Interim Conservation Report for the Monument to

Sir George & Lady Anne Savile

The Church of St Michael & All Angels Thornhill – Wakefield Diocese

for The Parochial Church Council

Elliott Ryder Conservation

Contents

Report Prepared by :

Kieran Elliott ACR
Elliott Ryder Conservation
Aeronfa
Pentre
Tregaron
CEREDIGION
SY25 6NF

01974 299029

August 2012

Introduction

The church of St Michael and All Angels is situated in the Parish of Thornhill, in the Diocese of Wakefield. It contains a collection of interesting monuments but it is the seventeenth century monument to Sir George and Lady Anne Savile, which forms the basis of this report.

Elliott Ryder Conservation were commissioned on behalf of the Parochial Church Council to investigate fully the current condition of the monument and associated fabric and put forward proposals and costings to ensure its long-term preservation.

An assessment of the monument was undertaken by Kieran Elliott (ACR) between 14th and 15th August 2012. Preliminary investigations had begun in March 2012 including, taking incremental drillings for specialist salt analysis, absolute moisture levels recorded using a 'Speedy Carbide' moisture meter from representative areas, with seasoned oak dowels inserted into drill holes to allow re-testing, paint samples were removed for analysis, 'Demec' studs were secured adjacent to cracks/misalignment to quantify anticipated movement and environmental monitoring equipment was installed to establish ambient conditions impacting the monument and soluble salts in particular.

Monitoring of liquid moisture in the tomb-chest, physical movement within the canopy structure and environmental conditions is on-going and will be monitored for at least twelve months (from the beginning of March 2012), however preliminary findings already point towards general trends allowing assumptions to be made.

This preliminary assessment and interpretation of results of investigations and analyses, aimed to record the current condition of the monument and inform a conservation strategy. The results are detailed herein, and should be read in conjunction with a previous report prepared by Holden Conservation Services dated June 2010.

The production of this report was made possible with kind financial assistance from the Yorkshire Historic Building Trust, the Church Buildings Council and English Heritage.

1 Brief

1.1 The churches project manager (Mr Brian Pearson) and inspecting church architect (Mr Stephen Parry of PPIY Ltd) invited Elliott Ryder Conservation to undertake the investigative works necessary to inform a conservation strategy and prepare a budget price for grant application purposes.

2 Description of the Building Adjacent to the Monument

2.1 The church is heated by means of a wet system with radiators (incorporating individual thermostats) fed by a boiler, which is approximately seven years old and regularly serviced/maintained. Pipe work is both surface mounted and within ducting around the building. The building is heated prior to services and weekly church groups during the cooler months. A frost guard setting allows the heating to come on if the temperature dips below eleven degrees.

2.2 The church appears very well maintained internally. The monument is enclosed within the arch of the stone arcading separating the choir and the north aisle to the west and east. The floor areas to the north and south of the monument are bare sandstone paving incorporating carboniferous limestone ledger slabs and geometric ceramic tiles covered with thick underlay and carpet respectively.

3 Materials

3.1 Examination shows that the monument is carved from a mixture of compact, cream-buff coloured magnesian (Dolomitic) limestone, a medium-coarse grained, micaceous sandstone with a ferruginous content, green-brown in colour and a dark-grey, carboniferous limestone. Evenly distributed ferrous minerals were noted within the sandstone.

3.2 Natural ferrous (iron) deposits are inherent within the green sandstone and are also concentrated in random isolated areas.

3.3 Other materials present over the monument include black, white, red, silver and gold paint. The heraldry does not appear to be gilded. The carboniferous limestone (outer) columns are heavily coated with a soft accretion that has the appearance and characteristics of a wax not varnish. Various phase of pointing area also visible, including plaster, lime mortar (for the fine, original joints) and isolated areas of dark-grey ciment fondue, which is concentrated on the south elevation.

3.4 Approximately 30-35 % of the monument displays fragmentary remains of a thick, now brittle coating, which consists of a white undercoat and a light-brown coloured top coat, most likely to be an oil paint. This is concentrated on the north and south elevations with the west and east return elevation largely un-treated. The main pigment present is lithopone (a combination of zinc sulphide and barium sulphate). This pigment was widely used in house paints in the middle of the twentieth century, and is still used occasionally today. *Please see the appendix for results of the coating analysis.*

4 Dimensions Overall

Height	4.87m – Floor level to upper heraldic border
Width	3.70m - Outer plinth – west to east
Depth	2.61m – North to south elevation
Arch span	2.38m
Arch/Vault depth	1.640m – Arriss to Arriss of Intrados

5 Environmental Conditions

5.1 An aged hair hygrometer sits on top of the tombchest in the north-east corner, this was checked against our digital 'Rotronic A1', temperature and relative humidity probe (which was calibrated at the beginning of the year) and was found to be reading approximately 10% too low, with RH values within that area of the church actually much higher.

5.2 A 'Tinytag Ultra' digital temperature and relative humidity probe was installed around the neck of the kneeling figure on the north elevation out of direct sunlight, and is set to record temperature and RH values on the hour every hour for the next twelve months. This will be useful with regard to RH values impacting the monument in relation to salt crystallisation and cross referring with the oak dowels embedded in the tombchest to chart the increase or decrease in moisture affecting the monument.

5.3 A pair of large tracery windows are located to the north-east and south-east elevations, with plain and coloured glass respectively. The south elevation of the monument was observed to be bathed in sunlight on sunny mornings and is likely to account for the greater extent of efflorescence observed on the south elevation.

6 Condition

6.1 Significant structural instability is clearly obvious in the canopy and the tombchest. This is manifested by chronic fracturing/separation of mortars in joints and dovetailed joints filled with a range of different mortars. Many adjacent stones are also stepped or show signs of serious misalignment. There are no obvious signs of iron staining or jacking from corroding ferrous fixings, the former may be disguised by the once uniform coating. The misalignment of horizontal mouldings is more pronounced on the north elevation, beneath the female effigy in particular. The tombchest panels north and south are largely un-affected, with the west and east return elevations displaying fine, even joints in what would appear to be original mortar. Details of movement in joints to follow.

6.2 Three out of the eight supporting columns are not engaged (or bearing weight from above) and can be rocked and would appear to be dowelled. These are the north-west outer, and south-west and east outer columns.

6.3 The allegorical figures above the columns/capitals have all been re-bedded, rather crudely, with excess resin extruding from the bottom beds of each. The high level figures on the north elevation are also further restrained with wire around their necks. The canted heraldic panels on both elevations would appear also to have been restrained at the same time judging by the same white gunnable resin employed to re-bed the figures. There are no signs of movement to the plain central panel or flanking volute panels on the south elevation, but there are signs of movement on the same panel opposite, with the horizontal joints beneath showing separation of between 2-4mm.

6.4 The carved voussoirs and spandrels are still relatively crisp and in a sound condition on both elevations. The standing figures at high level on the north elevation have both lost their hands and display isolated areas of exfoliation typical of magnesium limestone, particularly the drapery of the north-east figure. The kneeling figure on the north has suffered badly with the proper right foot now missing, with an area of proper lower, left leg also missing, having been cut or worked to 'let-in' the figure into another area. Approximately 5% of the upper surface of the figure has been lost through exfoliation. The semi-reclining figure on the south elevation is decorated, approximately 10-15% of the total surface area now displays exfoliation/delamination. In general terms the extent of total loss of original upper stone surface from the north and south elevations (including the magnesian limestone plinths) is 10-15% and 20-25% respectively.

6.5 The female effigy is well carved and looks at odds with the male which is rather crude in comparison, however this figure is much broken, with a significant transverse fracture running down the proper right side, from the waist down, which is now in three main sections, her hands are also missing. The now articulated sections look to have a significant amount of material missing from the break edges and would necessitate large repairs, even to suggest the original form of the drapery, without replicating missing detail. The male effigy is poorly executed and not in keeping with the remainder of the decorative stonework on the remainder of the monument. The poor quality of the design and execution may suggest it is a later replacement. Despite this the effigy is intact and in a sound condition. The horizontal joints on the top of the tombchest spanning the effigies are in a poor condition and are falling into the void beneath.

6.6 The monument appears awkward, jammed into its location between the columns and the over sailing segmental arch. This is coupled with it appearing to be top-heavy with massive embellishments on top of the canopy, which itself has a large span and shallow rise. This design flaw is also likely to be the major factor in the progressive movement/instability currently evident, but possibly ground conditions, from repeat episodes of wetting and drying of the soil/foundations. The quality of construction (or re-construction if not in its original position) for much of the tombchest and canopy appears to be good, judging by the quality of the thin, parallel joints particularly the return elevations, however if it is contemporary with the re-construction of the Savile monument opposite then there may have been a disregard for fixings especially as it is contained within the arch.

6.7 Soluble salts affect the tombchest on both long sides (north and south) but are concentrated on the south. Salts can be seen achieving a maximum height of 1.10m above floor level, plus a random area between the pair of north-east columns, this is obviously attributable to falling moisture from a defect in the roof immediately above this area. The moulding above the capitals has cracked diagonally and is likely to be caused by an expanding internal iron fixing. A severely tapering joint is also visible behind and between the columns which is 17mm at its widest (at the top) this has been filled historically and since failed, with separation at both edges also indicating significant movement.

6.8 There are isolated areas of dramatic flaking/exfoliation to the north elevation, with approximately 50% of the sunken panel between the projecting cornice and shield at the viewers left-hand side significantly disrupted.

6.9 Approximately 10-15% of all pointing to the whole monument is now missing, this is concentrated on the tombchest. The mortar that remains here is largely dummy joints smeared over the surface giving the appearance of being full, what mortar there is has reached the end of its useful life and is severely weakened, meaning the soluble salts that are present are moving through the stone now and not the mortar. A small scale trial was undertaken to remove and replace defective mortar and replace it with a mortar compatible with both magnesian limestone and sandstone. The deep joints were tamped and surface filled with a mortar based on weak hydraulic lime, such that salts will migrate through the permeable, sacrificial mortar and not the stonework.

7 Investigations

Measuring Moisture Content

7.1 Given the levels of efflorescence on the south elevation moisture levels within the stone were expected to be high. Representative locations were selected in the north-east and south-west corner opposite 50 and 100cm above finished floor level. Stone drillings were taken from a depth of up to 50mm and sampled immediately with a 'Speedy Carbide' moisture meter. All four samples contained so little moisture, reading were taken twice on-site and found to be the same. The Calcium Carbide re-agent was tested when back at the workshop to check it was working with known damp materials which it was. Recorded moisture values were between 0.4% and 1.0% which must be considered very dry for the time of year, and were as follows.

	Location	Total Percentage of Moisture
NE1	East return of ashlar -1.00m above flat plinth	0.4%
NE2	East return of ashlar -50cm above flat plinth	0.4%
SW3	West return elevation - 50cm above flat plinth	0.8%
SW4	West return elevation – 1.00m above flat plinth	1.0%

7.2 The values on the north-east corner were the same, whilst the samples from the south elevation (which receives more direct sunlight) were slightly higher, albeit still considered dry, with the higher drilling returning the highest value.

7.3 Rather than pepper the tombchest with drill holes, seasoned oak dowels were inserted into the holes, such that they could be removed and sampled for moisture levels at ease in the future with a Protimeter capacitance meter. This is much more accurate when sampling timber rather than stone, as the sharp prongs of the meter have to be inserted into the material being sampled, the presence of salts in a hard stone surface also give misleading values. The dowels were inserted into the drills holes and sealed with 'Plasticene' to create a sealed environment for which the timber can absorb/desorb moisture. The dry, seasoned dowels were recorded before inserting into the holes and upon removal five months later when they had taken on moisture within the stone of the tombchest panels. The results are as follows and are expressed as the Wood Moisture Equivalent value (percentage).

7.4 'Protimeter' WME (Wood Moisture Equivalent) values were used which are the theoretical percentage moisture content that would be attained by timber in contact with and in moisture equilibrium with the material under test.

7.5 Protimeter WME measurements can be used to establish if non-conductive materials are in a 'dry' 6 – 16%, 'at risk' 17 – 19% or 'damp condition' 20 % upwards, as the critical percentage moisture content thresholds for timber are known.

	13.2.12	31.7.12	Percentage Increase
NE1	6.1%	9.45%	55%
NE2	6.8%	14.55%	114%
SW3	8.1%	13.60%	68%
SW4	6.9%	9.55%	38%

7.6 The percentage increase of moisture within the previously dry dowels varied considerably, although the readings after five months indicated the timber/stone was still considered to be dry, even after the wettest June and July months on record.

7.7 Salt Analysis

7.7.1 The drillings from the 'Speedy Carbide' measurements were split and a quarter sent (a quarter was retained) for specialist analysis to determine soluble salts levels within the stone of the tombchest panels, where efflorescence was perceived as being a potential problem with regard to the structural integrity and future load-bearing capacity of the stonework. Testing based upon BS 3921 : 1995 was carried out to determine water soluble salt levels. *Please see the results of analysis by Sandberg LLP as an appendix.*

7.7.2 Eight of the main soluble salts encountered in historic buildings were tested for. The salt levels present in the samples was found to be very low, with the two highest values for Calcium Sulphate and Magnesium Nitrate, both found at 50cm above the plinth in the north-east and south-west corners respectively. The values for these were still both considered low with readings of below half of one percent by mass, levels which are considered acceptable within modern house bricks after manufacture. The specific types of salts present can be attributed to burning solid fuels within the building historically and the magnesian limestone beneath the sandstone panels respectively, with ambient atmospheric moisture coupled with rising moisture within, taking the mineral components in solution.

7.7.3 Despite the very visible efflorescence (fluffy and fresh not hard, well-established crusts) particularly on the south elevation it appears this is a thin veneer of soluble salts reacting with changes in atmospheric moisture and is not a reservoir of soluble salts, waiting to crystallise at or near the surface.

7.7.4 We can be confident recent measures to effectively remove rainwater away from the building, including the installation of drainage externally on the north and south elevations in 2000 and 2011 coupled with the repair of the roof and guttering in 2000, the footprint of the monument and the tombchest in particular are dry, and that liquid moisture and with it soluble salts and its associated decay mechanisms are not a factor currently. This is also particularly welcome given the recent unprecedented levels of rainfall appear not to have impacted the monument.

7.8 Rainwater Levels

7.8.1 The closest Met Office weather station to Thornhill is in Bradford 11.6 miles away. Two months out of twelve had rainwater levels over 100mm in 2011, four months out of the first seven had rainwater levels over 100mm in 2012. With a total of 662.2mm of rainfall for the whole of 2011 and 620.5mm for the first seven months of 2012. *Please see the full set of data as an appendix.*

7.9 Construction – Internal Survey

7.9.1 Due to the extensive use of paint it was difficult to establish the number of component elements which make up the monument. An internal survey of the tombchest and canopy was undertaken, by removing sections of mortar from the joints and viewing within. Access with an endoscope was deemed unsafe due to the unstable nature of the canopy in particular and the width of the access hole and amount of percussive drilling required.

7.9.2 The vertical joint to the right of the top bed of the plinth for the reclining figure on the south elevation of the tombchest was removed by chiselling, this gave visual access to the core of the tombchest, which appears to be the same construction to that of the Savile monument opposite, which is random stone rubble bedded with lime mortar. However from the access point on this monument the stone is loose and not solid.

7.9.3 A section of joint (130mm long) in the canopy, issuing from the voussoir to the right of the keystone on the south side, 560mm back from the arriss of the intrados was removed. This gave clear visual access 210mm up into the canopy. Removing the dummy joint revealed the joint was largely empty and tapered back up into the canopy, which is significant as arch/vaulting stones are usually cut with radiating, parallel joints for maximum strength. The mortar which fell out and was still visible at depth was plaster and not lime or lead, which may go some way to explain the extent of movement observed in the canopy, as casting plaster (as it would have been) has no real structural strength and is hygroscopic, meaning it attracts moisture, becoming weaker for it. This could be significant has the area of efflorescence on the north elevation attributable to falling moisture from a temporary roof defect may have been absorbed into the top of the canopy core.

7.9.4 On the north elevation a section of mortar from the vertical joint to the left of the shield gave visual access back into the core of the canopy at his level, and showed random rubble blocks (not cut stone) behind the cut stone of the voussoir, once again plaster was the bedding medium not proper mortar.

8 Structural Assessment

8.1 The canopy which was thought to have moved historically, had 'Demec' studs adhered to key joints on the outer faces. The stainless steel studs which have a depression in the centre of each were applied horizontally across joints/areas displaying movement. Five locations on the north and three on the south, (including two at either end of the underside of the vaulting soffit) were selected and baseline readings recorded using a digital Vernier calliper accurate to two decimal places. Three readings were taken from each pair of studs and a mean value calculated. The readings were re-taken after five months and the results are compelling, with three of the areas widening and the remaining five closing, three significantly, highlighting that the canopy is moving. The two areas displaying the largest amount of movement were at either end of the canopy on the soffit of the arch/vault.

Location	13.3.12	31.7.12	Difference +/-
1	48.95mm	47.75mm	**-**1.2mm
2	69.39mm	69.54mm	+0.15mm
3	53.85mm	58.84mm	+4.99mm
4	52.57mm	52.61mm	+.04mm
5	59.04mm	55.73mm	-3.31mm
6	78.51mm	68.27mm	-10.24mm
7	81.18mm	65.69mm	-15.49mm
8	82.07mm	66.64mm	-15.43mm

8.2 Interpretation and Summary

8.2.1 Large pieces of stone do move on a microscopic level on a seasonal basis usually depending on the amount of clay particles present, with massive blocks and stone structures incorporating joints/mortars more so. Whilst these areas have only been recorded for a relatively short period (five months and not the usual minimum of twelve) the highest values recorded in locations 6, 7, and 8 demonstrate a far greater degree of movement than would be expected.

8.2.2 The standard of building to the whole monument can only be guessed at, however the main horizontal elements of the monument, including the top lines of the cornice and the moulded course above the capitals display serious discrepancies. The top bed of each key axis is currently below true horizontal by between 24 and 44mm on the south elevation and 26 and 32mm on the north, having seemingly dropped significantly on both sides, <u>if</u> built in true horizontal originally. The implication of this during partial dismantling would be the requirement for unacceptably large joints to bring elements back into true horizontal, if the arch was not moved, but secured as is being suggested.

9 Recommendations for Further Investigations and Maintenance

9.1 It will be useful to continue monitoring the oak dowels within the tombchest, to establish if moisture movement is seasonal or is on a continual downward trend.

9.2 A longer-term (twelve month) study of environmental conditions impacting the monument is recommended to understand fully the internal church environment on a daily and seasonal basis and the impact of lagging pipe work or turning down further the radiator to the east of the east return elevation.

9.3 Although the salt levels sampled were not cause for serious concern, it would be sensible to remove them periodically by means of dry brushing with a paint brush and vacuum cleaner to prevent re-distribution. Removal of this efflorescence will prevent these salts moving in and out of solution or crystallising at the surface and causing the surface of the stone to deteriorate in the medium to long-term. There is no point in poulticing these areas, which may be counter-productive by introducing the amount of moisture required for the number of cycles necessary to bring about a reduction in conductivity. Moisture levels are currently low and the areas cannot be isolated.

10 Points for Consideration

10.1 Given the brittle, poor quality of the bedding material (plaster) and even if the dramatic movement observed is seasonal, this type of bedding material and the random rubble construction of the core will not accommodate repeated movement cycles indefinitely. It would seem prudent to partially dismantle the monument down to the horizontal moulding above the capitals, as advocated by the structural engineer and architect. This would alleviate the historic and progressive instability observed and allow the inclusion of additional structural support within the canopy (in the form of an opposing pair of steel supports) to minimise further movement and perhaps more importantly prevent the arch from spreading further and adversely affecting the adjacent columns of the arch. Although the monument is likely to have been in place for three hundred years plus, even if not in its current location the canopy is currently moving dramatically, as borne out by the Demec studs and this cannot be ignored.

10.2 Inserting a pair of opposing, horizontal structural beams and securing every other voussoir by means of vertical, threaded dowelling secured into position, would improve significantly the structural integrity of the arched canopy.

10.3 In spite of obvious historic movement, current moisture and soluble salts levels within the tombchest do not justify dismantling the monument down to ground level. Less interventive measures should be employed to alleviate rising moisture and soluble salt activity. The majority of the jointing/pointing mortars visible have reached the end of their useful lives and as such should be replaced with a compatible, mortar softer than the host stone. This will allow existing and future moisture/soluble salts to migrate through a sacrificial mortar, such that the aged stone is less compromised/saturated, as moisture will find the path of least resistance through a more permeable medium which fills the joints completely.

10.4 Due to the extent of displacement/sagging observed along the largest horizontal axes' consideration should be given to the potential size of new joints which may appear unsightly. Part of the skill of a monument conservator is to minimise these kinds of visual discrepancies when re-building such a structure. Given the sizes involved (26 – 44mm out of horizontal) this would be challenging. Comprises would have to be made regarding striving for absolute horizontal and bedding/jointing mortars could be toned down with suitable paints, but it is an issue for consideration and discussion beforehand.

10.5 Serious thought should be given to alleviating some of the excess weight from the centre of elements above the canopy. This would be helped by removing much of the random stone rubble as was the case on the canopy of the Savile monument opposite (ten rubble sacks full of rubble/mortar was removed upon dismantling) and replacing with lightweight concrete blocks cut to shape. Consideration might also be given to removing excess material from the rear of unseen architectural elements by means of cutting away rough, not carved stone by grinding or cutting by rotary means.

10.6 The light-brown coating is now part of the history of the object/monument. It covers approximately 50% of the monument and is in a relatively sound condition. The coating (thought to be a house paint from the 1950-60s) was probably applied to disguise different decay mechanisms and unify the overall appearance of the sandstone and limestone elements of the monument. It is largely stable, with only isolated areas of flaking/delamination, with no signs of it being fugative. Its wholesale removal whether desirable or not is likely to reveal underlying decay mechanisms which would require treatment, and its removal from previously deteriorated surfaces could be difficult.

10.7 Cleaning the monument presents different issues with regard to time and associated costs. Magnesian limestone and bare sandstone of this type both respond well to cleaning using low-pressure steam (dental de-scaler) however the presence of the paint layer precludes its use as this technique would adversely affect the painted surfaces. It may be more prudent to undertake a general dry clean to the all surfaces and a more detailed wet-clean to decorative stonework including embellishments above the cornice, the shields, capitals, voussoir and figurative carving. These areas are all decorated and covered with thick accumulated dust/debris.

11 Recommendations for Conservation

11.1 The following inter-related passive and interventive treatments should be carried out to ensure the long-term preservation of the monument.

11.2 Remove all loose fixtures and fitting adjacent to the areas of work on the north and south elevations. Apply protections to the floor in the form of dust sheets with hardboard sheeting, taped together, on top. Erect timber hoarding around the monument on both sides to provide protections to adjacent timber panelling and to create a working environment. Strike on completion of all works.

11.3 Apply temporary light-weight plastic protections to the organ for the duration of the works.

11.4 Prop the underside of the upper tombchest moulding on the north elevation in case removing the effigy un-weights it. Remove the female effigy only away from the tombchest, to be stored within the workspace created. Apply a sturdy timber box to encapsulate the male effigy in-situ. Build a substantial timber turning piece to provide support to the whole arch vaulting front to back.

11.5 Erect a suitable fixed, access scaffold with a lifting beam on both elevations. Strike on completion of all works.

11.6 Carry out a photographic survey of both elevations. Carry out a detailed measured survey of both elevations to be dismantled, to facilitate re-building.

11.7 Dismantle one side at a time down to the required level in a numbered sequence. Provide attendance for the architect and structural engineer during dismantling. Remove excess rubble and mortar material for disposal into an awaiting skip. Provide air extraction to be vented externally for the duration of the dismantling.

11.8 Insert the pad stones and support steelwork to the satisfaction of the professional team. Restrain voussoirs back to the steelwork, with threaded stainless steel dowelling secured into position. Re-build the dismantled sections of stonework in reverse order taking into account original dimensions. Incorporate light-weight or dense concrete blocks cut to size. Repeat the same process on the opposite side.

11.9 Dry clean the whole monument with soft bristle brushes and a vacuum cleaner. Carry out cleaning trials using techniques materials from the following range : Smoke sponge, Wishab sponge, de-ionised water, warm water compresses, A solution of White Spirit and de-ionised water 50 : 50 with the addition of Synperonic A7, Liniment of Soap, all applied on cotton wool or stencil bushes.

11.10 Relay areas of cupping/flaking paint using Paraloid B72 cut into sheets (or applied by syringe injection) and inserted between the substrate and paint layers, relax the paint and re-lay with the aid of a heated spatula.

11.11 Surface consolidate all vulnerable areas of stonework with a weak solution of Paraloid B72 (Ethyl-methacrylate Methyl-acrylate co-polymer) in Acetone/ Industrial Methylated Spirits 50 : 50.

11.12 Insert support fillings as required to vulnerable areas of stonework with a mixture of crushed, sieved stone dust of the relevant type (sandstone/limestone) and a 10% w/v solution of Paraloid B72.

11.13 Clean all decorative, carved stonework using the safest most effective materials/technique.

11.14 Rake out all defective pointing from the tombchest and plinth, insert new mortar based on hydraulic lime, taking into account the efficacy of small scale trials on the south elevation.

11.15 Re-join the extant sections of the female effigy using stainless-steel of suitable length and diameter/profile, secured into position using a conservation grade polyester resin. Deep fill areas of missing break edges using a cellulose based filler mixed with calcium-carbonate powder in the ration of 3 : 1. Build up in layers of no more than 8mm at a time. Apply a final layer to suggest but not replicate missing detail using a mixture of crushed, sieved limestone dust and a 10% w/v solution of Paraloid B72, coloured o assimilate with adjacent stone.

11.16 Re-instate the conserved effigy back onto the tombchest, once free from the timber supports

11.17 Integrate all information into a final conservation report, supplied in paper format. Supply the client with three copies of this report.

Thoughts should be given to the prospect of reducing dense areas of salt in the future, there would be no real benefit in attempting this at present. Work could be done to pare back (using scalpels and working under magnification) dense salt on the magnesian limestone plinth. This should be left for several years, for the replacement pointing (and re-distribution of moisture) and the anticipated changes in environmental conditions to take effect.

Reducing compact efflorescence would be necessary to render the exposed surfaces more permeable again, and to eliminate an external source of salt.