PROJECT HEATNET (2018/2019)

TORRY PHASE 1A DISTRICT HEATING FEASIBILITY STUDY

FOR

ABERDEEN HEAT & POWER LTD
63 COTTON STREET
ABERDEEN

AND

ABERDEEN CITY COUNCIL
TOWN HOUSE
BROAD STREET
ABERDEEN

WGE ROWE C. ENG.
INTEGRATED ENERGY UTILITIES
MIDDLE REACH, RIDLEY HILL,
KINGSWEAR DEVON TQ6 OBY
WR 31.12.2017

1 EXECUTIVE SUMMARY

1.1 Aberdeen City Council resolved, on 24th October 2016, to support the development of district heating in Torry utilising funding from the Interreg North West Europe (NWE) HeatNet, together with match funding from ACC. Aberdeen City Council is one of the fourteen Project Partners participating in this project.

The HeatNet project seeks to establish transition strategies for delivering low carbon district heat.

The Interreg North West Europe HeatNet project is to incorporate six ''living labs'' which will be employed to develop a HeatNet model and then test and demonstrate it in order to ensure its robustness. These are located the UK, Ireland, Belgium, France, and the Netherlands. Transition Roadmaps plan for roll out of new technical, institutional & organizational arrangements in these 6 living labs (new roles and responsibilities of stakeholders, regulation & policies, spatial planning, business models & viability, connection to finance and markets, acceptance, etc. It is proposed that one of these ''living lab'' pilot projects will be this project.

The district heating that has, so far, been installed in Aberdeen is regarded as a low carbon standard. It has been constructed of well-insulated, pre-assembled pipes, using relatively low pipe pressures and relatively low flow and return temperatures.

The Torry ''living lab'' project (termed Torry District Heating Network Phase 1A) will employ the same pipe design philosophy, as employed elsewhere in Aberdeen, so as to minimise carbon emissions through pipe design, while also pragmatically meeting the heat and hot water needs of an existing building portfolio. The Torry Phase 1A project will, in the short term, seek to further reduce carbon emissions through the employment of ''smart'' controls. In the medium term, it is envisaged that carbon emissions, to this pilot area, will be further reduced by switching from a gas heat source to heat from waste incineration. In the long term, there is the potential to achieve further carbon savings by utilising recycled heat and heat from a variety of renewable sources that could, conceivably, be developed in this locality.

Provost Hogg Court, Balnagask House and Deeside Family Centre are to be connected to the Heat Network under this project. Capital cost has been estimated as £606,000. This is within the budget approved by Council on 24th October 2016.

1.2 Aberdeen Heat and Power Ltd

Aberdeen Heat & Power Ltd (AH&P) are a contributing sub-partner to the Interreg North West Europe HeatNet project.

Aberdeen Heat & Power is a 'not for profit' company that was set up by Aberdeen City Council in 2002 to develop and operate district heating and CHP (Combined Heat & Power) schemes within the City, with specific aims of alleviating fuel poverty and reducing the Council's carbon footprint.

To date, Aberdeen Heat and Power has developed four district heating networks supplying heat and hot water to 2350 flats (within 33 multi storey blocks) and to 17 public buildings.

In addition, 10 stand alone multis storey blocks have been converted from electric heating to communal gas heating systems, including the three Torry blocks of Brimmond, Grampian and Morven Courts which form the starting blocks to development of the Torry district heating network.

Carbon emissions from these buildings have been reduced by 45% and typical fuel costs to tenants have been reduced by up to 50% over previous electric heating systems.

Customer satisfaction surveys have indicated that tenants are very satisfied with this new heating system.

The long term aim of the company is to develop the district network across the city and ultimately link the respective energy centres together into a city "ring" which is commonplace in district heating developed countries such as Denmark and Sweden.

The work undertaken in development of district heating by ACC and AH&P over the last 15 years serves to underpin the fuel poverty and carbon reduction aims and indeed, the Aberdeen district heating scheme is seen as a leading exemplar model of district heating in Scotland and beyond.

This is further recognised through the company having received four high profile awards – UK Housing Awards 2008 – Increasing Environmental Sustainability and Outstanding achievement in Housing in the UK and the COSLA Excellence 2008 silver award. In 2013 Aberdeen Heat & Power won a prestigious award for Excellence from Global District Energy Climate Awards, and in 2015 AH&P were very proud to win a VIBES (Vision In Business Environment Scotland) Award under the category of Product or Service.

1.3 Scottish Government Policy

In 2015 the Scottish Government issued a national policy termed National Infrastructure Priority document and on the back of this a Draft Energy Strategy was produced outlining the objectives towards energy efficiency and carbon reduction targets for Scotland up to 2050 with interim targets of 2020 and 2032. These ambitious documents also included sub-strategies for Local Heat and Energy Efficiency Strategies (LHEES) to be developed through Local Authorities with an outline programme for potential funding through the Scottish Energy Efficiency Programme (SEEP). Within these documents there is strong reference and support for the development of district heating as a methodology to decarbonize the heat sector, where these measures are applicable and cost effective.

2 4th Generation District Heating (4GDH)

In order to establish transition strategies for delivering low carbon district heat, the Interreg North West Europe HeatNet project seeks to follow the 4th generation District Heating (4GDH) transition strategy outlined by *H. Lund et al.*[1]

The reporting objectives of the Torry Phase 1A project are:

- a demonstration of what initial steps might be taken in the transition towards 4GDH;
- an identification of some of the barriers to 4GDH; and
- what subsequent steps might be taken in the further transition towards 4GDH

Appraisal of transition options towards 4GDH

One of the underlying targets of 4GDH is to design the building space and hot water heating systems to operate with a flow temperature of circa 70C and to achieve very low return temperatures in the range of 30-40C. District heating systems however must be able to supply buildings having existing central heating systems which have been designed and installed to operate ay standard UK design temperatures of 80C Flow: 70C Return. It is necessary therefore to adapt these existing central heating systems by smart control and by taking full advantage of spare

space heating capacity to enable district heating flow temperatures of 70-75C and to achieve seasonal return temperatures in the range of 40-55C. We are calling this 'partial 4GDH'. The following option appraisal therefore considers three options. 1.Do nothing, 2. Develop system to operate at fill 4GDH heat distribution network conditions 70C flow: 30C return, and 3.Design and adapt existing building heating systems to enable district heating networks to operate at 'partial 4GDH' conditions of 75C flow: 45-55C return (as Aberdeen Heat & Power standard design practice)

2.1 Do nothing

Advantages

- no inconvenience to residents/building users; and
- saving in officer time, that would otherwise be spent on other Council priorities.

Disadvantages

- loss of inward investment;
- loss of opportunity to replace existing boilers (which have a finite life);
- loss of opportunity to reduce gas consumption;
- loss of opportunity to reduce heating maintenance costs;
- loss of opportunity to extend the current heat network, in preparation for the envisaged Energy from Waste project (and the low carbon/low heating cost opportunities that this will provide);
- loss of opportunity to develop a transition strategy towards 4GDH; and
- a diminishing of ACC/AH&P's status as being amongst Europe's district heating leaders.

Summary

Not recommended due to:

- loss of inward investment opportunity;
- failure to meet the requirements of the Interreg North West Europe HeatNet project, and
- loss of stepping stone towards Council's Heat Network strategy for Torry.

2.2 Full 4GDH

Advantages

- realisation of inward investment opportunity;
- maximisation of opportunity to develop a transition strategy towards 4GDH; and
- maximisation of ACC/AH&P's status as being amongst Europe's district heating leaders.

Disadvantages

- It is noted that the principal objectives for a full 4GDH system are better suited to new build designs rather than retrofit
- maximum inconvenience to residents/building users;
- reduction in number of premises that would be improved;
- expensive: existing heating radiators etc would have to be replaced;
- expensive: hot water boost would have to be provided;
- expensive: the thermal properties of the building fabric would also have to be greatly improved;
- diminution of opportunity to replace existing boilers (which have a finite life);
- diminution of opportunity to reduce gas consumption;
- diminution of opportunity to reduce heating maintenance costs; and
- diminution of opportunity to extend the current heat network, in preparation for the envisaged Energy from Waste project (and the low carbon/low heating cost opportunities that this will provide).

- For this project, required replacement of the existing underground pipework and distribution pumping

Summary

Not recommended due to:

- the potential adverse impact on the Council's over-all Heat Network strategy for Torry: with its emphasis on the early and widespread reduction in fuel poverty, and
- risk of non-delivery

2.3 Partial 4GDH

Advantages

- realisation of inward investment opportunity;
- minimimal inconvenience to residents/building users;
- maximum number of premises that would be improved;
- cost effective: existing heating radiators etc would not have to be replaced;
- cost effective: hot water boost would not have to be provided;
- cost effective: the thermal properties of the building fabric could be improved at a later time;
- maximisation of opportunity to replace existing boilers (which have a finite life);
- maximisation of opportunity to reduce gas consumption;
- maximisation of opportunity to reduce heating maintenance costs;
- maximisation of opportunity to extend the current heat network, in preparation for the envisaged Energy from Waste project (and the low carbon/low heating cost opportunities that this will provide);
- maintenance and operation of the existing plant and equipment currently supplying heat to the three multis at Balnagask Circle: and
- maintenance of ACC/AH&P's status as being amongst Europe's district heating leaders

Disadvantages

- diminution of opportunity to develop a transition strategy towards 4GDH

Summary

Recommended due to:

- realisation of inward investment opportunity;
- compliance with the requirements of the Interreg North West Europe HeatNet project; and
- maximum compliance with the Council's Heat Network strategy for Torry: with the opportunity to develop the detail of a Heat Network strategy that will enable ACC to maximise the reduction in fuel poverty in Torry.

3. THE TORRY PHASE 1A DISTRICT HEATING DEVELOPMENT PROPOSAL UNDER THE INTERREG HEATNET PROGRAMME

3.1 The Proposed Torry Phase 1A District Heating extension.

The present Torry scheme currently supplies three 52 dwelling multi-storey blocks: Morven, Brimmond, and Grampian Courts from a gas fired heat station.

It is proposed to connect and adapt three Aberdeen City Council institutional buildings under this HeatNet Torry Phase 1A scheme with an annual floor area, existing boiler capacity, annual fuel consumption and estimated annual useful heat requirement as follows:

BUILDINGS PROPOSED FOR PHASE 1A DISTRICT HEATING EXPANSION				
Building	**Present annual gas heating Consumption [kWh]**	**Estimated annual heat requirement[kWh]**	**Existing Installed boiler capacity**	**Gross floor area [m2]**
Provost Hogg Court [sheltered housing]	1,176,202	823,341	2 x 200kW + 2 x 34kW HWS	4400
Balnagask House [sheltered housing]	417,557	168,000	2 x 104kW	1200
Deeside Family Centre	200,381	140,267	2 X 70kW + 1 x 34 kW HWS	1000

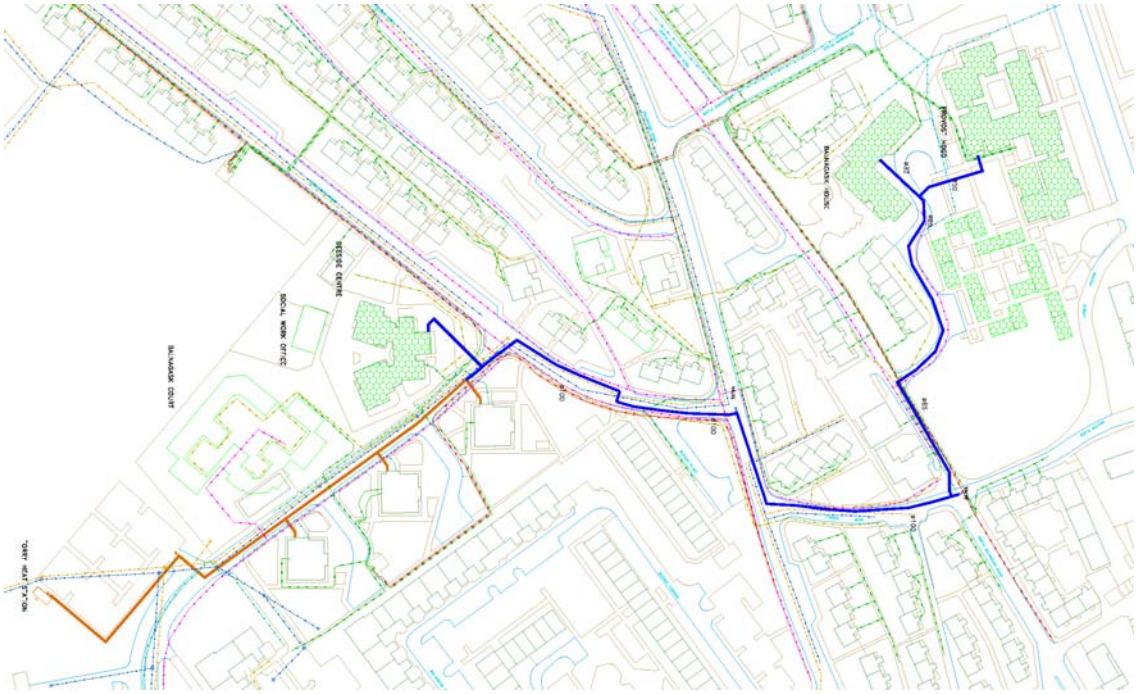
3.2 Planning for the wider Torry District Heating Network

In designing and setting out the Phase 1A DH scheme consideration must be given to the longer term district heating network to serve the wider Torry area and possibly beyond. In the design of the Heatnet project, as an extension of the existing Torry district network, the aspects of arterial network sizing have been considered and taken into account, and can be enveloped into a wider system in the future. This is part of the future proofing ethos that has been adopted by AH&P over successive years of development of the district networks in the City.

System operating pressure is a primary consideration taking in account ground level variations throughout the district heating network. The present Torry district heating system and the AH&P schemes serving the central and Northern areas of the City have been designed to operate with a base pressure of 4 bar.g. Local topography and potential future connections to the City Centre have been taken into account in the design of this proposed system.

3.3 Recommended Heat distribution mains to serve the Torry Phase 1A buildings

Drawing 22985440 (appended) shows the Torry Phase 1A DH Network plan showing the extension from the existing DH system to connect the three buildings listed in para. 3.1above.



3.4. The suitability of the existing Torry Heat Station capacity to supply the additional Phase 1a Heat Loads

The 24 hour seasonal heat demand profile for the present Torry heat load and including the proposed additional loads described in para 3.1 above is shown by Figure 1. This indicates a peak winter month demand of 800kW for the three existing multi-storey blocks, Provost Hogg Court. Balnagask House and Deeside Family Centre.

The existing Torry heat generating station has 6 boilers with a combined capacity of 600 kW as shown by Drawing No 2294565. The Heat Station has space for 4 further boilers or a CHP generator giving a total potential capacity of 1000 kW. The existing 125mm gas supply connection, the heat distribution pumping, and control system is sized and arranged for the ten x 100kW boiler capacity. A small alteration would be required to the heating and gas pipework within the heat station

It is also possible to retain the existing two x 200kw boilers at Provost Hogg Court for peak load and standby operation.

The proposal under this Torry Phase 1A development is to retain the existing 6 x 100kW boilers in the Torry heat station and to incorporate the Provost Hogg boilers. The Torry heat station can be extended at relatively low cost should the scheme be developed beyond Phase 1A.

3.5. Connection & adaptation of building heating systems to meet Intereg Heatnet 4th generation system objectives

Surveys and technical assessments have been carried out on each building under consideration for connection in Torry Phase 1A to determine the required adaptation to meet Partial 4th Generation operating temperature and efficiency targets. All the building heating and hot water systems to be connected were originally designed at the UK standard design flow temperature of 80degC but use will be made of design margin on radiators and smart controls to reduce the seasonal operating temperature of the buildings heat distribution systems in the new design for all three buildings.

The proposals for the building heating system connection and adaptations in each building are as follows:

3.5.1 Provost Hogg Court.

The Provost Hogg Court Sheltered Housing heating system is in two parts, the first is constant temperature circuit operating at 80C fed directly off the boiler header serving 15 Bungalows which are separate from the main building system which is heated by an outdoor temperature compensated system.

A district connection comprising isolation valves, pipeline strainer, pressure differential regulation valve and a heat meter will be located in the existing boilerhouse as shown by Drawings No 22969691 and 22945566.

A simple radiator system is installed within each bungalow together with hot water service hot water cylinders. A new temperature control will be installed to reduce the flow temperature to the lowest temperature to take advantage of the radiator sizing margin. A two port regulating control valve will inject water at 70C into this system from the district heating system. The distribution flow temperature to the bungalows with set at the lowest temperature calculated following design margin checks on the radiators. New low feed velocity thermostatic radiator

valves with and pre-setting to maintain a 15C minimum temperature differential will be installed on each radiator. The hot water service control valves to each cylinder will be fitted with new two port control valves to control the cylinder temperatures at 55degC. Inverter control will control the circulating pressure differential at around 2m head to minimize heat distribution pumping power consumption and to provide all the two port control valves with conditions for good control authority.

The second outdoor temperature compensated heating system serving radiators and will be controlled at the lowest seasonal temperature. An inverter pump drive will control the circulating pressure differential at around 2m head to minimize heat distribution pumping power consumption and to provide all the two port control valves with conditions for good control authority. Checks will be made on radiator design margins and thermostatic radiator valve condition.

The gas fired hot water heating boilers will be replaced by a non-storage plate exchanger heater with control as shown by drawing 22969691. Hot water will be circulated at 55degC into the existing secondary system

It is proposed that the existing high efficiency boilers will be retained with new shunt and heat distribution pumps for standby heat top up to the district heating system. The boilers and pumps will be brought on when the measured district heating network circulating pressure differential falls below 4m.

3.5.2 Deeside Family Centre

The Deeside Family Centre heating circuit is an outdoor temperature compensated system serving radiators and some fan convectors. The proposed district heating connection and control is shown by Drawings Nos 22969693 and 22945564.

A district connection comprising isolation valves, pipeline strainer, pressure differential regulation valve and a heat meter will be installed in the existing boilerhouse, to supply a heating temperature of 70degC.

Checks will be made on radiator design margins and the building heating system will be controlled at the lowest seasonal temperature. An inverter pump drive will control the circulating pressure differential at around 2m head to minimize heat distribution pumping power consumption and to provide all the two port thermostatic control valves with conditions for good control authority. and thermostatic radiator valve condition. Two port solenoid valves will be fitted to each fan convector to stop circulation when the fans are switched off

A gas fired hot water heating boiler will be replaced by a non-storage plate exchanger heater with control as shown by drawing 22969693. Hot water will be circulated at 55degC into the existing secondary system.

3.5.3 Balnagask House

The proposed district heating connection and control is shown by Drawings Nos 22969692 and 22945565.

The district connection comprising isolation valves, pipeline strainer, pressure differential regulation valve and a heat meter will be located in the existing boilerhouse, to supply a heating temperature of 70degC.

The Balnagask House sheltered housing heating system is in two circuits both with outdoor temperature compensated system serving radiators and will be controlled at the lowest seasonal temperature. An inverter pump drive will control the circulating pressure differential at around 2m head to minimize heat distribution pumping power consumption and to provide all the two port control valves with conditions for good control authority. Checks will be made on radiator design margins and thermostatic radiator valve condition.

Gas fired hot water service storage vessels will be replaced by a non-storage plate exchanger heater with control as shown by drawing 22969692. Hot water will be circulated at 55degC into the existing secondary system

3.6 Estimated Capital Cost of Torry Phase 1A Development

The Torry Phase 1A district heating scheme estimated capital costs comprising the district heating heat distribution main network extension the building connection and adaptation works to meet Partial 4th Generation standards as described in Sections 3.1 to 3.6 above are summarised as shown below. The estimated costs are based upon competitive tender rates and Aberdeen Heat & standard design and construction management procurement arrangements with direct purchase of all materials and individual contracting with specialist companies for each part of the installation works.

SUMMARY OF ESTIMATED CAPITAL COST TORRY PHASE 1A	
Description	**Estimated Cost [£]**
Heat Distribution Mains for Phase 1A expansion	£333,000
Provost Hogg Boilerhouse Connection and System Adaptation	£75,000
Balnagask House Connection and System Adaptation	£38,000
Deeside Family Centre Connection and System Adaptation	£32,000
Works contingency	£24,000
Administration costs 15%	£75,000
Currency contingency 5%	£29,000
TOTAL ESTIMATED CAPITAL COST	**£606,000**

3.7 Carbon Dioxide [CO2] Emission Reduction

As the existing buildings are already served by gas boilers and the proposed arrangement is also served by gas boilers, the proposed system extension to supply three ACC institutional buildings for this project would achieve only a small CO2 reduction, resulting from having boilers operating as part of controlled scheme as opposed to having numerous smaller less efficient boilers.

It is envisaged that significant reduction in CO2 emissions will be achieved in the medium term, should the scheme be further extended and be supplied with heat from Energy from Waste (EfW), rather than from gas fired boilers. These savings could be as follows:

CO2 SAVING FOR TORRY PHASE 1A WHEN HEAT IS SUPPLIED FROM EfW plant		
Annual gas consumption	CO2 emmission from gas firing	Reduction in annual CO2 emission
3,413 MWh	198 kg/MWh	675,803 kg/annum

4 HEAT COSTS

The Schedule below sets outs the present estimated annual cost for space and hot water heating for each building, based upon the following operating factors and the present gas unit price:

- Average Annual Individual Gas Boiler Efficiency: 75%
- Gas Boilerhouse Operational Electricity Consumption: Allowance of 1% of Gas Consumption at 12p/kWh Electricity Cost
- Annual Gas Heating Maintenance & Call-out Charge: £5/kW system capacity
- Depreciation at 8% of boiler plant replacement capital cost
- Administration

EXISTING INDIVIDUAL GAS HEATING	Provost Hogg Court	Balnagask House	Deeside Family Centre	Total
Annual Gas Consumption [kWh]	1,176,202	417,557	200,381	1,794,140
Gas Unit Price including CCL (p/kWh)	1.755	4.498	1.755	
Gas Daily charge (£/annum)	£4,869	n/a	£1,099	£5,968
Gas Cost [£/annum]	£20,642	£18,782	£3,517	£42,941
Boilerhouse Electrical Running Cost [£/annum]	£1,411	£288	£240	£1,939
Annual Boiler Plant Maintenance & Call Out [£/annum]	£2,500	£600	£600	£3,700
Depreciation	£6,600	£4,000	£2,000	£12,600
Administration of bills	£500	£500	£500	£1,500
Total Annual Cost [£]	**£36,522**	**£24,170**	**£7,956**	**£68,648**

The above figures for maintenance are based on norms for this type of establishment. At this time is has not been able to fully establish the true maintenance figures for individual buildings so therefore a true annual cost is not presented. Suffice to say that there will be financial savings from maintenance for each building through not having individual gas boiler servicing and gas safe checks, although the operating costs of the energy centre must be taken into account.

DISTRICT HEATING OPERATING COST (55% proportion of costs for three ACC Institutional buildings)	Total
Gas consumption Proportion (kWh / annum) (includes network losses)	1,918,352
Gas Price p/kWh	1.755
Daily charge proportion	£6,870
Gas cost	£33,532
Energy Centre Electricity proportion	£1,718
Maintenance and Call Out Proportion	£3,529
Depreciation	£11,600
Administration of bills	£800
Management Charge (monitoring, inspection)	£3,464
Total Annual Cost [£]	**£61,513**

The estimated annual operating cost saving in the heating cost to the three buildings from the proposed adaptation to 4GDH and connection to the existing Torry District network is therefore £7,135. This saving will increase further when the district heating network connects to the EfW station or alternative renewable sources.

5. HEAT METERING AND CHARGING SYSTEM

Where a statutory requirement for individual building and dwelling heat metering system exists AH&P have currently adopted the ISTA system of automatic remote meter reading and pre-payment billing.The system is compliant with the Heat Network (Metering & Billing) Regulations 2014. It is envisaged that this system will be installed to Provost Hogg Court, Balnagask House and Deeside Family Centre

6. TORRY PHASE 1A DISTRICT HEATING SCHEME DEVELOPMENT PROGRAMME TIMESCALE

The programme for development of the Torry Phase 1A district heating scheme is shown by Figure 2. The activities under this programme would be as follows:

The programme assumes agreement between ACC and AHP to proceed with the scheme by the end of March 2018 including the installation agreement sign off.

The Tender documentation is to be completed during April to enable a 4 week tender period in May 2018.

District heating mains installation period July to October 2018

Connection to the Provost Hogg Court boiler house and adaptation of the internal heating system would be carried out between August and November 2018

Connection and internal heating adaptation work to Balnagask House, and Deeside Family Centre office would take place between August and November 2018

7. Project Risks

- The proposed timescale for project completion is almost directly co-incidental with the Brexit programme. There is therefore uncertainty over exchange rate and as such a contingency of £29k has been applied to the capex costs.
- The peak winter loading for the entire scheme has been calculated at 800kW, which would leave a 20% margin on total boiler capacity for comfort, but this relies on all boilers being available at the time of peak loading. This risk has been considered as acceptable. Under much of the operating year the existing six boilers in the Torry boiler house would be adequate to supply the entire system, leaving the Provost Hogg Court boilers for standby duty. It is noted that this risk will be greatly reduced when expected EfW heat supply becomes available. It is also noted that the resilience of the heat provision system (prior to EfW) will be s considerable improvement on resilience of the current heating systems.

References

1 '4th Generation District Heating Integrated Smart Thermal Grids into future sustainable Energy Systems'. Lund; Werner; Wiltshire; Svendsen; Thorsen; Hvelplund; and Mathiesen. Published by Elsevier, 2014.

2 Heat Generation Technology Landscaping Study, Scotland's Energy Efficiency Programme (SEEP) Ref - 4th Generation District Heating Technology.

Figure 1- Torry Phase 1A Average 24 Heat Demand Profile in each month

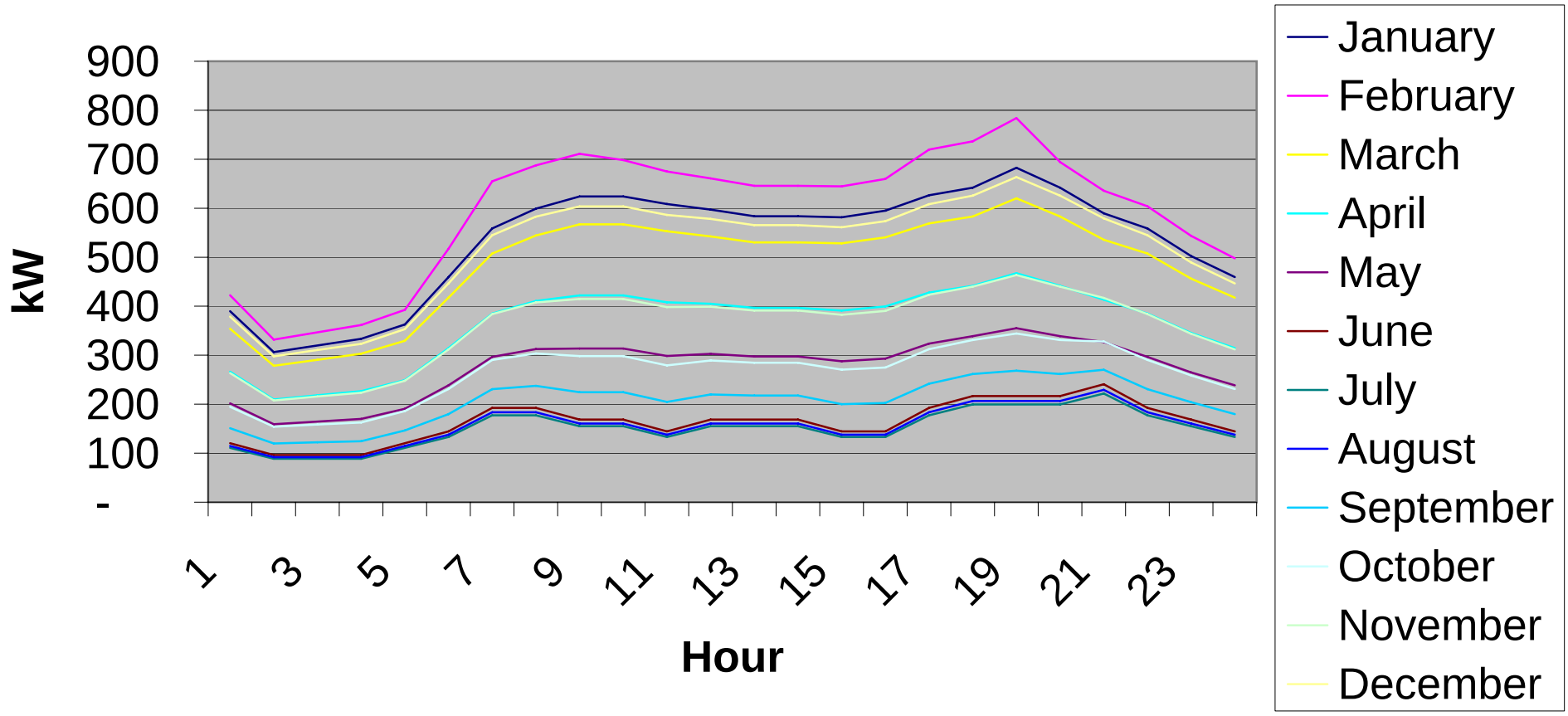
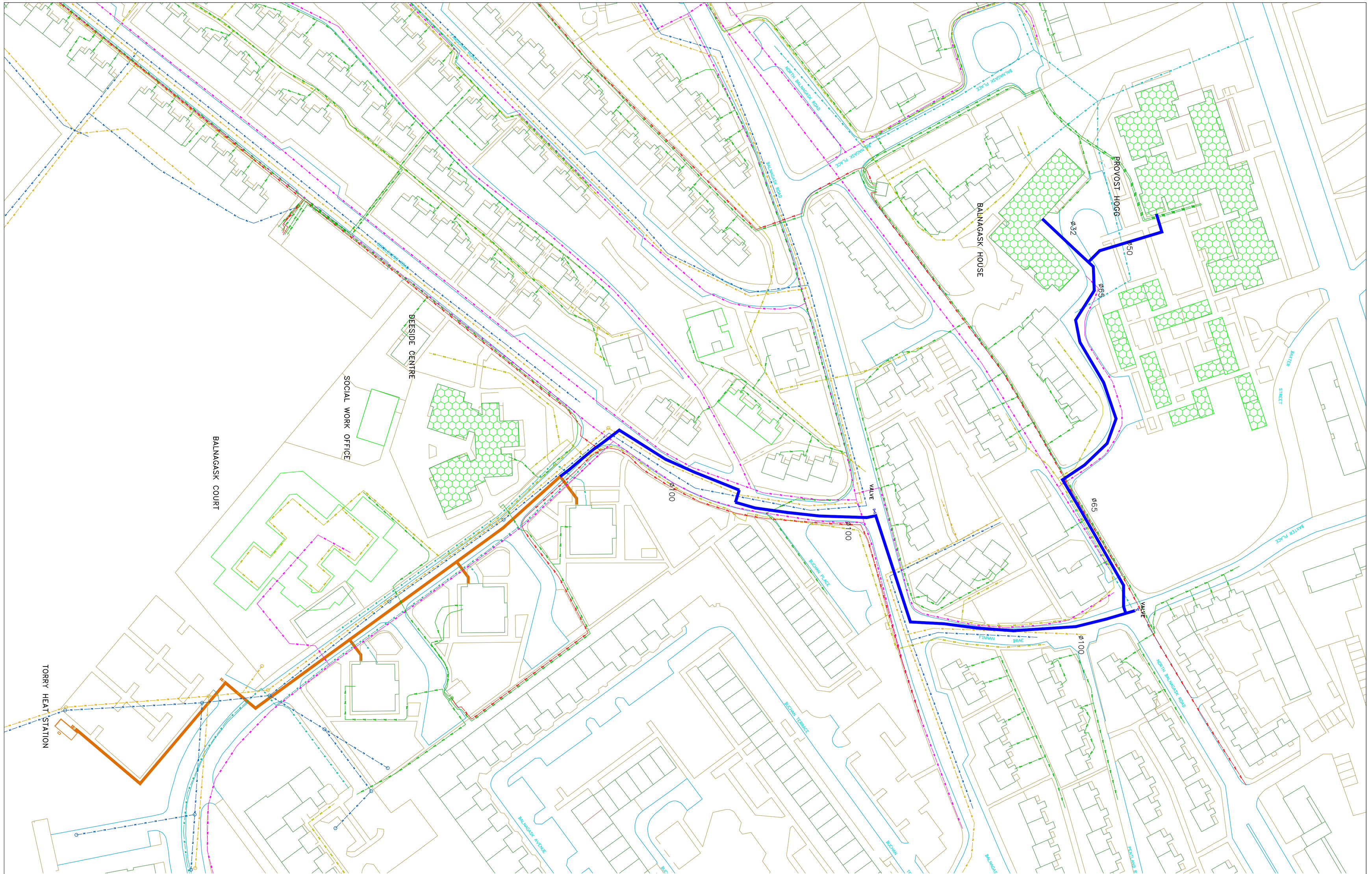


FIGURE 2 TORRY PHASE 1A DISTRICT HEATING PROJECT DEVELOPMENT TIMESCALE

		2017		2018											
	ACTIVITY	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	Feasibility Study Completion														
2	Receive comments and questions on feasibility study														
3	Approval by AHP/ ACC														
4	ACC/AHP Agreement signed off														
5	Planning Application Heat Distribution mains														
6	Design drawings and specifications for Contract														
7	Invite Tender for Works Contracts														
8	Place contracts														
9	DH Mains Stage 1A installation to Provost Hogg Court														
10	Connection and Internal System Upgrading to Provost Hogg Court														
11	Connection and Internal System Upgrading to Balnagask House														
12	Connection and Internal System Upgrading to Deeside Centre														



Rev	Date	
A	30.10.17	
B	09.11.17	
C	02.01.18	

ABERDEEN HEAT & POWER LTD

Subject

TORRY PHASE 1A DH NETWORK (EXCLUDING TULLOS PRIMARY SCHOOL)

Project

TORRY DH PHASE 1A

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Scale	Drawn	Checked	Authorised	
1:800	D.P.	W.R.		A3
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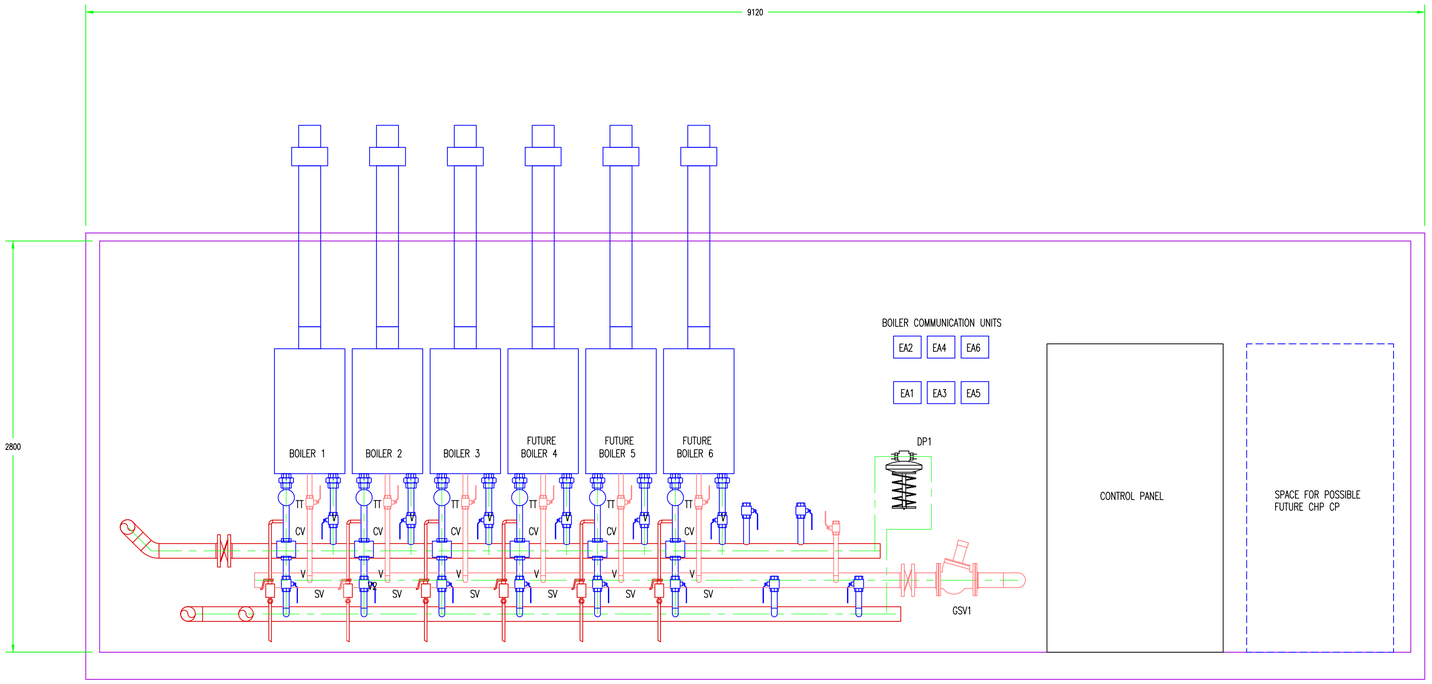
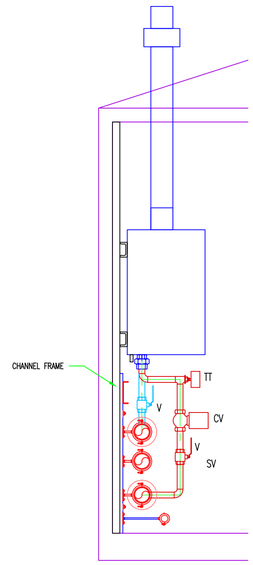
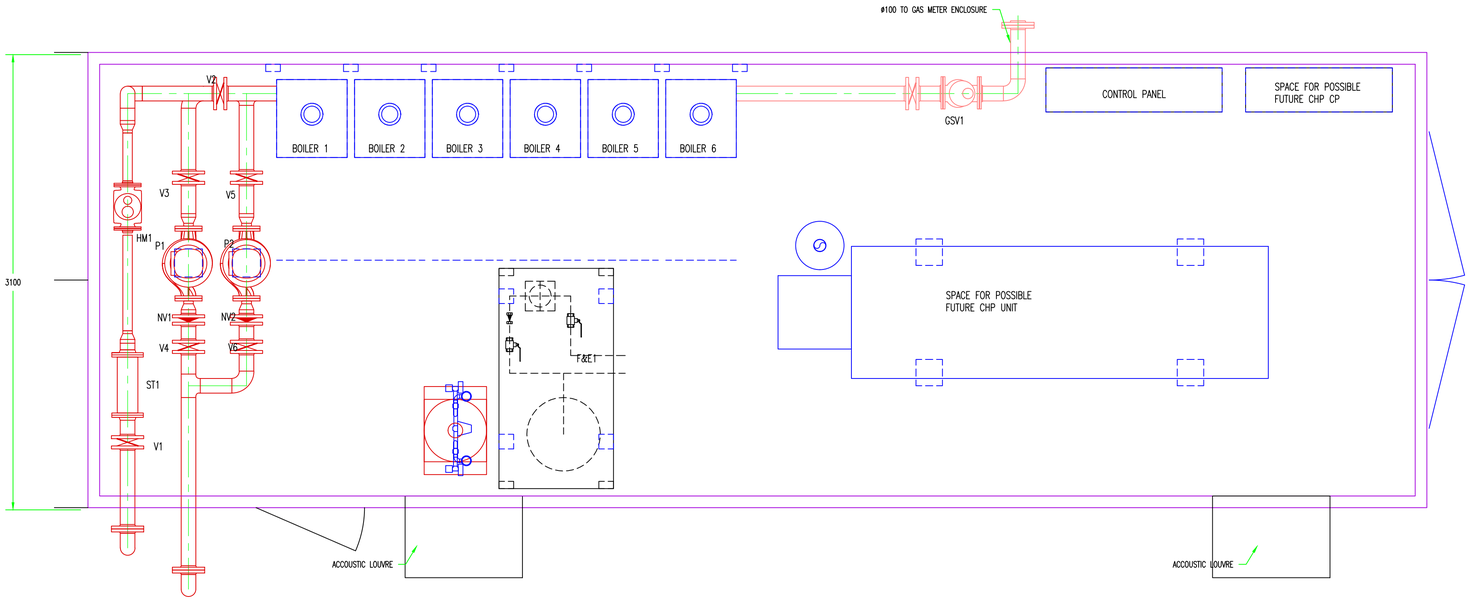
Drawing Number 22985440







B	ISSUED FOR INFORMATION	D.P.	W.R.	02.01.18
A	ISSUED FOR INFORMATION	D.P.	W.R.	30.10.17
Rev	Description	By	Chk'd	Date

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Project
TORRY DISTRICT HEATING SCHEME

Subject
HEAT STATION PIPEWORK & EQUIPMENT GENERAL ARRANGMENT

Scale	Drawn	Checked	Authorised	
1:50	D.P.	W.R.		A1
	Date 2.3.12	Date 2.3.12	Date	

Drawing Number
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ABERDEEN HEAT & POWER

HIGH LIMIT VALVE

DIFFERENTIAL PRESSURE VALVE

CONTROL VALVE

BUTTERFLY VALVE

PUMP

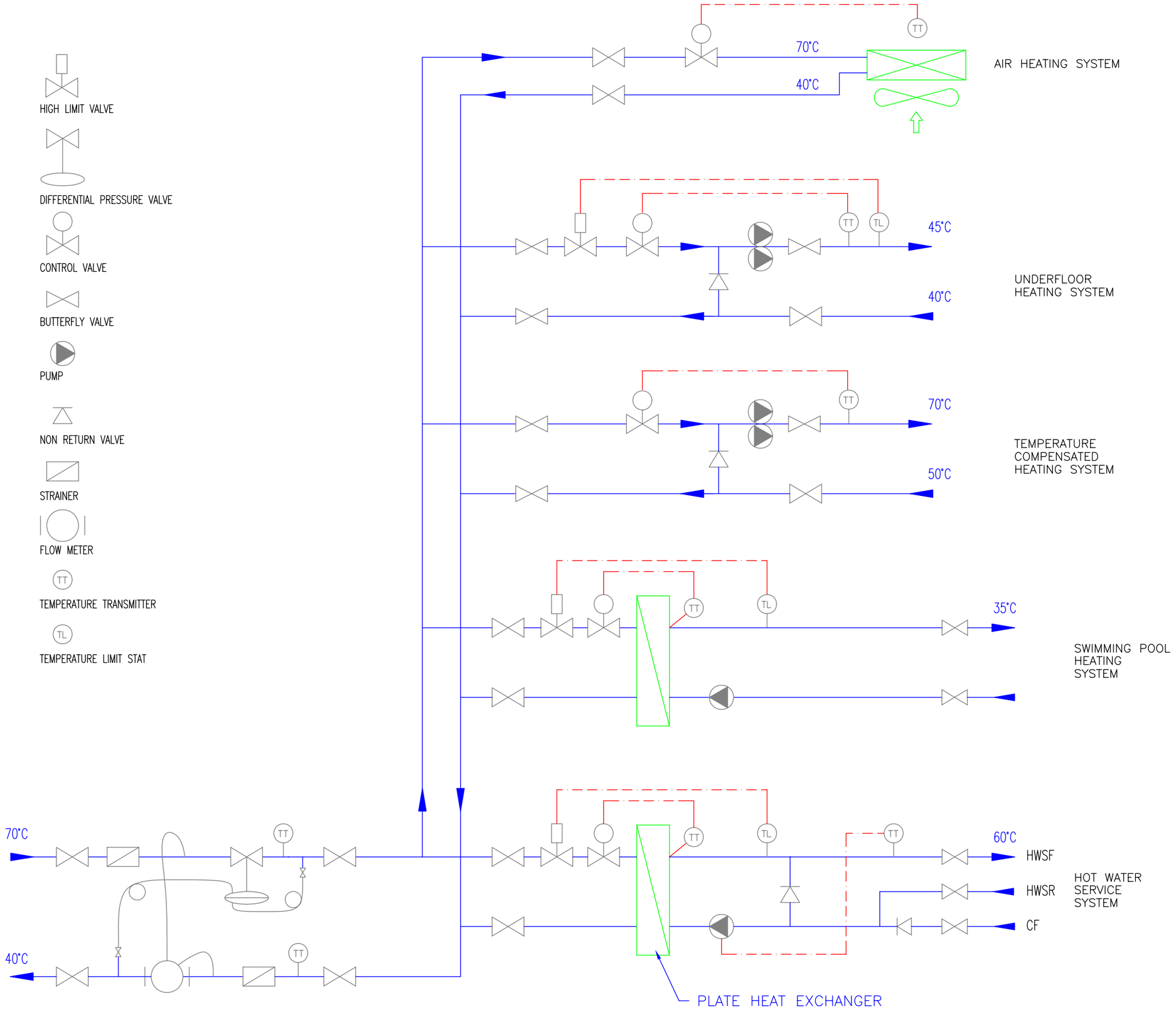
NON RETURN VALVE

STRAINER

FLOW METER

TT TEMPERATURE TRANSMITTER

TL TEMPERATURE LIMIT STAT



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Project

TORRY DISTRICT HTG PHASE 1A

Subject

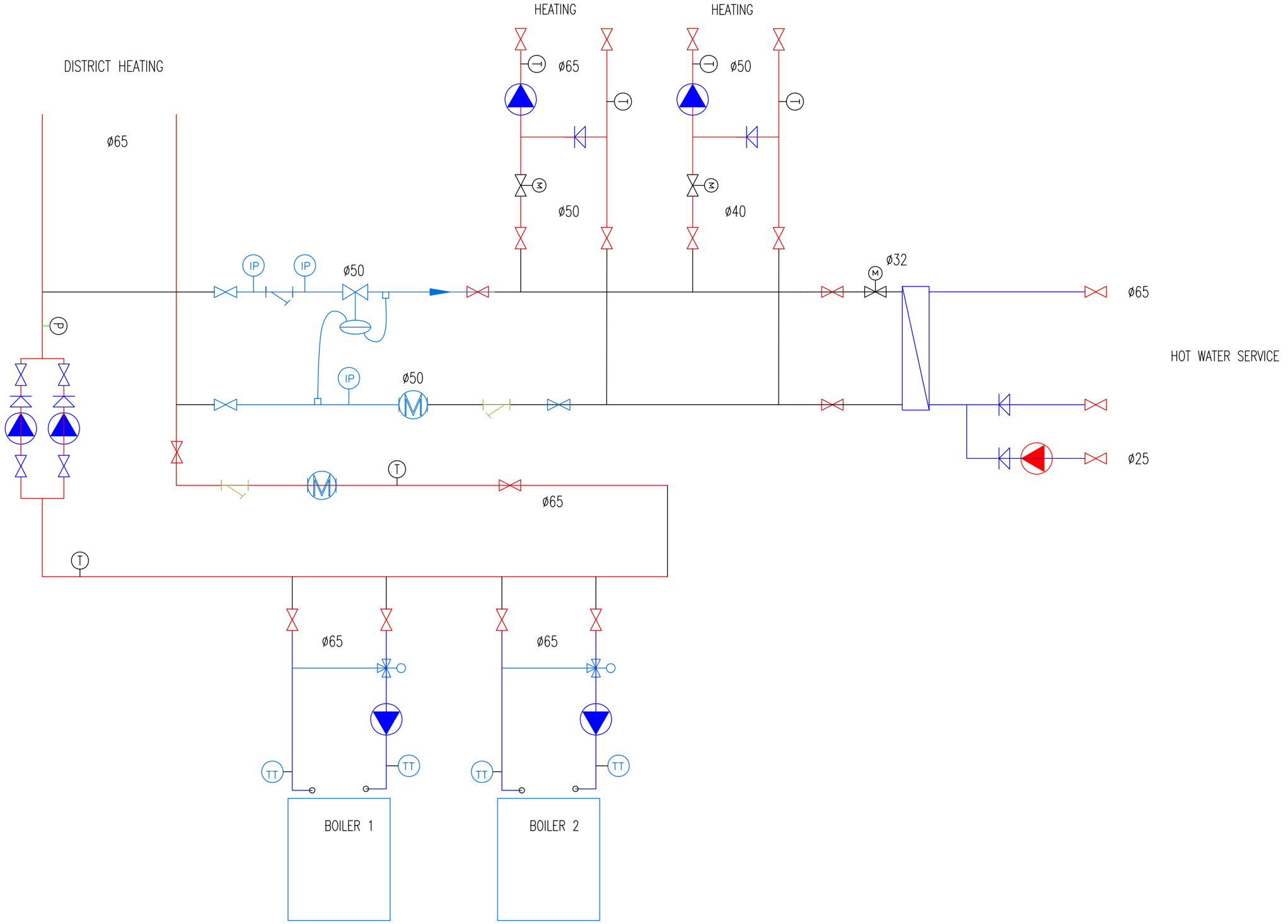
HEATING CONNECTION AND CONTRIOL TO NON DOMESTIC

Scale	Drawn	Checked	Authorised	
NS	D.P.	W.R.		A3
	Date 6.4.17	Date 6.4.17	Date	

Drawing Number

2296777

ABERDEEN HEAT & POWER LTD



Rev	Date	Rev	Date	Rev	Date
A	30.10.17				

ABERDEEN HEAT & POWER LTD

Subject

PROVOST HOGG PLANTROOM
LINE P&I DIAGRAM

Project

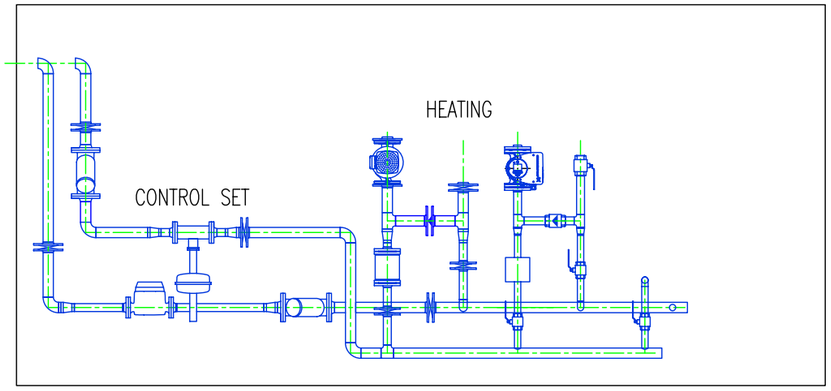
TORRY DH PHASE 1A

I E U
Middle Reach. Ridley Hill
Kingswear. Devon TQ6 0BY.
Tel 01803 752851

Scale	Drawn	Checked	Authorised
NS	D.P.	W.R.	
	Date 13.3.17	Date 13.3.17	Date

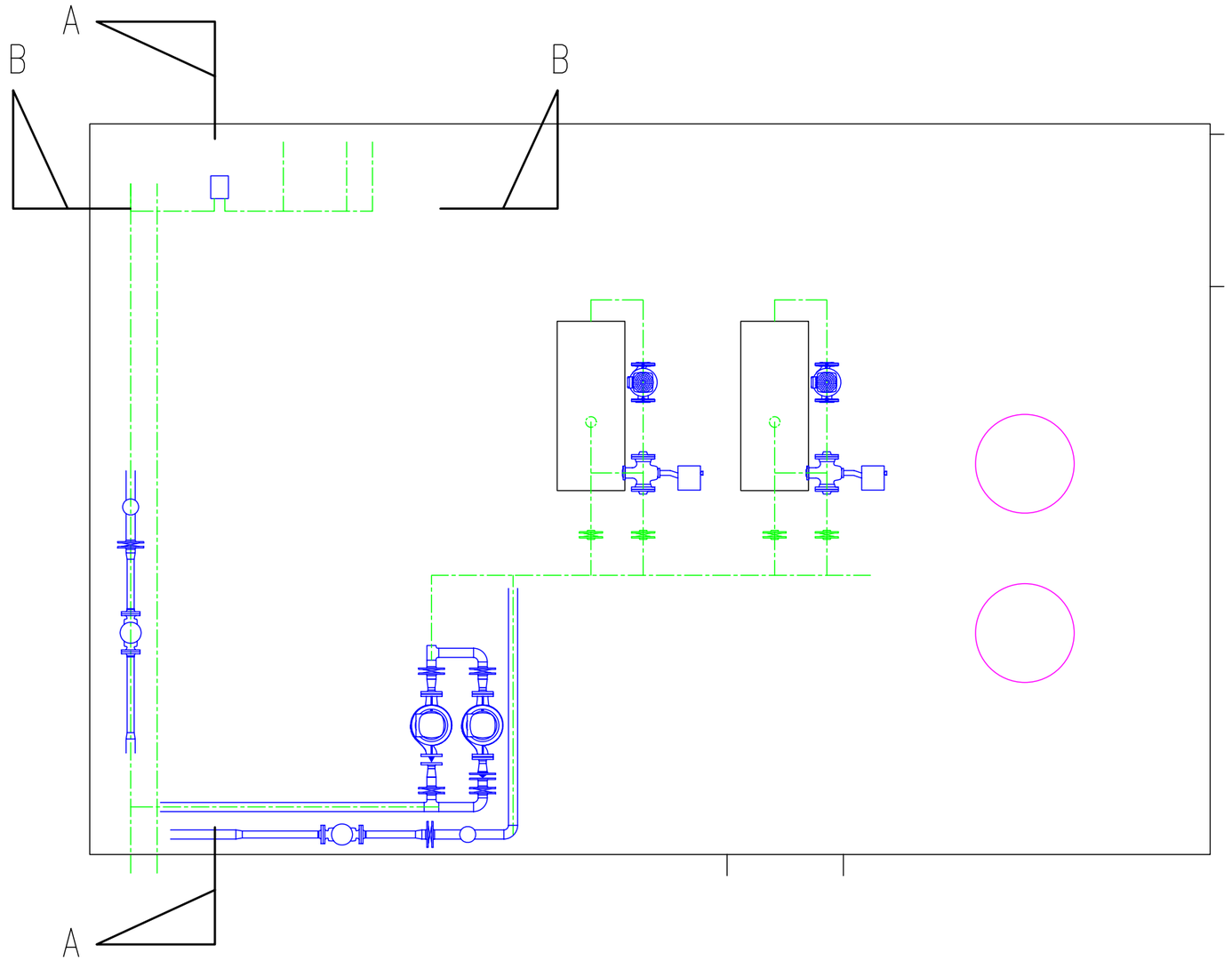
Drawing Number

22969691



VIEW A–A

VIEW B–B



Rev	Date							
A	30.10.17		ABERDEEN HEAT & POWER LTD	Subject: PROVOST HOGG PLANTROOM G.A.	Project: TORRY DH PHASE 1A	I E U Middle Reach. Ridley Hill Kingswear. Devon TQ6 0BY. Tel 01803 752851	Scale: NS	Drawn: D.P. Date: 13.3.17	Checked: W.R. Date: 13.3.17	Authorised: Date:	A3

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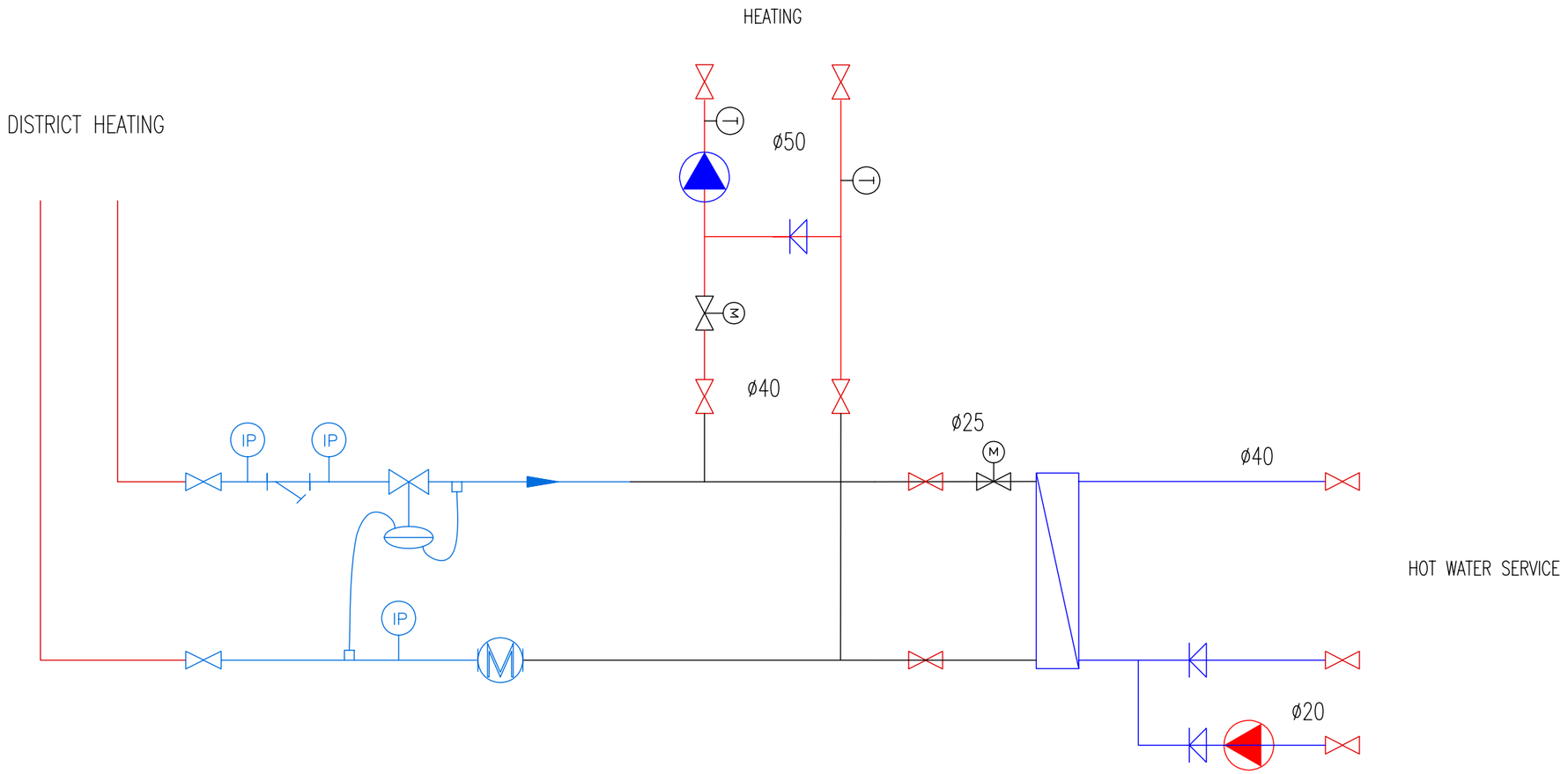


Rev	Date	Rev	Date	Rev	Date
A	30.10.17				

ABERDEEN HEAT & POWER LTD

Subject

DEESIDE CENTRE PLANTROOM
LINE P&I DIAGRAM

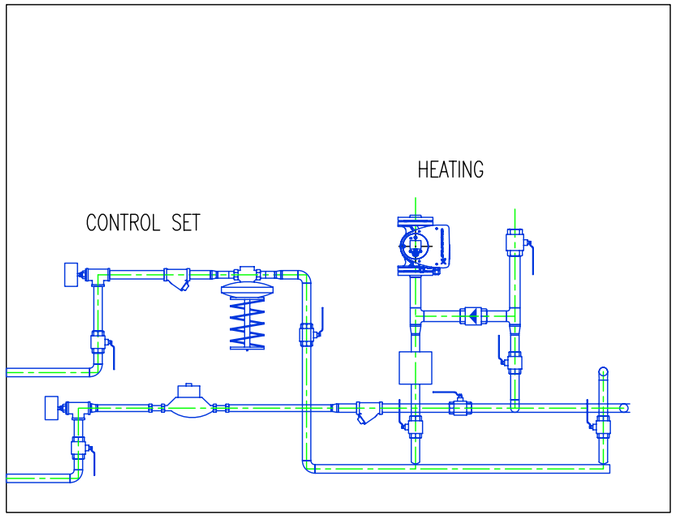
Project

TORRY DH PHASE 1A

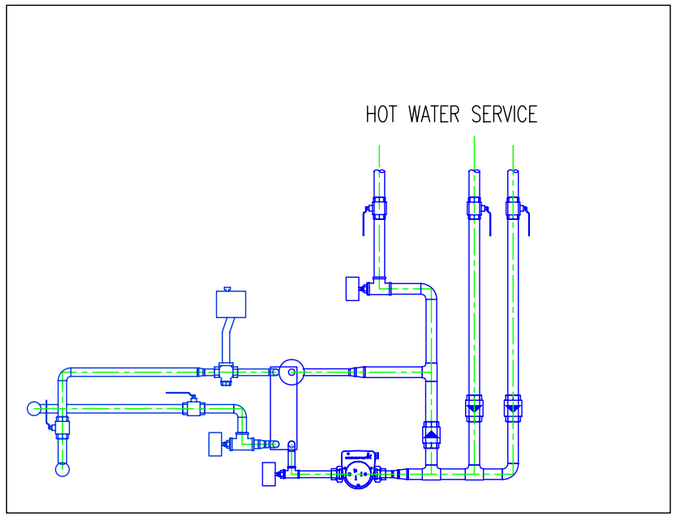
I E U
Middle Reach. Ridley Hill
Kingswear. Devon TQ6 0BY.
Tel 01803 752851

Scale	Drawn	Checked	Authorised
NS	D.P.	W.R.	
	Date 13.3.17	Date 13.3.17	Date

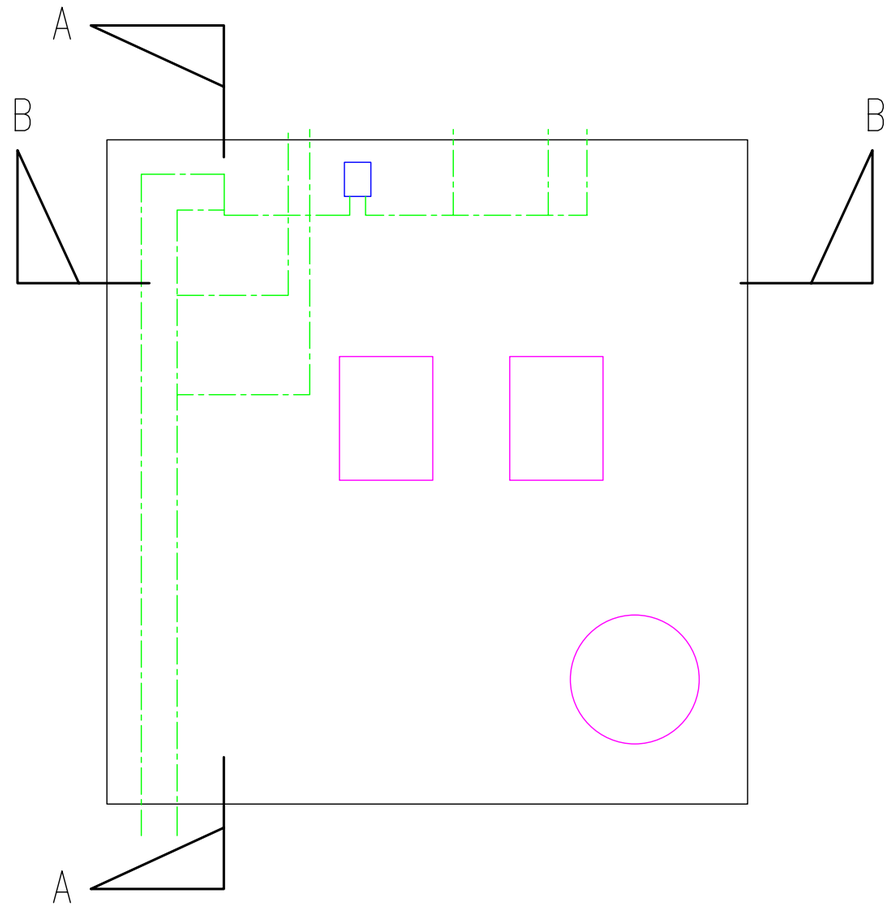
Drawing Number
22969693



VIEW A–A



VIEW B–B



Rev	Date						
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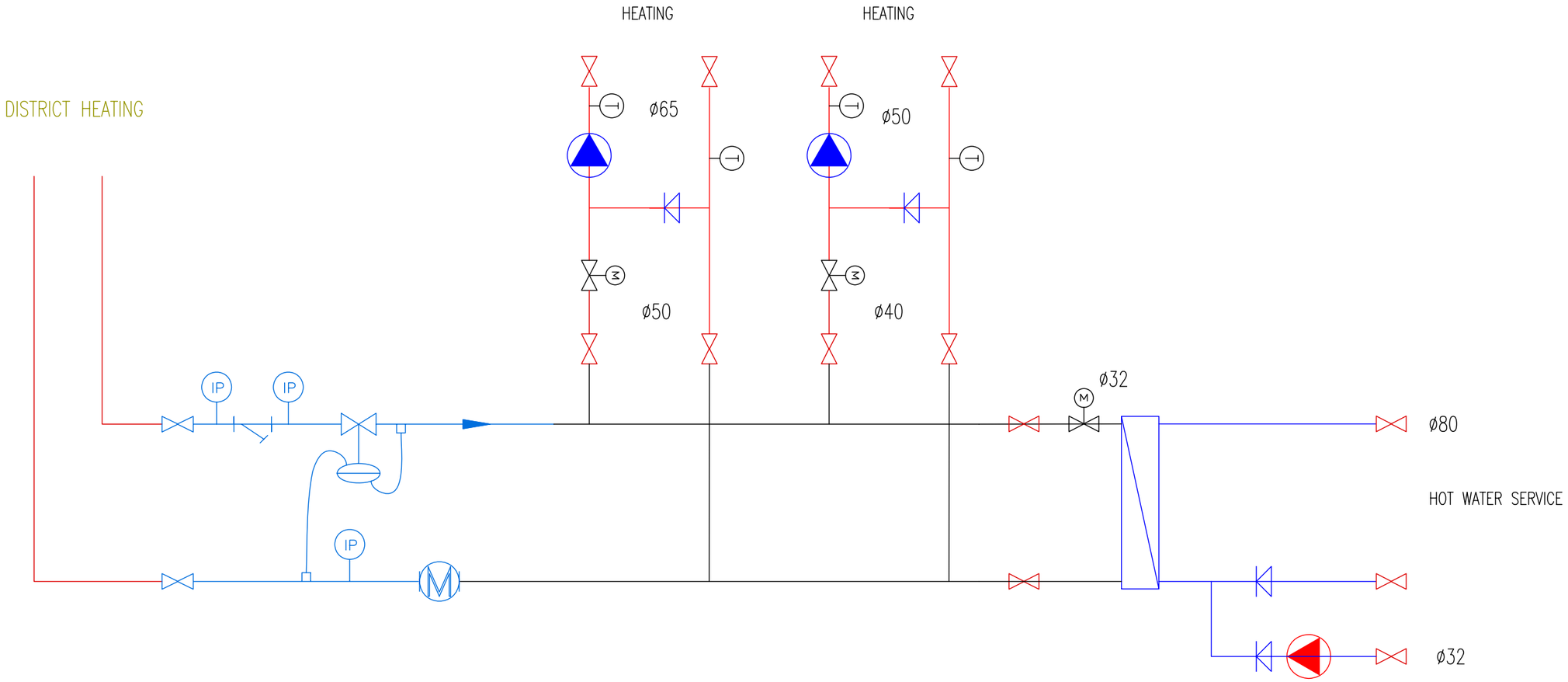


Rev	Date	Rev	Date	Rev	Date
A	30.10.17				

ABERDEEN HEAT & POWER LTD

Subject

BALNAGASK HOUSE PLANTROOM
LINE P&I DIAGRAM

Project

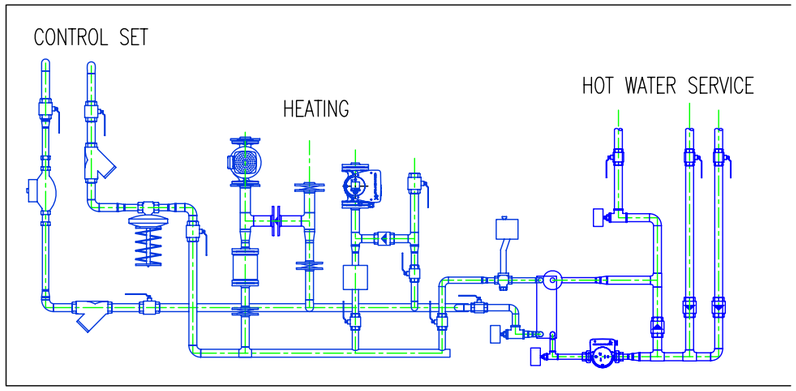
TORRY DH PHASE 1A

I E U
Middle Reach. Ridley Hill
Kingswear. Devon TQ6 0BY.
Tel 01803 752851

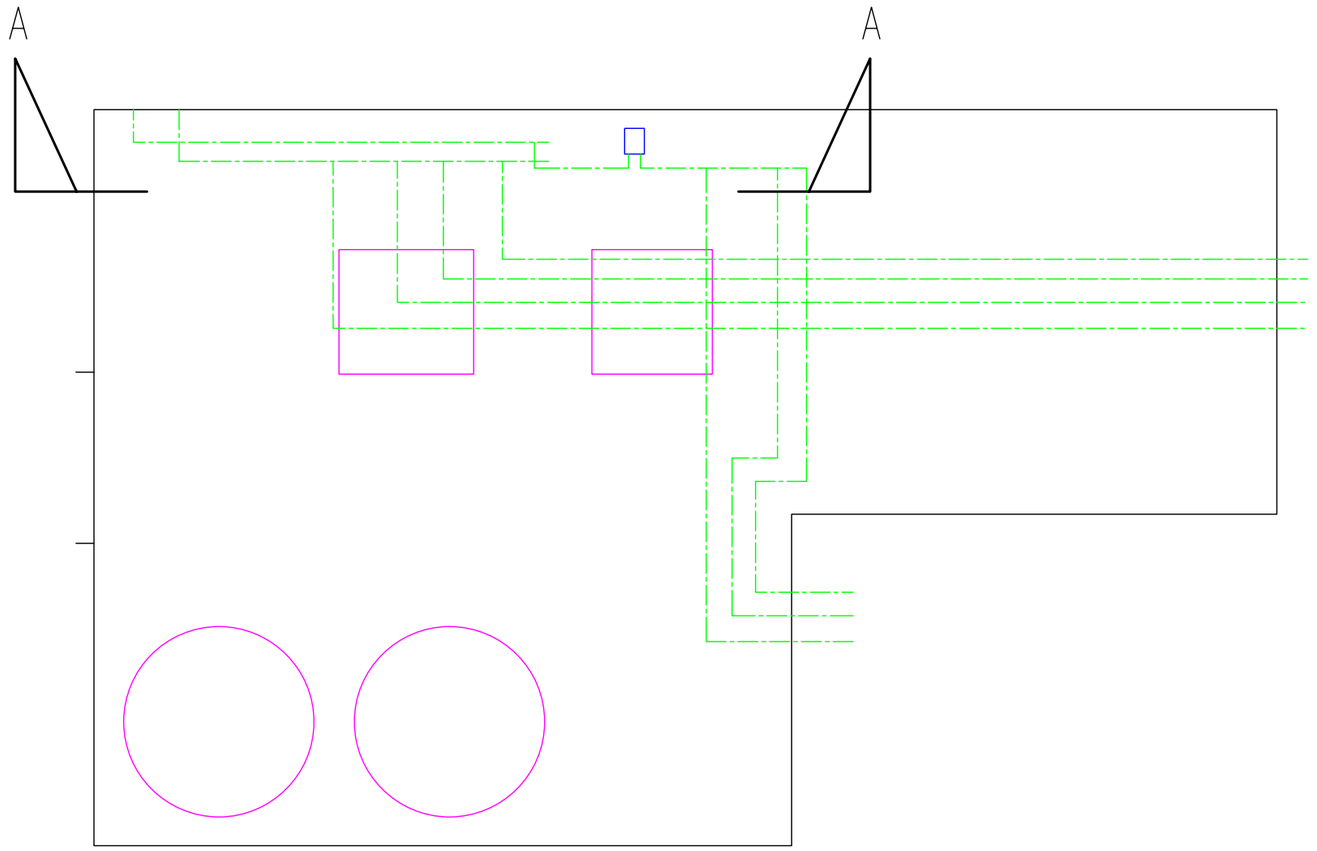
Scale	Drawn	Checked	Authorised
NS	D.P.	W.R.	
	Date 13.3.17	Date 13.3.17	Date

Drawing Number

22969692



VIEW A–A



Rev	Date			Subject	Project		Scale	Drawn	Checked	Authorised	
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								Date 13.3.17	Date 13.3.17	Date	
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