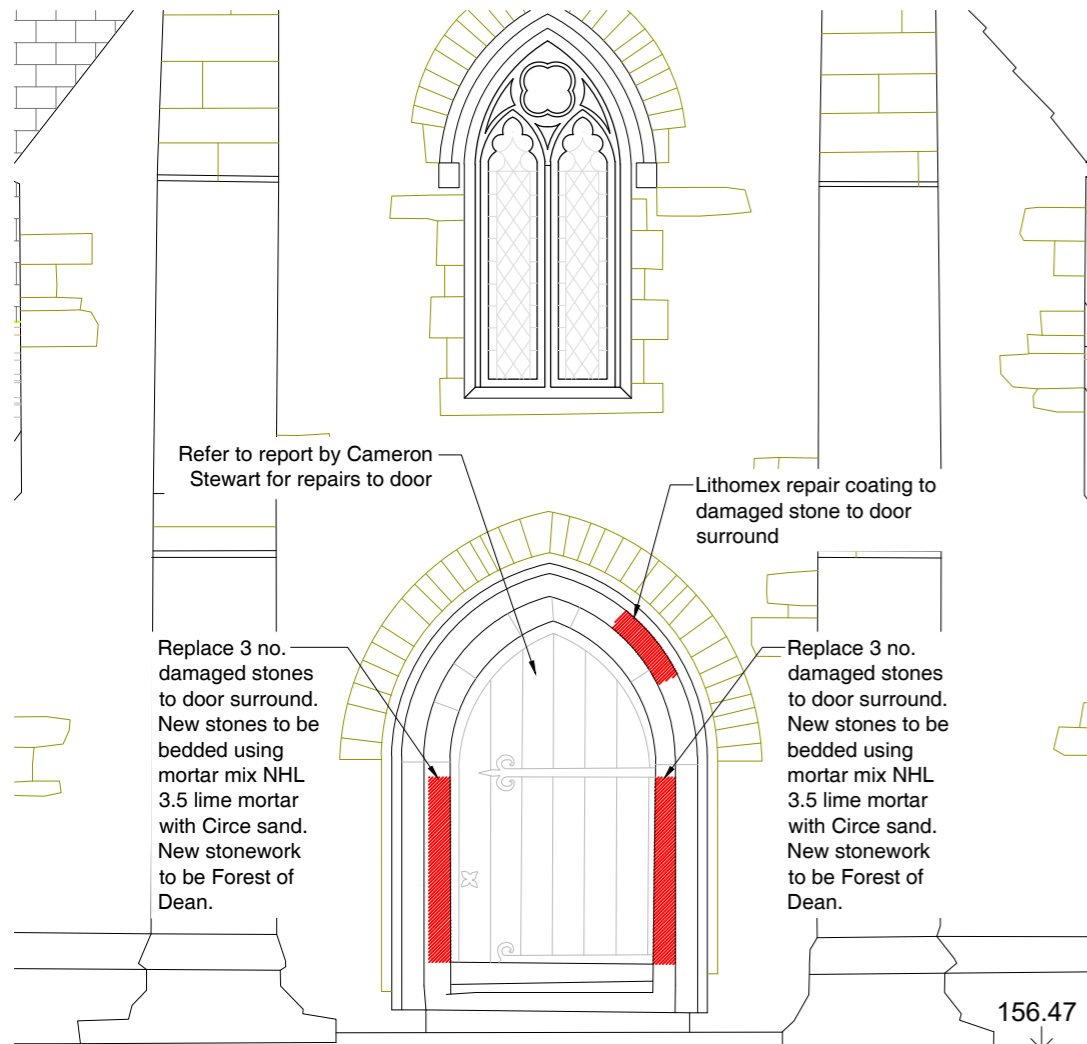
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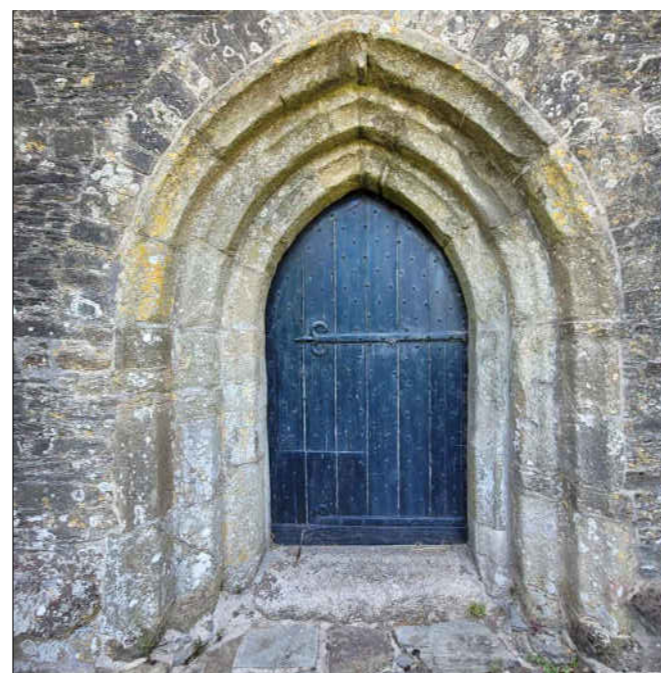
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Rev	Date	Revision	By	Chk
-	15.09.22	First issue following site survey	ST	GE

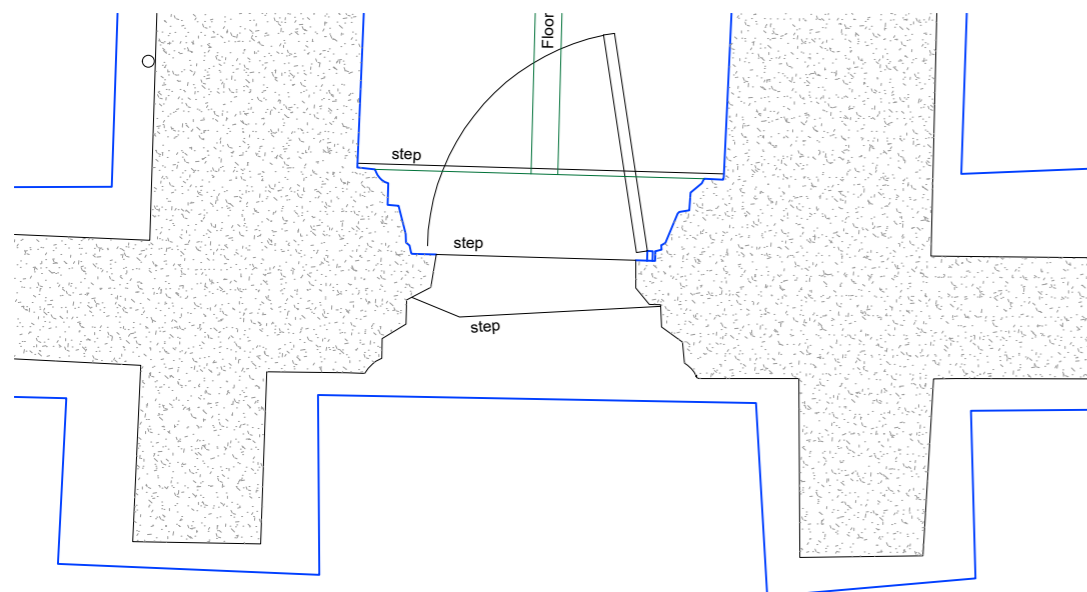
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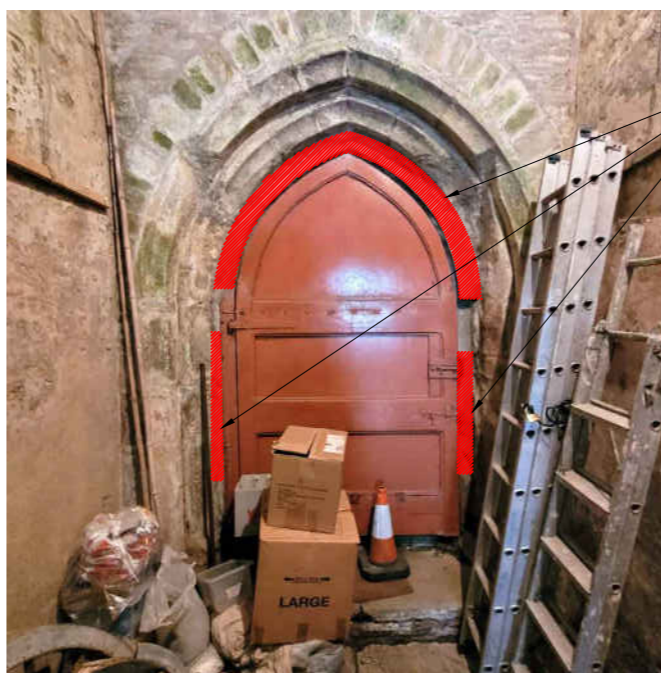
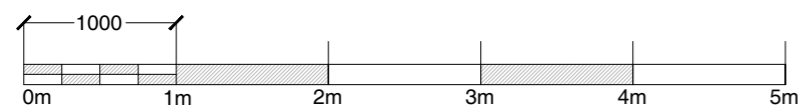
**01 Existing External West Door Elevation**  
Scale 1:50



**03 Existing External West Door Image**  
Scale 1:50



**02 Existing External West Door Plan**  
Scale 1:50



Remove cement render hoodmould. Replace with lime mortar hoodmould built out from stainless steel mesh screwed back to stonework with stainless steel screws. Finish with Lithomex repair coating.

**04 Existing Internal West Door Elevation**  
Scale 1:50

**Le Page Architects**

Le Page Architects Limited  
Plumer House  
Tailyour Road  
Crownhill  
Plymouth  
PL6 5DH  
Tel: +44 (0)1752 849 880

Email: [enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)  
Web: <http://www.lepagearchitects.com>

Client

St Sampson PCC

Project Name  
St Sampson Church Re-Ordering  
Accessible WC, Timber Screen, Kitchenette  
Drawing  
West Door and Stone Arch Refurbishment  
Plan, Elevations & Images

Scale 1:50 @ A3

Drawn by MS Date August 2022  
Checked by GE August 2022

Project No. Drawing No Revision

J20.038 SS.WD.AB300 -

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Rev	Date	Revision	By	Chk
A	22/08/22	For Comment	MS	GE

Notes

**For Comment**

**Le Page Architects**

Le Page Architects Limited  
 Plumer House  
 Tailour Road  
 Crownhill  
 Plymouth  
 PL6 5DH  
 Tel: +44 (0)1752 849 880

Email: enquiries@lepagearchitects.com  
 Web: http://www.lepagearchitects.com

Client

St Sampson PCC

Project Name  
 St Sampson Church, Re-Order  
 Accessible.WC, Kitchenette, Screen, Chapel

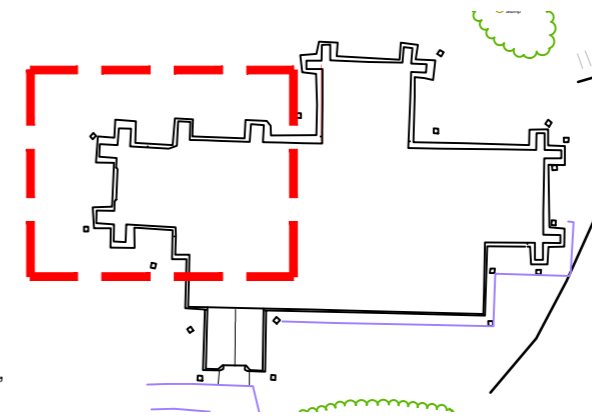
Drawing  
 Proposed Drainage Layout Plan  
 Kitchenette and WC

Scale  
 1:50 @ A3

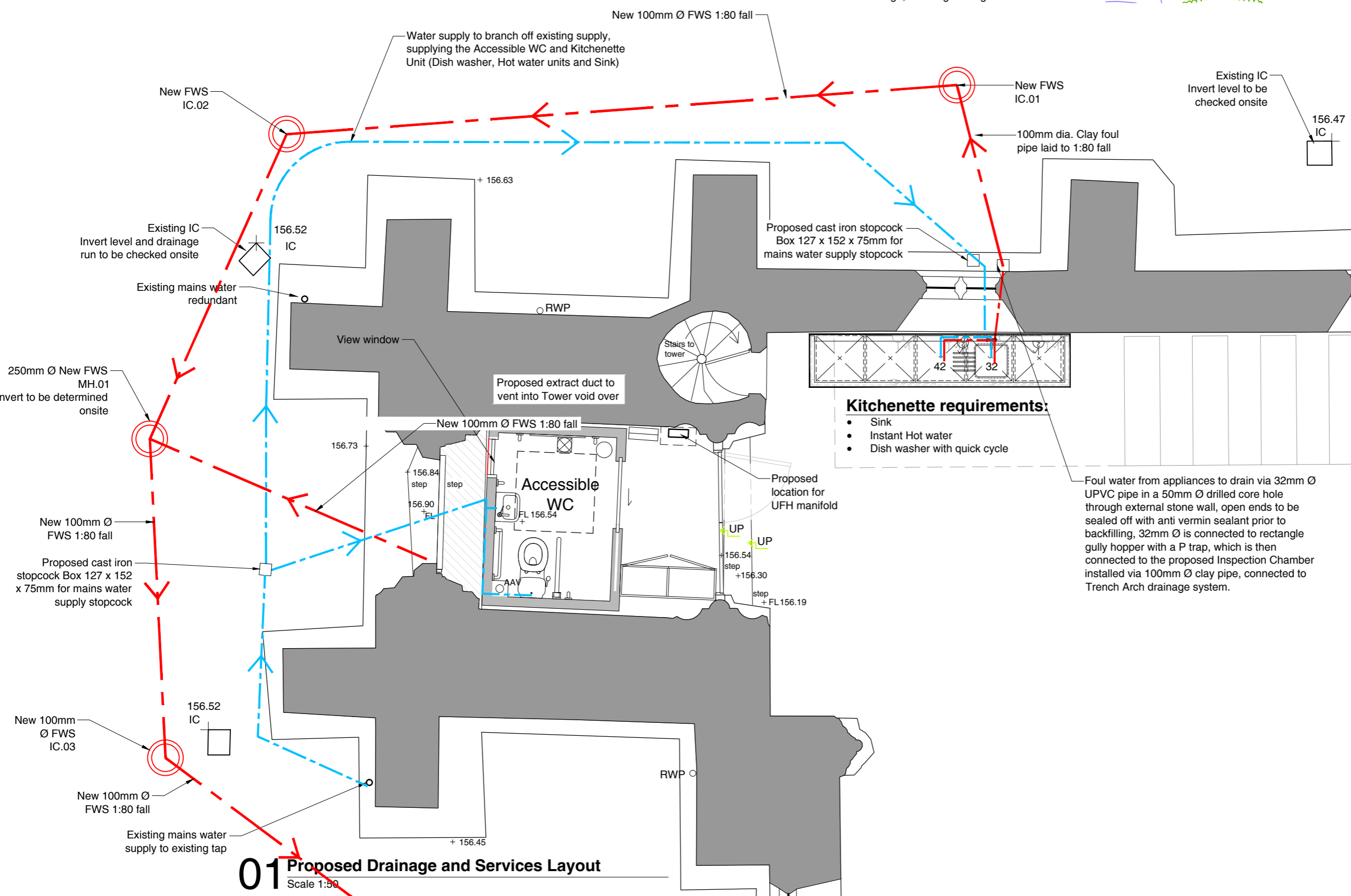
Drawn by  
 MS  
 Date  
 August 2022  
 Checked by  
 GE  
 August 2022

Project No. Drawing No Revision

J20.038 SS.D AB.02 A



Proposed bedding and backfilling is to comply with Building Regulations, Approved Document Part H1, Section 2: Foul Drainage, referring to Diagram 10.



**01 Proposed Drainage and Services Layout**  
 Scale 1:50

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Rev	Date	Revision	By	Chk
A	22/08/22	For Comment	MS	GE

Notes

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Le Page Architects Limited  
Plumer House  
Tailyour Road  
Crownhill  
Plymouth  
PL6 5DH  
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Client

St Sampson PCC

Project Name  
St Sampson Church, Re-Order  
Accessible WC, Kitchenette, Screen, Chapel

Drawing  
Proposed Drainage Layout Plan  
Trench Arch Foul Drainage System

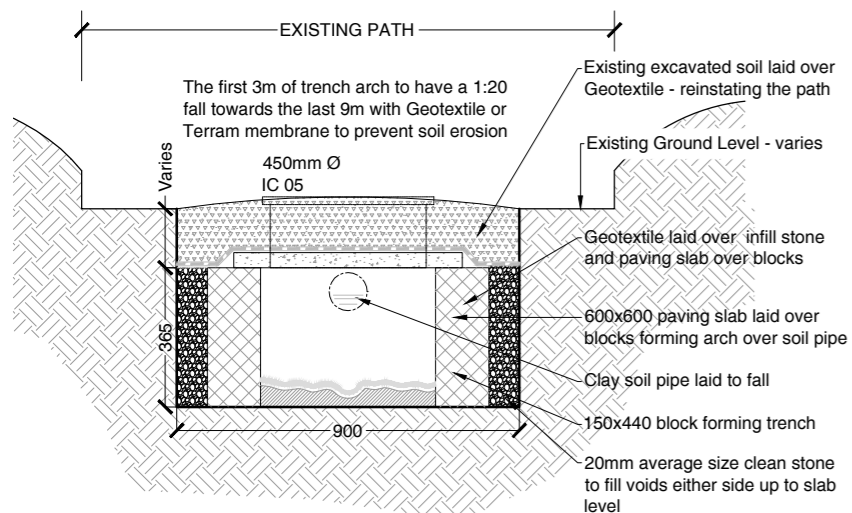
Scale  
1:200 @ A3

Drawn by  
MS  
Date  
August 2022

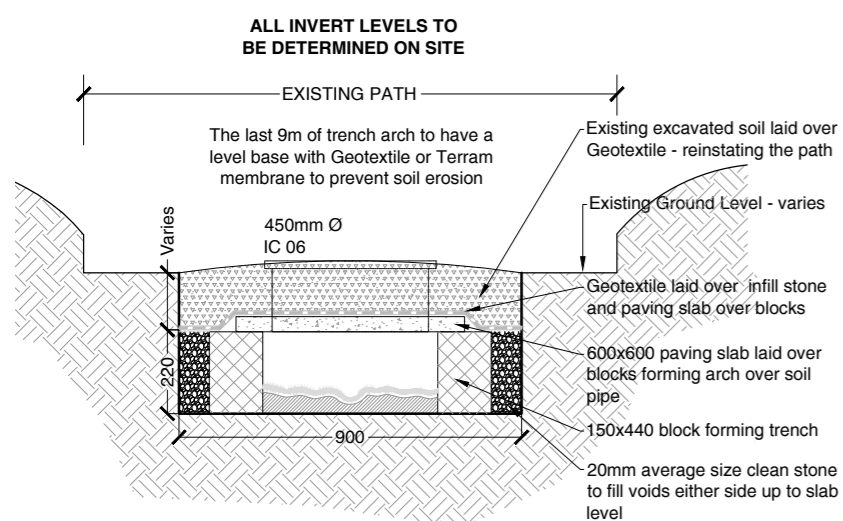
Checked by  
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Date  
August 2022

Project No. Drawing No Revision

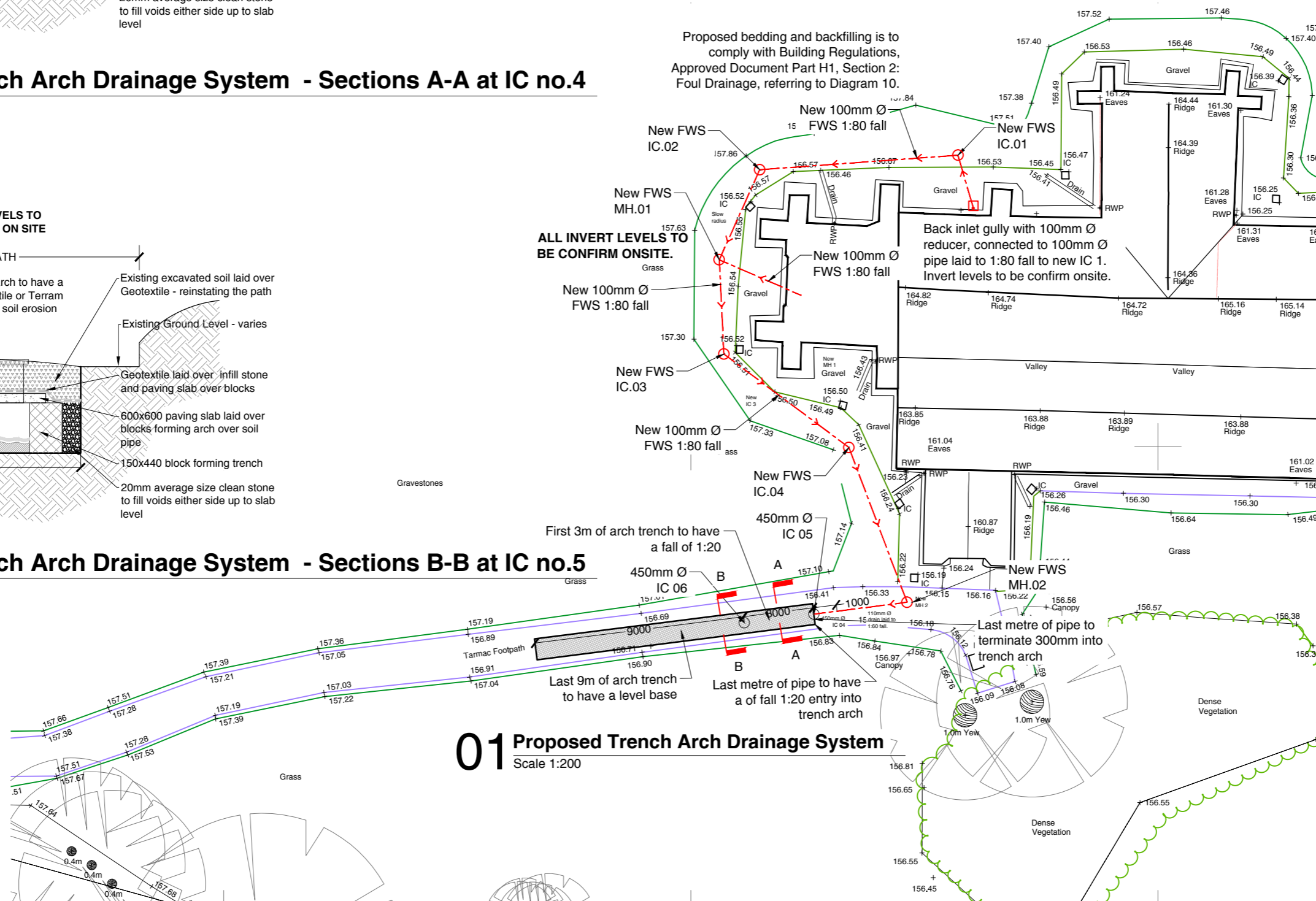
J20.038 SS.D AB.01 A



**02 Typical Trench Arch Drainage System - Sections A-A at IC no.4**  
Scale 1:20

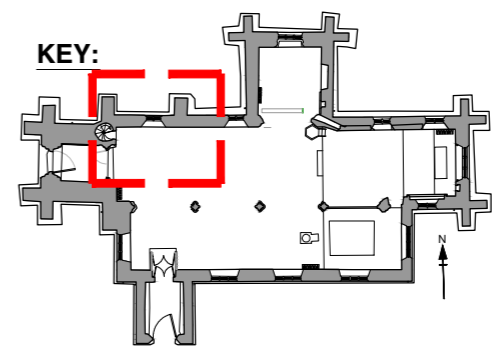
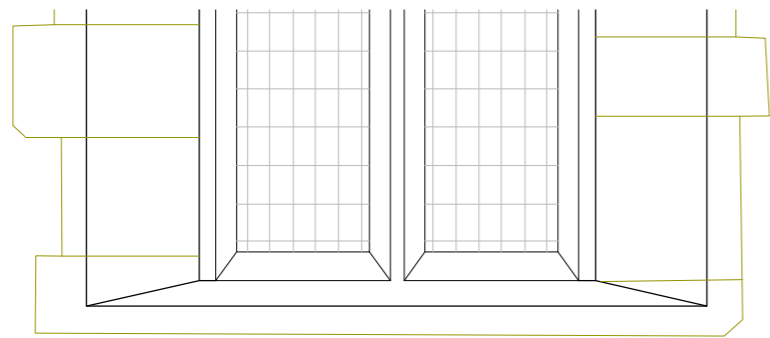


**03 Typical Trench Arch Drainage System - Sections B-B at IC no.5**  
Scale 1:20



**01 Proposed Trench Arch Drainage System**  
Scale 1:200





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Rev	Date	Revision	By	Chk
A	00/00/00	Informal Advice Issue	MS	ALP
B	22/08/22	For Comment	MS	GE

Notes

Joinery:

Joiner to provide shop drawings for CA approval prior to fabrication.

**For Comment**

**Le Page Architects**

Le Page Architects Limited  
Plumer House  
Tailyour Road  
Crownhill  
Plymouth  
PL6 5DH  
Tel: +44 (0)1752 849 880

Email: [enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)  
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Client

St Sampson PCC

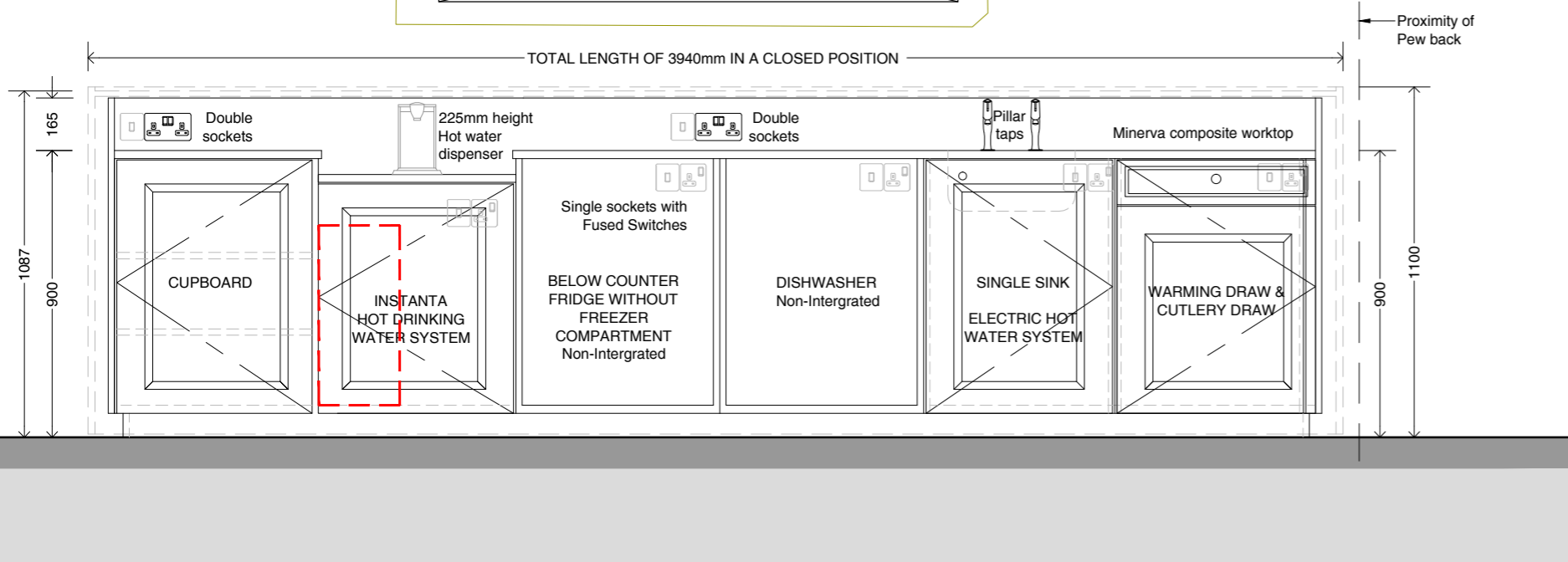
Project Name  
St Sampson Church Re-Ordering  
Acces.WC, Screen, Kitchenette, Chapel  
Drawing  
Proposed Hideaway Kitchenette  
Proposed Elevations

Scale 1:20 @ A3

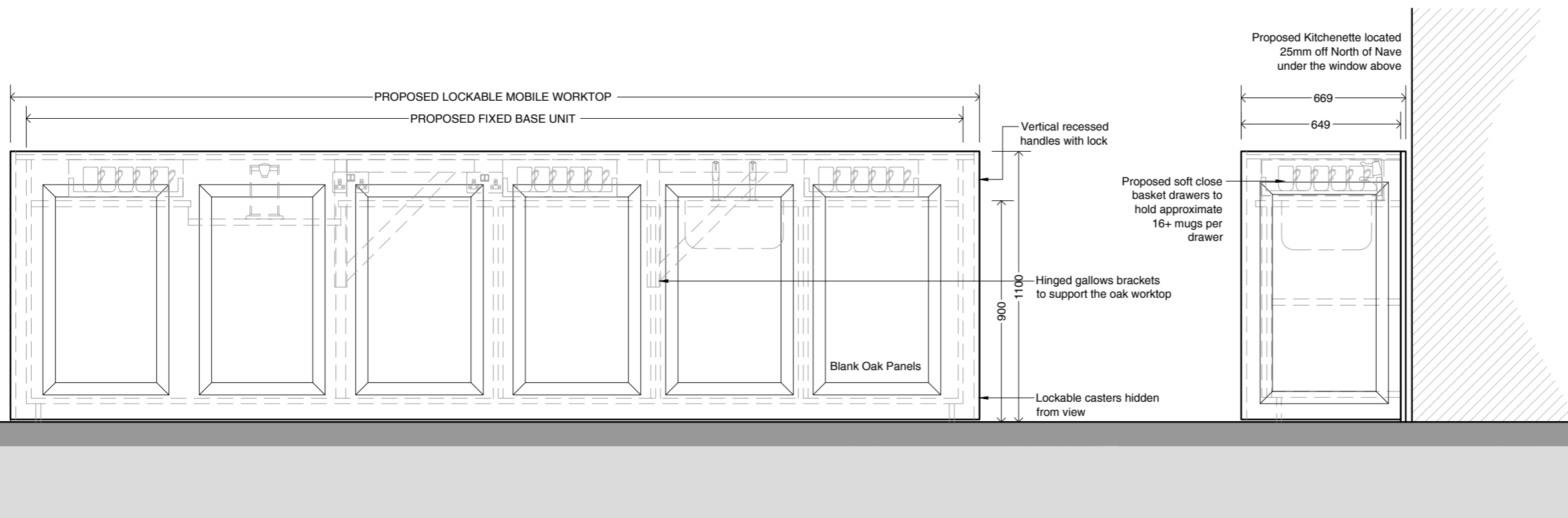
Drawn by MS Date August 2022  
Checked by GE August 2022

Project No. Drawing No Revision

J20.038 SS.K AB101 B



**01 Proposed Hideaway Kitchenette in Elevation**  
Scale 1:20



**02 Proposed Hideaway Kitchenette Elevation in Closed Position**  
Scale 1:20

**03 Proposed Hideaway Kitchenette Side Elevation**  
Scale 1:20

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A	00/00/00	Informal Advice Issue	MS	ALP
B	22/08/22	For Comment	MS	GE

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Le Page Architects Limited  
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 Tailour Road  
 Crownhill  
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Client

St Sampson PCC

Project Name

St Sampson Church Re-Ordering  
 Acces.WC, Screen, Kitchenette, Chapel

Drawing

Proposed Timber and Glazed Screen  
 Existing and Proposed Elevations

Scale

1:50 @ A3

Drawn by

Date

MS

August 2022

Checked by

August 2022

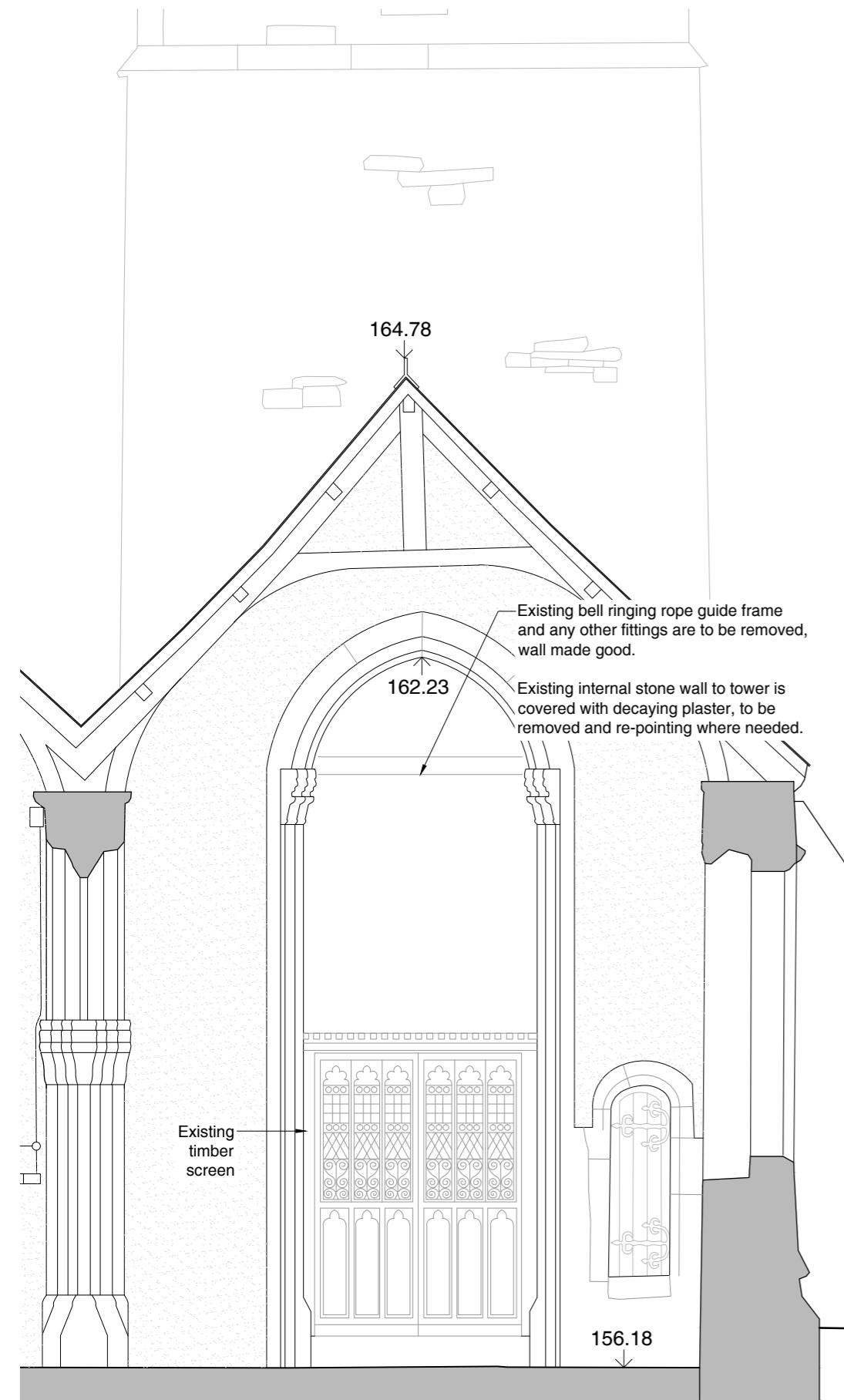
GE

Project No.

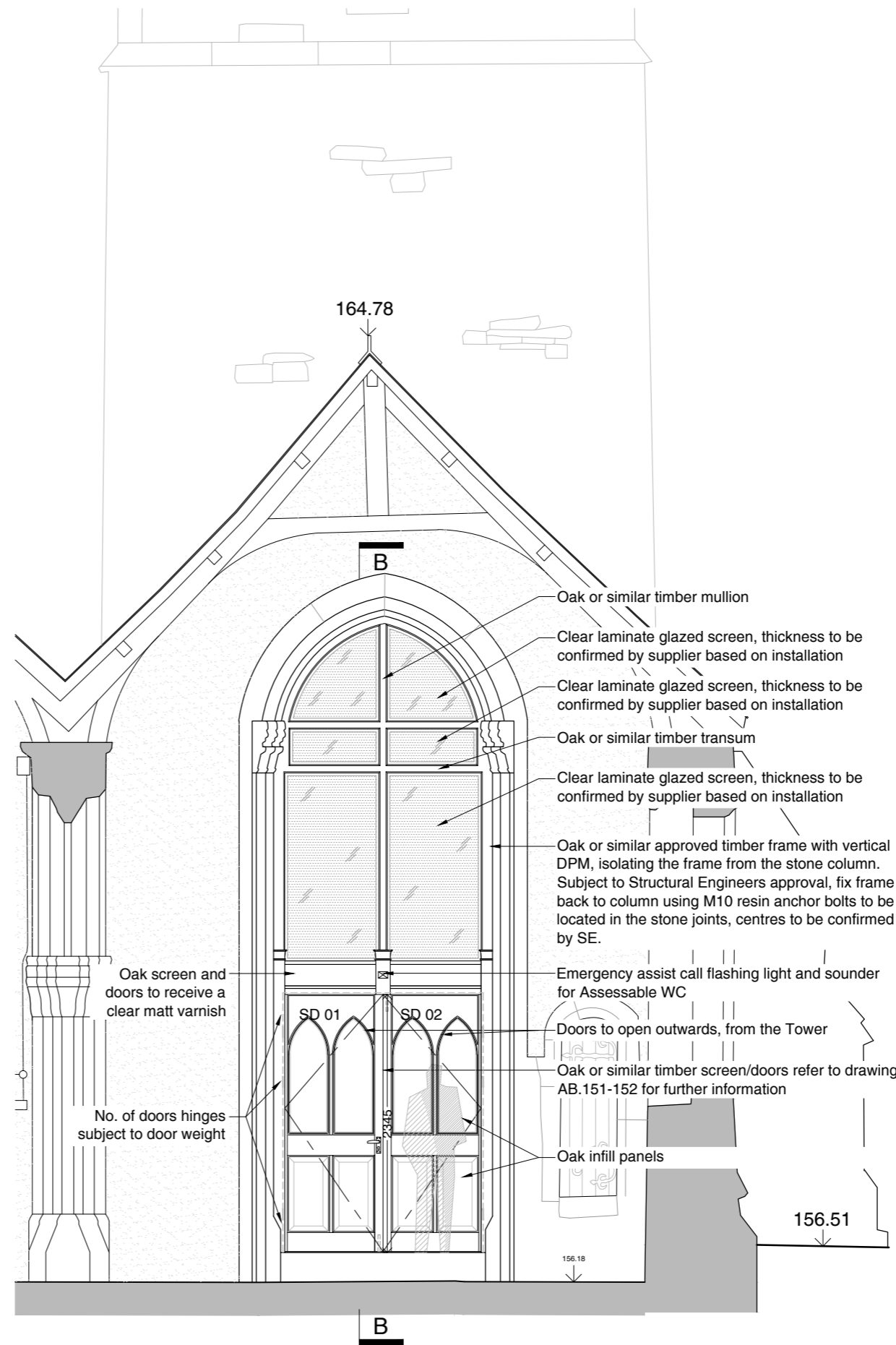
Drawing No

Revision

J20.038 SS.TS AB150 B



**01 Existing Timber-Glass Screen**  
 Scale 1:50



**02 Proposed Glazed and Timber Screen**  
 Scale 1:50

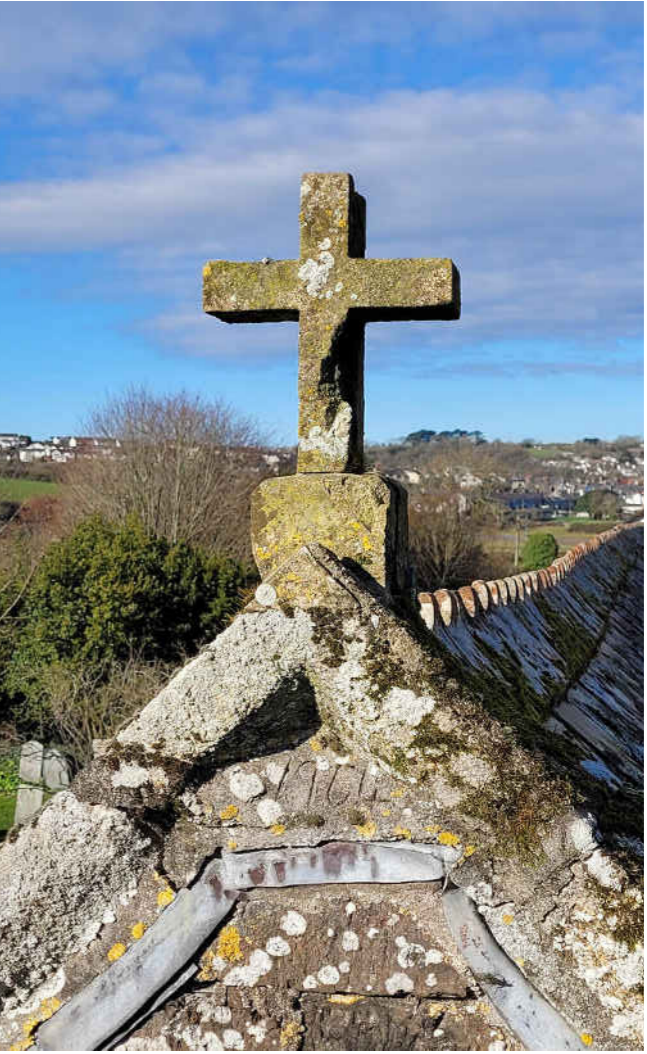
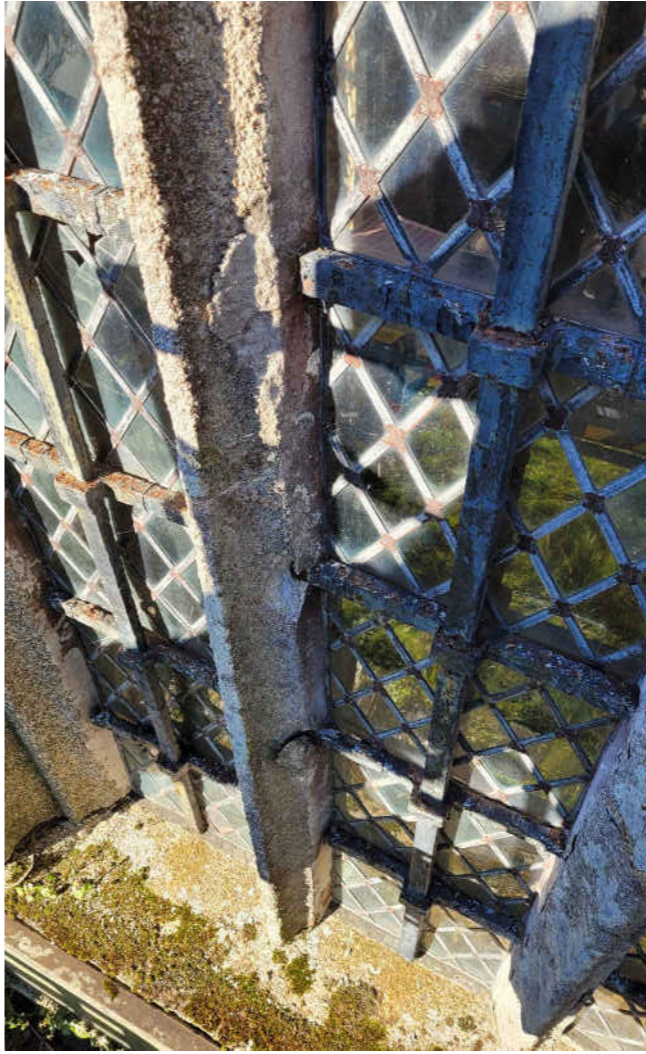
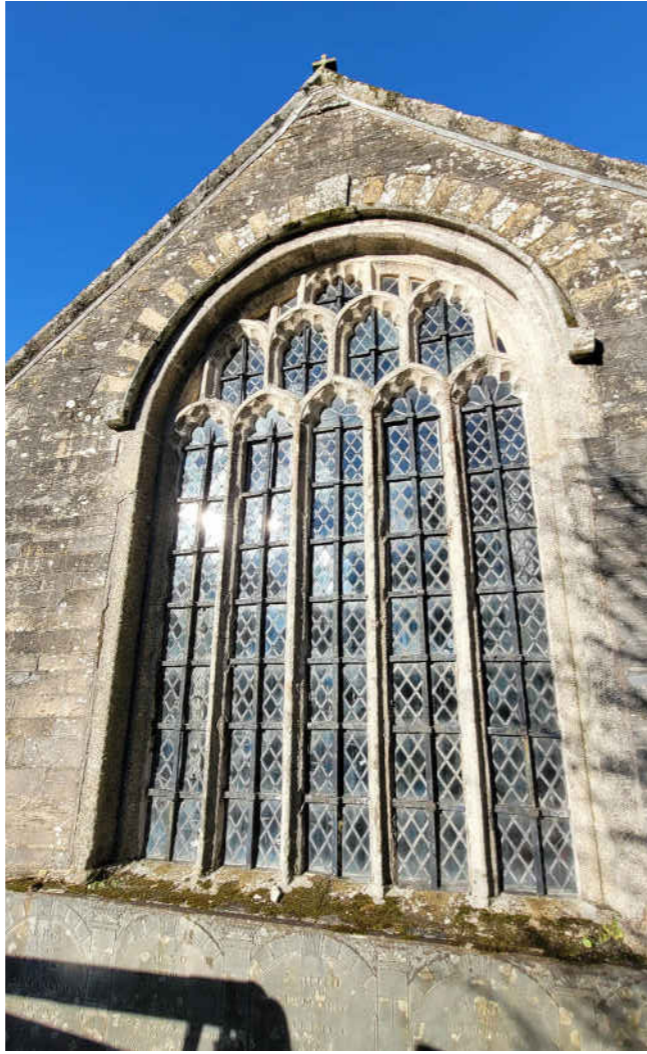
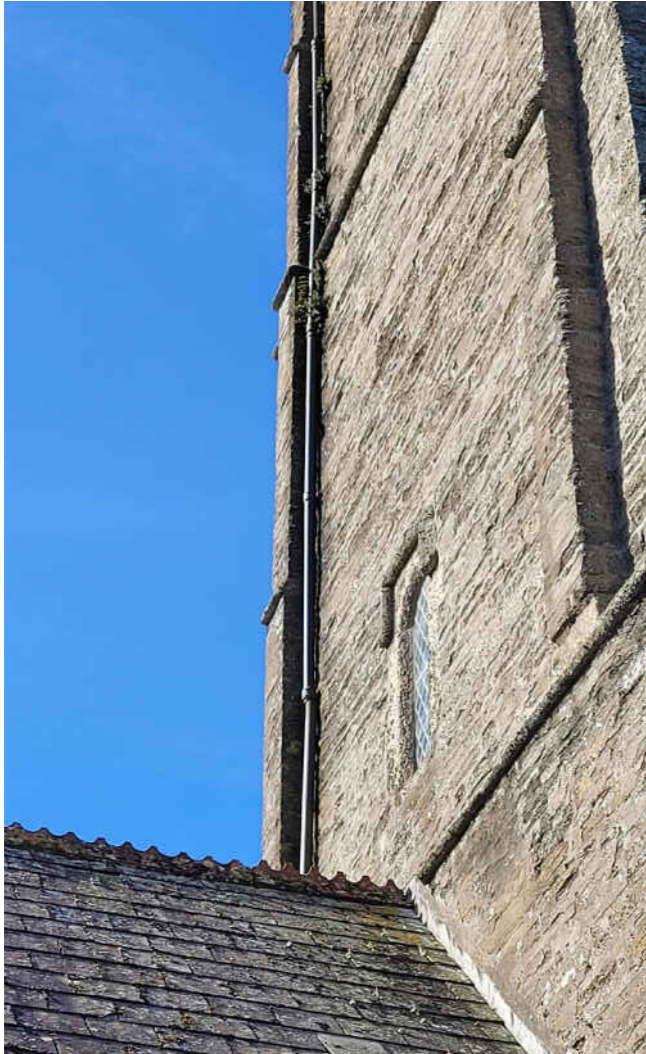
## Case Study 2, St Petroc, Egloshayle



St Petroc, Egloshayle

**Le Page Architects**

St Petroc, Repairs



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Rev	Date	Revision	By	Chk
A	28/03/23	Updated following site visit	GE	ST
B	05/04/23	Notes updated	GE	ST

Notes

### Le Page Architects

Le Page Architects Limited  
Plumer House  
Tailyour Road  
Crownhill  
Plymouth  
PL6 5DH  
Tel: +44 (0)1752 849 880

Email: [enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)  
Web: <http://www.lepagearchitects.com>

Client

St Petroc PCC

Project Name  
St Petroc, Egloshayle

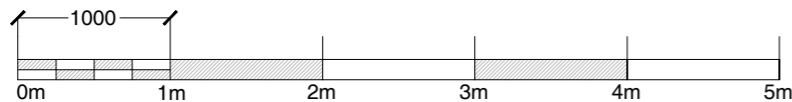
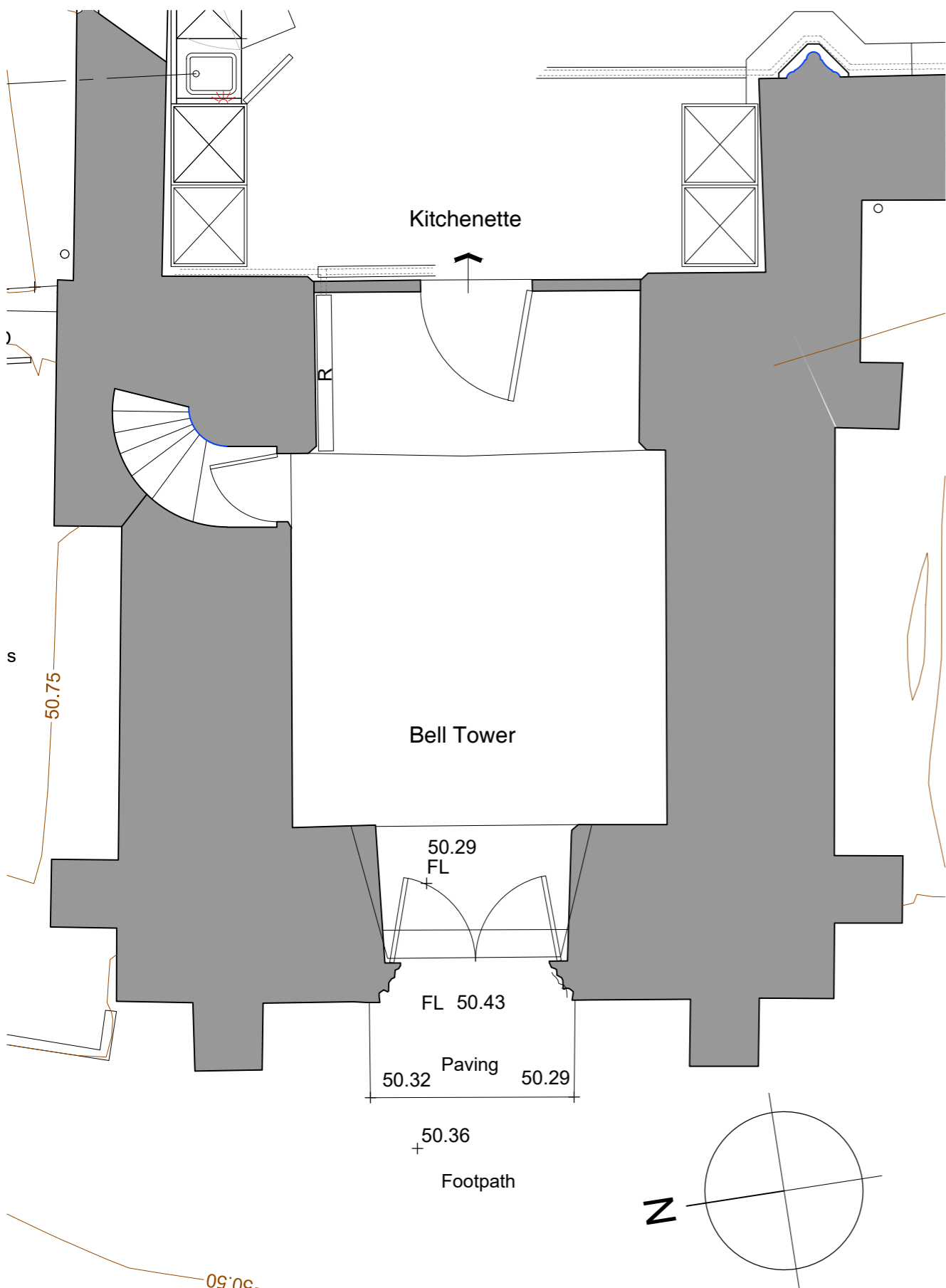
Drawing  
West Door Stonework Repairs  
Plan & Images

Scale 1:50 @ A3

Drawn by GE Date March 2023  
Checked by SC March 2023

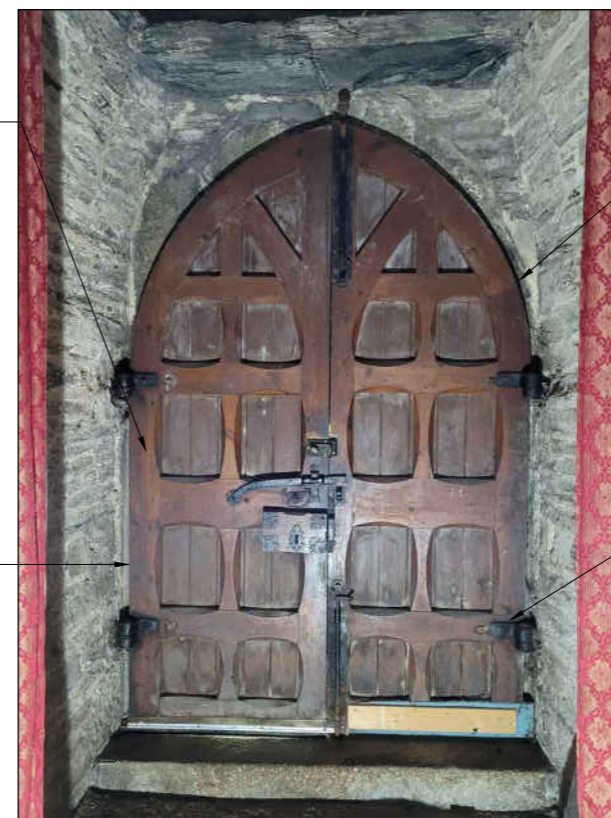
Project No. Drawing No Revision

J22.006 AB01 B



Dislodged stone behind door leaf to be pushed back in place and secured with stainless steel dowel pin repair

Existing dress stonework surround - Cataclews stone



Rake out all cement mortar pointing and repoint with Cornerstone Drymix mortar mix, 3:1, NHL 2.5 and CLD 28 coarse

Stainless steel dowel pin repair to cracked stone behind door leaf

**02 West Door Existing Internal Elevation**  
Scale 1:50

Stainless steel dowel pin repair to cracked stone

Surface repair to damaged stonework with Saint Astier St.One surface repair mortar, colour matched in accordance with data sheet

Grout repair to fine crack to figurehead with Saint Astier St. One surface repair mortar, colour matched in accordance with data sheet

Surface repair to damaged stonework with Saint Astier St.One surface repair mortar, colour matched in accordance with data sheet

Stainless steel dowel pin repair to cracked stone



Surface repair to damaged stonework with Saint Astier St.One surface repair mortar, colour matched in accordance with data sheet

Existing dress stonework surround - Cataclews stone

Dislodged stone to be pushed back in place and secured with stainless steel dowel pin repair

Rake out all cement mortar pointing and repoint with Cornerstone Drymix mortar mix, 3:1, NHL 2.5 and CLD 28 coarse

**03 West Door Existing External Elevation**  
Scale 1:50

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Rev	Date	Revision	By	Chk
-	00/00/00	Text	-	-

Notes

### Le Page Architects

Le Page Architects Limited  
 Plumer House  
 Tailour Road  
 Crownhill  
 Plymouth  
 PL6 5DH  
 Tel: +44 (0)1752 849 880

Email: [enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)  
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Client  
 St Petroc's, Egloshayle

Project Name  
 St Petroc's Egloshayle  
 Proposed Internal re-ordering  
 Drawing  
 Existing Floor Plan

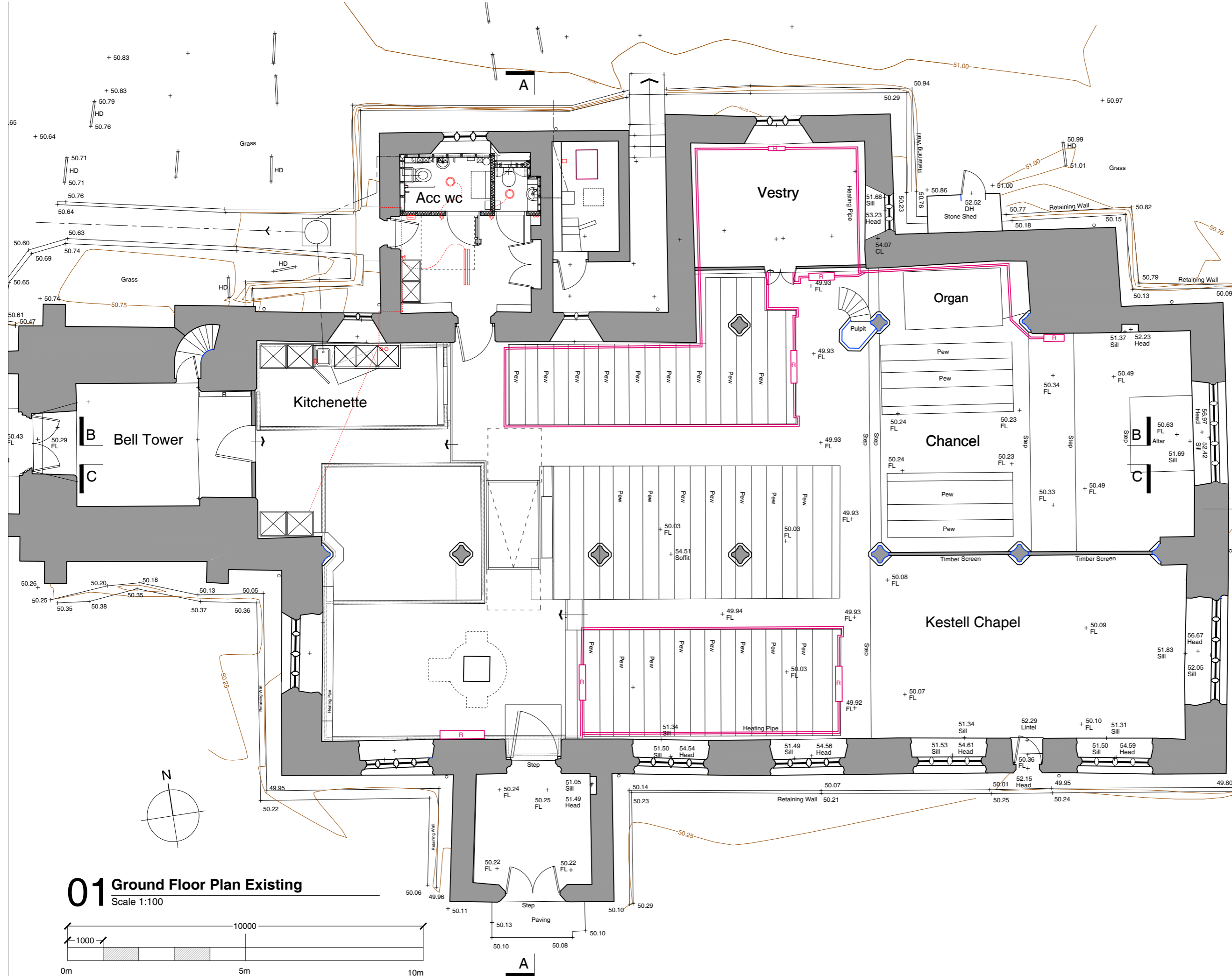
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Drawn by  
 JP Eng/ST  
 Date  
 March 2022

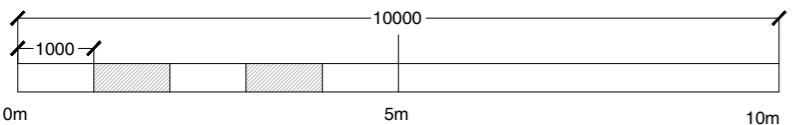
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 CS  
 Date  
 March 2022

Project No. Drawing No Revision

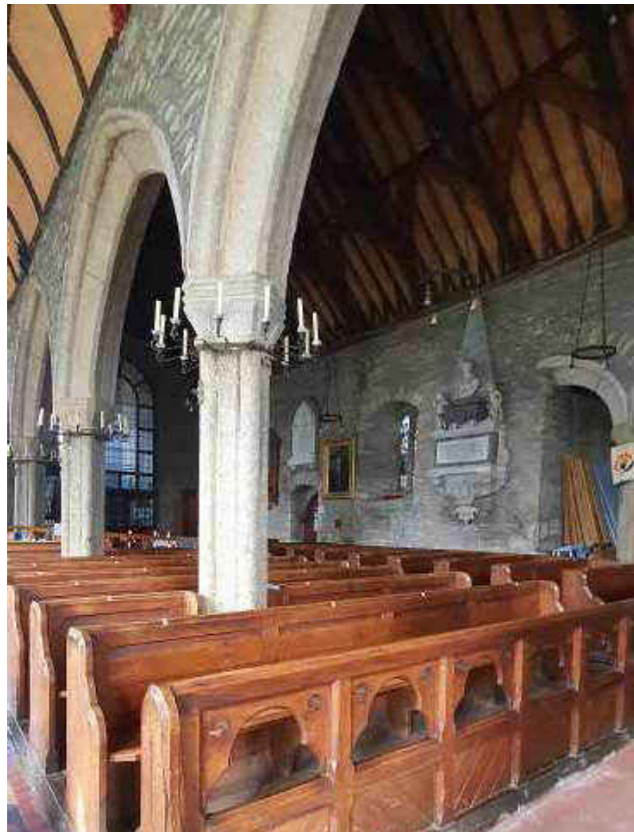
J21.039 AS.01 -



**01** Ground Floor Plan Existing  
 Scale 1:100



Site Photos



## **St Petroc, ReOrdering**

### **Brief**

- A dedicated worship space and an area for quiet prayer.
- A café / kitchen area
- A warm, environmentally sustainable church
- A church which can be used for a variety of uses by different sectors of the community
- A church that is welcoming, attractive and flexible to use

### **Proposals**

- A new kitchen will be provided in the tower to provide a bigger, spacious area easily located away. This also expands the catering capacity.
- The existing door and window panel to the tower will be retained and converted to bi-fold doors. This gives the option of opening up the kitchen.
- The Ringing Chamber will be relocated to a mezzanine level above the kitchen. A platform lift will be provided to the mezzanine level.
- Raising the internal floor level throughout the church. This will provide space to install under floor heating with minimal excavation. Where floor levels are raised, existing floor finishes such as polychromatic floor tiling will be carefully removed and relaid to the new floor level.
- The church is made more accessible by providing level access throughout. Level access is provided from the Porch into the church and continues through to the Vestry, Chancel and Kestell Chapel. An access ramp is also provided from the North Aisle to the accessible toilet.
- The vestry screen is relocated to enlarge the Vestry which will be used as a Parish Office



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Rev	Date	Revision	By	Chk
-	00/00/00	Text	-	-

Notes

### Le Page Architects

Le Page Architects Limited  
 Plumer House  
 Tailour Road  
 Crownhill  
 Plymouth  
 PL6 5DH  
 Tel: +44 (0)1752 849 880

Email: [enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)  
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Client  
 St Petroc's, Egloshayle

Project Name  
 St Petroc's Egloshayle  
 Proposed Internal re-ordering  
 Drawing  
 Existing Floor Plan

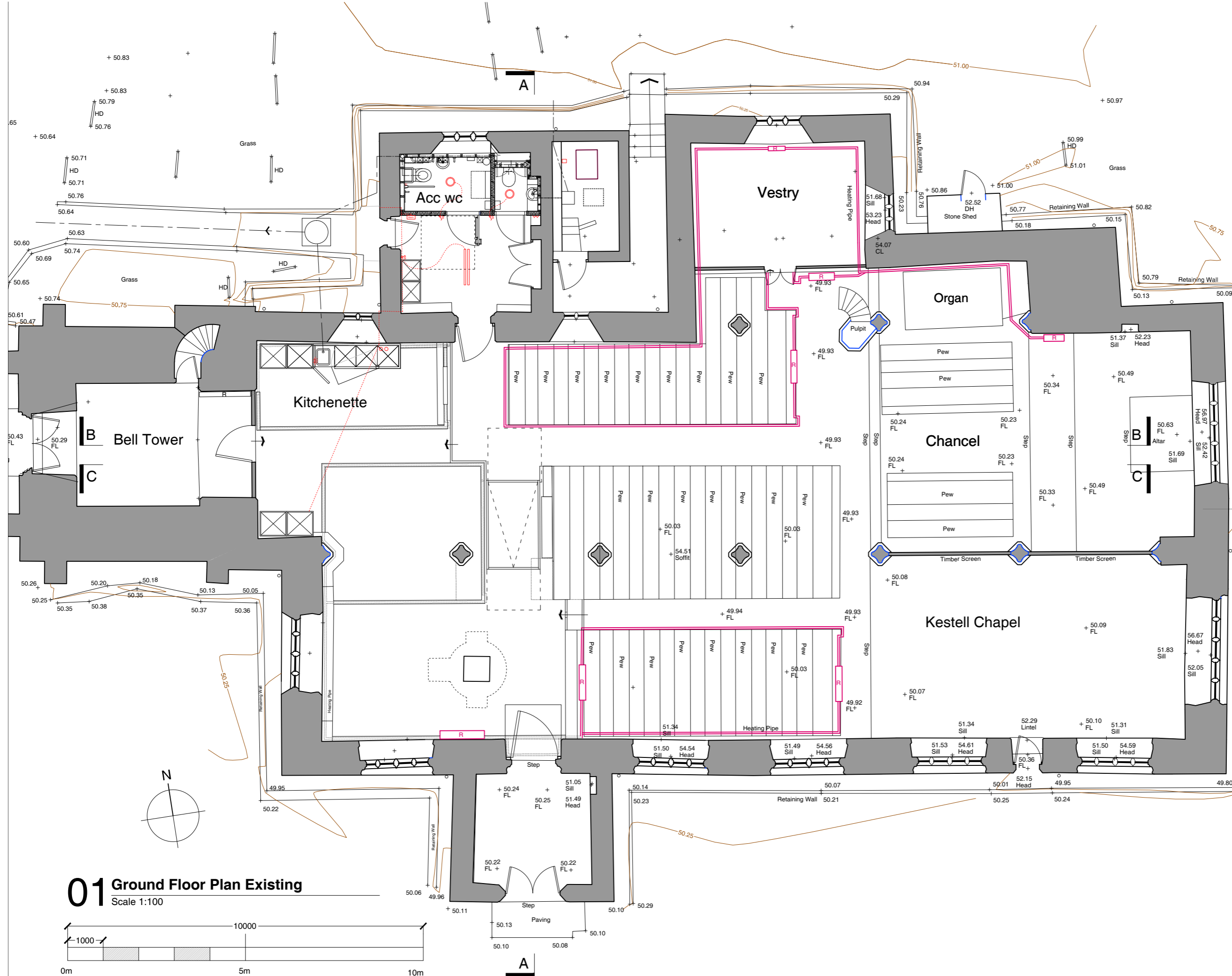
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Drawn by  
 JP Eng/ST  
 Date  
 March 2022

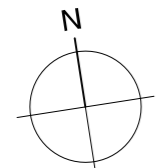
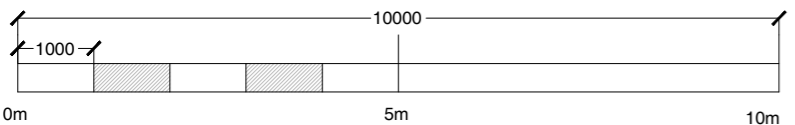
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 CS  
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 March 2022

Project No. Drawing No Revision

J21.039 AS.01 -



**01** Ground Floor Plan Existing  
 Scale 1:100



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Rev	Date	Revision	By	Chk
-	12/08/22	Preliminary Issue	ST	GE
A	26.09.22	Preliminary Issue	ST	GE
B	07.10.22	Updated to suit heating requirements	GE	ST
C	20.10.22	Plant Room Updated	GE	SC

Notes

Key:  
 - - - - - demolition/ relocation

### Le Page Architects

Le Page Architects Limited  
 Plumer House  
 Tailyour Road  
 Crownhill  
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 PL6 5DH  
 Tel: +44 (0)1752 849 880

Email: enquiries@lepagearchitects.com  
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Client  
**St Petroc's PCC**

Project Name  
**St Petroc's Egloshayle**  
**Internal re-ordering**

Drawing  
**Proposed Floor Plans**  
**Option 5**

Scale  
 1:100 @ A3

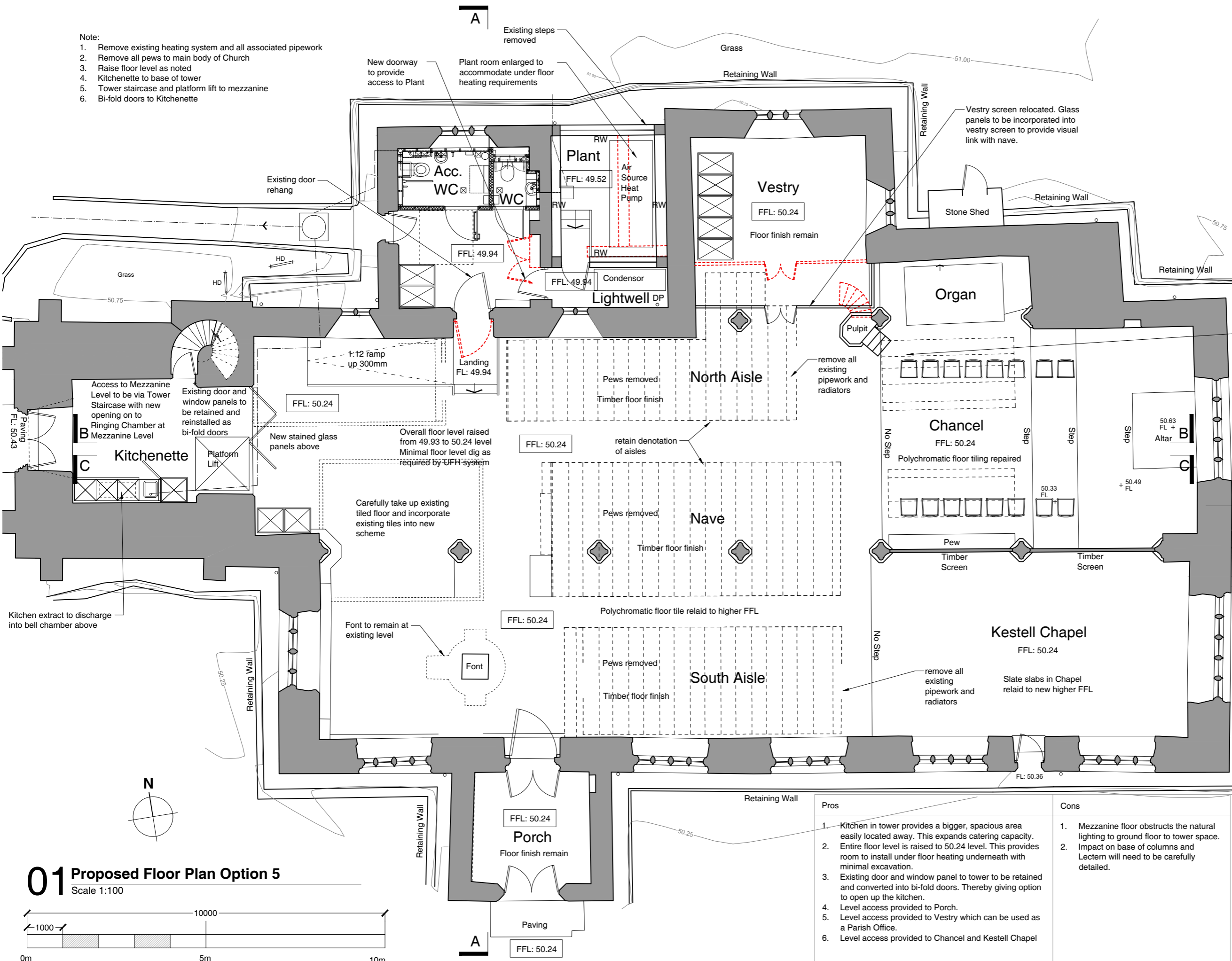
Drawn by  
 GE  
 Date  
 12.08.22

Checked by  
 ST  
 22.08.22

Project No. Drawing No Revision

**J21.039 SK05.01 C**

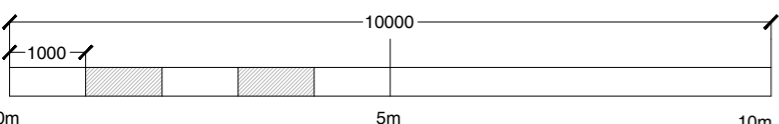
- Note:
1. Remove existing heating system and all associated pipework
  2. Remove all pews to main body of Church
  3. Raise floor level as noted
  4. Kitchenette to base of tower
  5. Tower staircase and platform lift to mezzanine
  6. Bi-fold doors to Kitchenette



Pros	Cons
<ol style="list-style-type: none"> <li>1. Kitchen in tower provides a bigger, spacious area easily located away. This expands catering capacity.</li> <li>2. Entire floor level is raised to 50.24 level. This provides room to install under floor heating underneath with minimal excavation.</li> <li>3. Existing door and window panel to tower to be retained and converted into bi-fold doors. Thereby giving option to open up the kitchen.</li> <li>4. Level access provided to Porch.</li> <li>5. Level access provided to Vestry which can be used as a Parish Office.</li> <li>6. Level access provided to Chancel and Kestell Chapel</li> </ol>	<ol style="list-style-type: none"> <li>1. Mezzanine floor obstructs the natural lighting to ground floor to tower space.</li> <li>2. Impact on base of columns and Lectern will need to be carefully detailed.</li> </ol>

## 01 Proposed Floor Plan Option 5

Scale 1:100



## **St Petroc, Interior, Heating**

### **Existing heating system**

50kW gas fired boiler in plantroom serving cast iron pipework and column radiators. Electric warm heaters to toilets and bell tower. Electric panel heaters to upgraded toilets. Gas boilers now removed.

### **Options**

1. New gas fired boiler(s) feeding two separate circuits. Traditional radiator circuit for background heating + fan convactor circuit to provide rapid warm up.
2. Underfloor heating (UFH) linked to an air source heat pump (ASHP). Would work well where floor levels are being raised. Where necessary, radiators or fan convectors can be added.
3. Combination of the two above, ie underfloor heating linked to gas boiler(s).

### **Wider Energy Use**

Most lighting is already fitted with LED lamps, with the exception of strip lights and floodlighting.

Limited small power, hot water generation and drainage pump.

## **Issues to be Considered**

Will need to review load assessment for electrical supply to accommodate the change in fuel source.

Noise, location and visual impact

Consider electric heating as part of a hybrid solution

Consider convector radiators or fan convectors for tower mezzanine and where floors levels are not being adjusted

PV panels can help reduce operational costs and associated emissions

Installation Costs

Running Costs (based on 2019 invoicing and age of boiler)

Fabric protection

Boiler Back Up

Application for formal advice with DAC and Pre App with Planning Authority

## **Summary**

For relatively low use with no fabric protection, gas fired boiler is best option from a capital and operational cost and the lowest carbon emissions.

With fabric protection, operational costs and associated emissions increase significantly for gas fired boiler but this still provides the best capital and operational costs.

UFH lined to ASHP has the highest capital and operational costs, but offers lowest carbon emissions. It will also become more sustainable over time as the Mains Electricity Grid emissions rates improve.

**Any Questions?**



## **Le Page Architects**

Plumer House  
Tailyour Road  
Plymouth  
PL6 5DH

T +44 (0)1752 849 880

F +44 (0)1752 849 880

[enquiries@lepagearchitects.com](mailto:enquiries@lepagearchitects.com)