ABERDEEN CITY REGION DEAL:
Powering Tomorrow's World

BUSINESS CASE	
Project name	Duct Network Extension
Theme	Digital
Lead	Richard Sweetnam, Chief Officer City Growth
Date	13 April 2018

1. Executive Summary

The Aberdeen City Region Deal was signed in November 2016 between Aberdeen City Council, Aberdeenshire Council, Opportunity North East, and the Scottish and UK Governments. The Deal aims to deliver economic benefits to the region through investment in innovation and infrastructure.

Aberdeen City Region has limited digital infrastructure compared to the rest of the UK and its global competitors. The situation has been improved by Aberdeen City Council successfully utilising an anchor tenant model to stimulate the local broadband market and increase the number of premises within Aberdeen that have access to ultrafast services. This work is continuing under the City Region Deal and by the end of 2020 there will be 389 public sector sites connected to ultrafast services, the infrastructure for which will provide 60% of premises within the Aberdeen City Region with potential access to gigabit speed fibre to the premises. The success of this approach has been borne out by the recent announcement by CityFibre and Vodafone to deploy 800km of fibre across Aberdeen, making fibre to the home accessible to approximately 80,000 homes by 2021.

With a view to stimulating the communications market Aberdeen City Council has also unlocked the spare capacity within its existing duct network through a lease type agreement with the operator for space to install a sub-duct for fibre optic cables. This achieved immediate success with two communication infrastructure companies having formal agreements in place to enable rapid deployment of their communication services with greatly decreased disruption to the public. One of the infrastructure companies is focused on mobile connectivity and has, through a separate contract commissioned by the Council, used the space to connect small cell mobile communication sites that are enabled for future network technologies.

This project aims to build on this success by extending the City's duct infrastructure further and providing the necessary foundations for the delivery of the wider digital theme within the City Region Deal which includes:

- Deployment of a sensor network
- Establishment of a regional data exchange to address collation and use of data in the region

The deployment of the duct network will focus on the strategic road corridors, with an aim to provide connected corridors, fit for future growth particularly around Connects and Autonomous Vehicles (CAV's). CAV's have been described as the next 'mobile device' beyond the current generation of smart phones, tablets and emerging wearable devices. The potential benefits of CAVs are significant, with recent research suggesting a value of £51 billion per year to the UK economy by 2030. The enabling infrastructure to support the introduction of sophisticated, highly connected and increasingly autonomous vehicles is, therefore, of real significance to the automotive industry and wider society.

The total cost of the project is estimated to be £5 M over a period of three and a half years. It is proposed that it will be funded by City Region Deal monies.

Current Landscape

The National Infrastructure Commission published a report "Connected Future" which sets out the steps the Government needs to take for the UK to become a world leader in the deployment of 5G mobile telecommunications networks, and enable the UK to take early advantage of the applications those networks may enable.

The Commission's central finding is that mobile connectivity has become a necessity. The market has driven great advances since the advent of the mobile phone but the Commission recommended that Government must play an active role to ensure that basic services are available wherever we live, work and travel, whilst our roads, railways and city centres must be made 5G ready as quickly as possible. This enabling infrastructure will lay the necessary groundwork for the introduction of sophisticated, highly connected and increasingly autonomous vehicles which are of increasing significance to the automotive industry and wider society.

The Market Failure in Aberdeen City Region

To date, the Aberdeen City Region has been poorly served when it comes to broadband infrastructure compared to the rest of the UK and its global competitors. In a 2014 study into superfast broadband coverage, Aberdeen City Region ranked 61 out of 63 UK regions; and in a separate worldwide study of Oil and Gas cities, the City Region recorded the second slowest connectivity speeds of all cities surveyed. The situation has improved as the Digital Scotland roll out has brought benefits to the region. Nevertheless the proportion of premises in the City Deal Region able to receive fixed superfast broadband services (>30 Mbps) is estimated to be 79%. This is adversely impacting economic performance and the competitive place credentials of the region, especially in terms of attracting and retaining key people to help drive the economy and in retaining graduates from the city's two universities.

Research carried out by GO ON UK shows that the Aberdeen City Region is one of those the most likely in the UK to adopt digital technologies. This is largely due to high skills levels, demand and a desire to use digital technology.
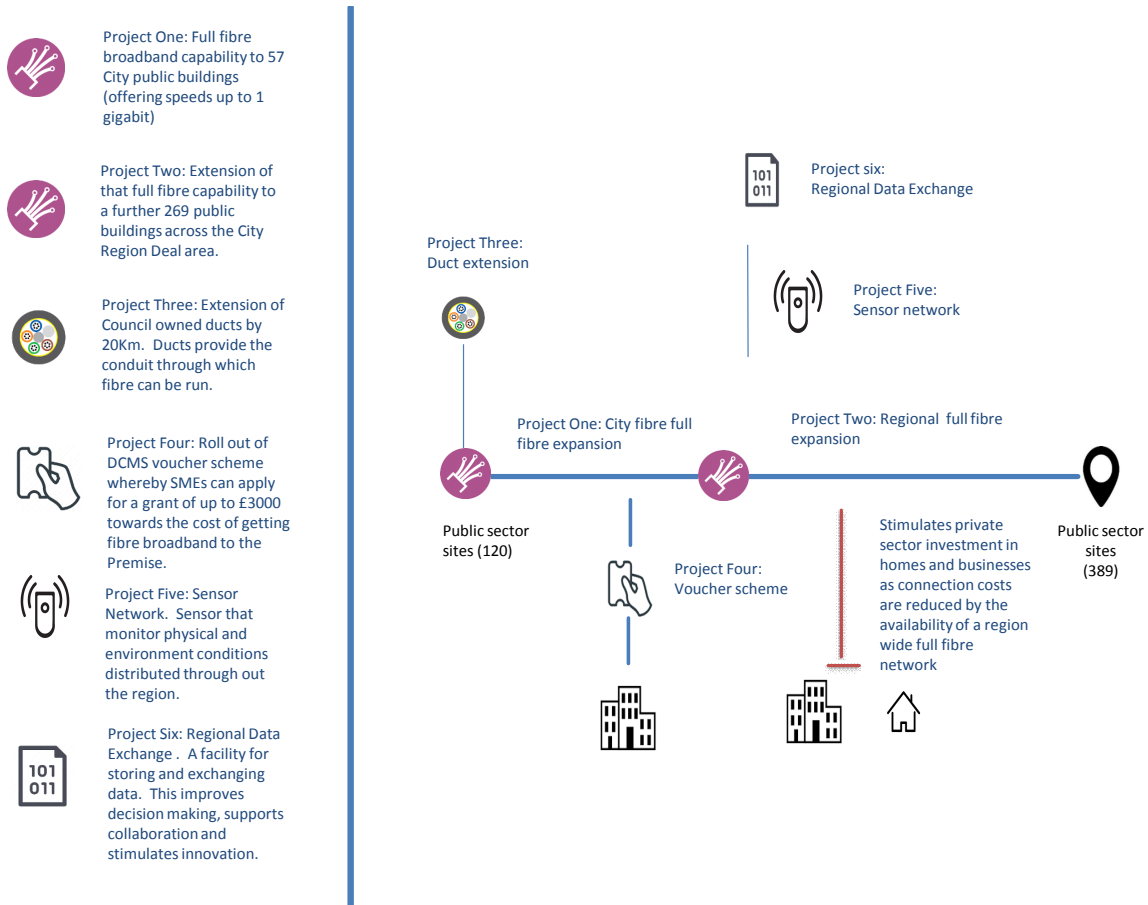
This demand in the City Region is not matched by supply. The issue is insufficient speed and availability to enable economic growth, delivery of modern public services and more sophisticated off campus academic and residential usage.

Local Activities Already Underway

The Aberdeen City Region Deal was signed in November 2016 between Aberdeen City Council, Aberdeenshire Council, Opportunity North East, and the Scottish and UK Governments. The Deal aims to deliver economic benefits to the region through investment in innovation and infrastructure.

Within the agreement, an ambitious vision is set out for a digitally connected smart city region with deployment of a sensor network and regional data exchange.

There are six digital projects within the Deal and these are set out in Figure 1. This project forms Project Three – extension of Aberdeen City's duct network.

Project One: Full fibre broadband capability to 57 City public buildings (offering speeds up to 1 gigabit)

Project Two: Extension of that full fibre capability to a further 269 public buildings across the City Region Deal area.

Project Three: Extension of Council owned ducts by 20Km. Ducts provide the conduit through which fibre can be run.

Project Four: Roll out of DCMS voucher scheme whereby SMEs can apply for a grant of up to £3000 towards the cost of getting fibre broadband to the Premise.

Project Five: Sensor Network. Sensor that monitor physical and environment conditions distributed through out the region.

Project Six: Regional Data Exchange . A facility for storing and exchanging data. This improves decision making, supports collaboration and stimulates innovation.

Since 2015, Aberdeen City Council has been successfully utilising an anchor tenant model to stimulate the local broadband market and increase the number of premises within Aberdeen that have access to ultrafast services. This work is continuing under the City Region Deal and by the end of 2020 there will be 389 public sector sites connected to ultrafast services, the infrastructure for which will provide 60% of premises within the Aberdeen City Region with potential access to gigabit speed fibre to the premises. The success of this approach has been borne out by the recent announcement by CityFibre and Vodafone to deploy 800km of fibre across Aberdeen, making fibre to the home accessible to approximately 80,000 homes by 2021.

With a view to stimulating the communications market Aberdeen City Council has also unlocked the spare capacity within its existing duct network through a lease type agreement with the operator for space to install a sub-duct for fibre optic cables. This achieved immediate success with two communication infrastructure companies having formal agreements in place to enable rapid deployment of their communication services with greatly decreased disruption to the public. One of the infrastructure companies is focused on mobile connectivity and has, through a separate contract commissioned by the Council, used the space to connect small cell mobile communication sites that are enabled for future network technologies.

O2 and Wireless Infrastructure Group (WIG) have installed the UK's first fibre connected small cell network in the Granite City. The first 5G-ready technology was switched on in city centre locations such as the railway station, the University of Aberdeen and Pittodrie in October 2017.

The wireless infrastructure uses a network of small cells attached to lamp-posts and traffic lights across Aberdeen's city centre. Cells are connected back to a nearby centre using fibre links which deliver faster and higher capacity mobile services. This technology is viewed as being essential for the advancement of future applications such as driverless vehicles and has laid the groundwork for these being deployed across the city in future.

The Proposal

This project aims to build on this success by extending the City's duct infrastructure further and providing the necessary foundations for the delivery of the wider digital theme within the City Region Deal which includes:

- Deployment of a sensor network
- Establishment of a regional data exchange to address collation and use of data in the region.

The digital theme will address the collation and use of data in the region. It will improve the use of data, apply standards for its collection, recording and storage, and implement the means to share data securely. This will enable the application of data science techniques to model complex inter-connected service provision, predict demand and impact, and rationalise how we collaborate for outcomes and develop policy at a City Region level to optimise the cost effectiveness of public services and infrastructure use.

The Objectives

This project seeks to invest in the necessary infrastructure to achieve the following objectives:

- Facilitate increased competition in the fibre market and provide open access for multiple providers
- Provide the facilities to allow the Aberdeen City Region to function as a testbed where new infrastructure and service providers, technologies and services can be rapidly deployed, assessed and put into production (e.g. 5G, autonomous vehicles, etc.)
- Provide a platform for developing 'end to end' delivery routes in conjunction with other duct owners
- Improve resilience for public and private sector networks and the ability to respond to demand
- Improve digital infrastructure to allow public services to be delivered more cost effectively to a larger proportion of residents, increasing the efficiency and wellbeing of the area.
- Provide enabling infrastructure for the Sensor Network and Regional Data Exchange CRD projects

3. The Economic Case

This section outlines the options explored and explains how these were assessed.

Option 1 – Do Nothing	
Description	Take no action and leave duct expansion to market forces
Expected Costs	£0
Risks Specific to this Option	Lack of market appetite from commercial suppliers to invest in duct network . Digital infrastructure in Aberdeen City Region will be constrained by commercial offerings and associated market interests and delay the development of the necessary infrastructure for the provision of world-class digital services.
Advantages & Disadvantages	No funding commitment from CRD funds required

Option 2 – Commercially Built Ducts	
Description	Active engagement is undertaken with the market to encourage commercial suppliers build ducts at their own expense.
Expected Costs	£55K
Risks Specific to this Option	Lack of market appetite Dependent upon commercial suppliers being willing to share duct space with other providers – there are currently significant challenges getting suppliers to share ducts Public services are subject to market rates and potential associated increase in costs Some suppliers do not use ducts for the deployment of fibre and instead choose to use narrow trenching which cannot be shared.
Advantages & Disadvantages	To date there has been limited deployment of duct networks by commercial suppliers and indications are that this is unlikely to improve in the near future.

Option 3 – Extend the Existing Duct Network	
Description	Extend the existing duct network to cover the primary travel to work routes in Aberdeen City.
Expected Costs	£4.8M
Risks Specific to this Option	Levels of commercial uptake of duct space may not meet expectations
Advantages & Disadvantages	Opportunity to do joint digs with other parties e.g. CityFibre – this could reduce costs and maximise the use of resources. Will reduce cost to public sector organisations in future for delivering services. Market analysis has indicated the costs to purchase / rent duct access piecemeal from the commercial sector would be prohibitive for public sector organisations. Enabling infrastructure for sensors, cameras, etc. which will facilitate reduced emissions, improved traffic flow, and provide data for innovative apps and deployment of autonomous vehicles. Fibre will need to be procured separately.
Other Points	Aberdeen City Council has duct sharing experience and associated development of wayleave agreements - currently provide to NHS; Aberdeen College; Aberdeen University; telecare; mobile work

Option 4 – Extend the Existing Duct Network and Install Dark Fibre	
Description	Extend the existing duct network to cover the main economic areas identified in the Strategic Case and install dark fibre.
Expected Costs	£5M
Risks Specific to this Option	Levels of commercial uptake of duct space may not meet expectations Lack of market interest in lighting fibre
Advantages & Disadvantages	Fibre will already be installed and available to be lit. Opportunity to do joint digs with other parties e.g. CityFibre – this could reduce costs and maximise the use of resources.

	Will reduce cost to public sector organisations in future for delivering services. Market analysis has indicated the costs to purchase / rent duct access piecemeal from the commercial sector would be prohibitive for public sector organisations. Enabling infrastructure for sensors, cameras, etc. which will facilitate reduced emissions, improved traffic flow, and provide data for innovative apps and deployment of autonomous vehicles.
Other Points	Aberdeen City Council has duct sharing experience and associated development of wayleave agreements - currently provide to NHS; Aberdeen College; Aberdeen University; telecare; mobile work

Objectives	Options Scoring Against Objectives			
	1	2	3	4
Facilitate increased competition in the fibre market	✗	✗	✓	✓
Provide the facilities to allow the Aberdeen City Region to function as a testbed where new infrastructure and service providers, technologies and services can be rapidly deployed and assessed	✗	✗	✓	✓
Provide a platform for developing 'end to end' delivery routes in conjunction with private sector duct owners	✗	✗	✓	✓
Improve resilience for public and private sector networks and the ability to respond to demand	✗	✗	✓	✓
Improve digital infrastructure to allow public services to be delivered more cost effectively to a larger proportion of residents, increasing the efficiency and wellbeing of the area.	✗	✗	✓	✓
Provide enabling infrastructure for the Sensor Network and Regional Data Exchange CRD projects	✗	✗	✗	✓
Ranking	4	3	2	1

The proposal for expanding the Councils fibre optic duct network will enhance the potential for rapid deployment of small cell communication sites. The Connect Future Report[1] highlights the importance of such infrastructure, particularly for the automotive industry;

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[1] *Connected Future Report*, National Infrastructure Commission 2016

"In the automotive industry, the low latency and high capacity capabilities of 5G will help facilitate the evolution of highly connected and, ultimately, fully autonomous vehicles. And, in sectors as varied as healthcare and gaming, the potential for new services – like real time health monitoring and augmented reality to improve lives and generate growth is enormous.

Realising these benefits will require the deployment of tens of thousands of new small cell mobile base stations connected to fibre optic cables, which will necessitate investment, coordination and removal of a number of regulatory barriers. In order to pave the way towards the vision of an always on, reliable and high speed network, it will be vital to address existing issues, such as areas of poor coverage."

The deployment of the duct network will focus on the strategic road corridors, with an aim to provide connected corridors, fit for future growth particularly around Connects and Autonomous Vehicles (CAV's). CAV's have been described as the next 'mobile device' beyond the current generation of smart phones, tablets and emerging wearable devices. The potential benefits of CAVs are significant, with recent research suggesting a value of £51 billion per year to the UK economy by 2030. The enabling infrastructure to support the introduction of sophisticated, highly connected and increasingly autonomous vehicles is, therefore, of real significance to the automotive industry and wider society.

Scope

An initial network design has been undertaken to show how this footprint will be expanded. This is presented below:

Proposed Full Fibre Network Design
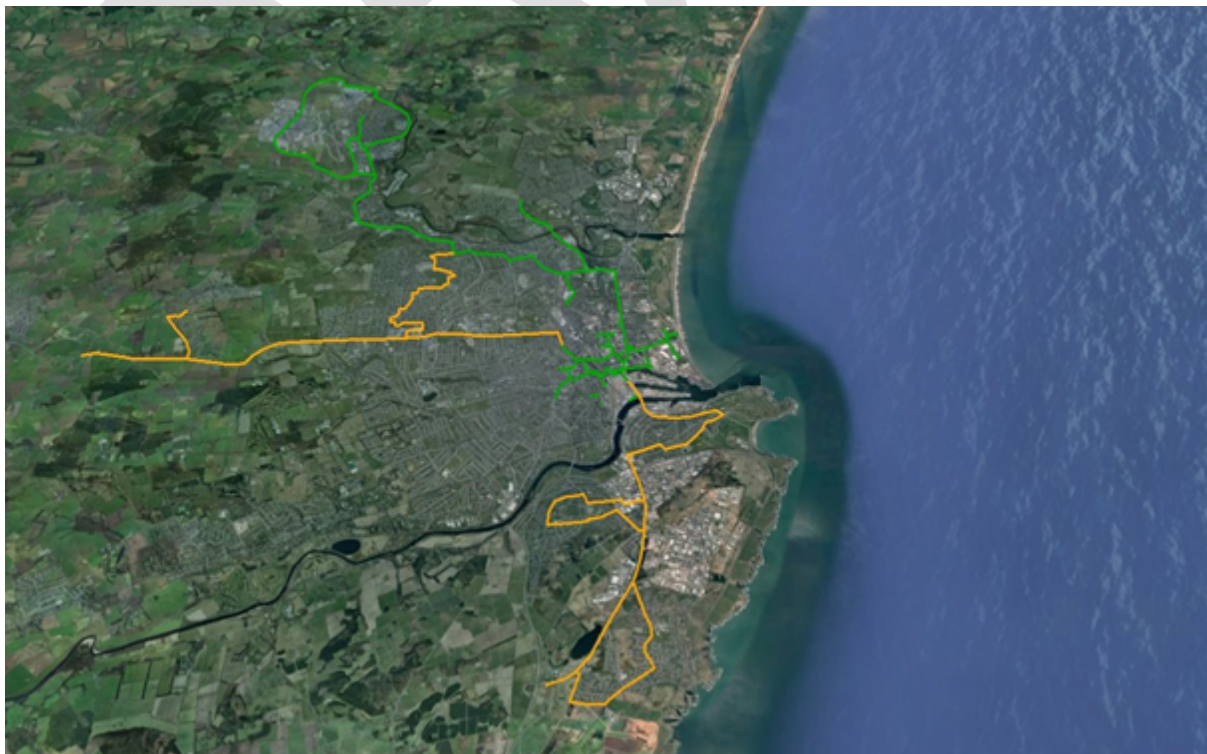
The length of duct required will be 20km.

Benefits

The project will provide the following benefits in support of the Aberdeen City Region Deal.

Benefit	Measures	Baseline
Stimulate the market to increase competition	No. of communication providers in the local market	2
Quickly deploying 5G small-cell	No. of small-cell communication sites	0
	Uptake of 5G	0%
	Cost of 5G	To be identified
Early adoption of autonomous vehicles	No. of suppliers testing autonomous vehicles in Aberdeen	0
Cost-effective Enabling Digital Infrastructure	Ducts along primary travel to work routes	
	Implement smart transport network	
	No. of duct partners (e.g. NHS, Police, Universities, etc.)	3

4. The Commercial Case

Networks Management Organisation

Aberdeen City Council currently offers both commercial and public sector access to duct infrastructure and have mechanisms in place to prevent "lock out" by single providers sitting on unused capacity in the duct. There are currently two commercial providers sharing Aberdeen City Council ducts along with the NHS from the public sector.

It is proposed that a networks management organisation would be established to support the deployment of new fibre infrastructures and collaborative interoperability across public and private sector capacity. This organisation would proactively engage with both the private and public sector to facilitate the use of the available ducts to deploy future digital services. The model is a collaborative one and the ownership structure would be designed to evolve around open standards of access and development.

The public realm asset ducting would host and/or connect to resources required to operate public and private (smart) services that will increase the efficiency and thereby the social and economic performance of the Aberdeen City Region Deal area.

Challenges and Risks

The project will face the following challenges and risks. Where mitigation has been identified this is included

Risk	Mitigation
Joint digs – these may offer benefits by reducing build costs by sharing digs with other suppliers in the area. There are challenges around any potential shared liability issues	Engagement with other providers in the market to be held to identify opportunities for joint digs – agreements to be developed in relation to liability, wayleave agreements, etc.
Operational barriers to swift deployment of new infrastructure such as unnecessarily restrictive planning constraints, traffic management policies, etc.	Both local authorities will work to ensure all operational constraints are removed such as planning approvals, permits, impact on street scene etc.
Procurement timescales and the risk that operators may have multiple procurements to be undertaken in parallel	A project team will be established to ensure there is dedicated resource and

	focus. The use of SWAN will assist with a more rapid procurement timeframe.
Interdependencies between digital infrastructure and transport programmes	CRD digital programmes are managed by the same Workstream Group. Dialogue is ongoing with local partners and the Scottish Government to ensure these are fully complementary.
Risk around commercial demand for duct space	Engagement with small regional players ongoing
Opportunity to Negotiate with Transport Scotland to connect into all of their data and link up their duct and sensor networks with Aberdeen City's.	Discussions have begun with Transport Scotland to identify and agree how this can be achieved.

5. The Financial Case

The total estimated cost for this project is £5M .

The project will be funded by Aberdeen City Region Deal monies. The project funding sources are set out in Table 5.3.

Source	£('000)
UK Government	**(2,000)**
Scottish Government	**(2,000)**
Local Government	**(1,000)**
Total	**(5,000)**

Project Resource Requirements

An appropriately resourced project team will require to be established for the duration of the project with expertise in the following:

- project management
- procurement
- contract management
- roads engineering
- traffic management

Resource Required	No. of FTE	Project Stage	Time Period
Infrastructure Project Manager – day-to-day management of project	1	Design, Procurement and Build	4 years
Procurement Advice/Category Manager	0.25	Procurement	1 year
Commercial Solicitor	0.25	Procurement	1 year
Roads Engineer	1	Design and Procurement	1 year
Roads Engineer	0.2	Build	3 years
Technical Officer	1	Design, Procurement and Build	4 years

Inspector	2	Build	3.5 years

State Aid

Investment in any duct infrastructure is driven by public sector usage and hence is state aid compliant. The Scottish Government State Aid unit have been consulted on the commercial exploitation of the City Council's duct network.

6. The Management Case

Governance

A workstream group has been established for the Digital theme and it is responsible for delivering the Business Cases for the constituent projects, identifying and arranging relevant resources, initiating the projects, and in partnership with the Programme Management Office, monitoring and reporting progress. Stephen Archer, Director of Infrastructure Services at Aberdeenshire Council, is the workstream lead and coordinates the activities of the Group.

Linkage to the Aberdeen City Region Deal Programme Board and to the Joint Committee is provided by the Programme Manager who sits on all workstream groups.

The governance structure for the Aberdeen City Region Deal is shown below:
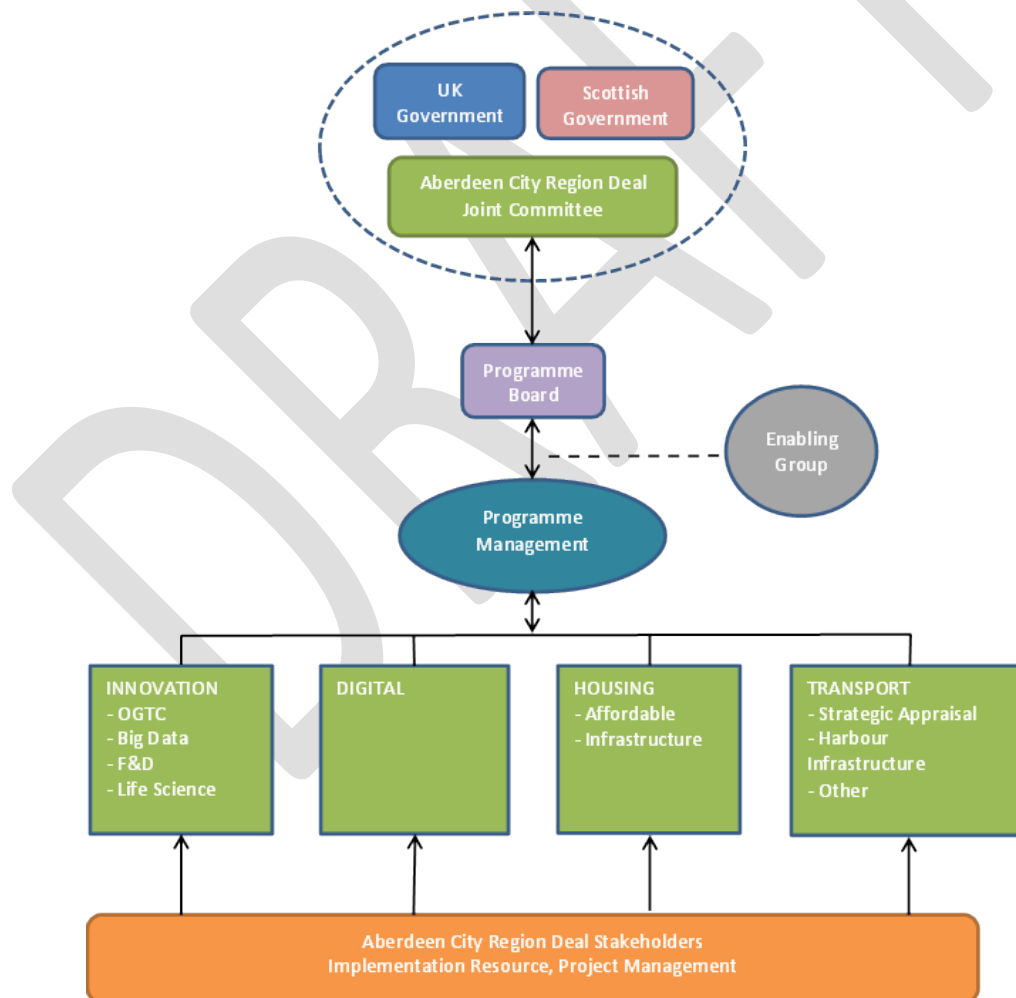
- Project Status Reports will be provided by the Project Manager to the Project Board on a monthly basis

- Digital Theme Dashboard to be compiled by the CRD Programme Manager on a monthly basis for scrutiny by CRD Digital Group
- Digital Theme Update to be provided to the City Region Deal Joint Committee quarterly
- Project Change Controls to be submitted for approval to the Project Board within the agreed tolerances. Outwith these tolerances, they will require to be submitted to the CRD Digital Group.

Outline Plan

The proposed duct infrastructure will be procured during early 2019. A phased approach will be taken, with one contract being awarded first followed by the second six months later. The infrastructure build will take approximately 4 years in total, with the first route being completed mid-2020 and the second late 2021.

The primary milestones are set out below:

Milestone	Date
Review of Business Case by Scottish Government	May 2018
Peer Review of Business Case	May 2018
Implementation Team Appointed	June 2018
Begin Design Phase	June 2018
Complete Design Phase	December 2018
Begin Implementation	June 2019
Duct Network Completed	October 2021