North Yorkshire County Council

# MALTON, NORTON & OLD MALTON FLOOD ALLEVIATION

## Wider Economic Impacts of Flooding

North Yorkshire County Council

# MALTON, NORTON & OLD MALTON FLOOD ALLEVIATION

## Wider Economic Impacts of Flooding

**TYPE OF DOCUMENT (VERSION) CONFIDENTIAL**

**PROJECT NO. 62240851**
**OUR REF. NO. 70047602**

**DATE: JULY 2018**

WSP
1st Floor LS1 Headrow,
Unit 113 The Headrow
Leeds
LS1 5JW

WSP.com

# QUALITY CONTROL

| Issue/revision | First issue | Revision 1 | Revision 2 | Revision 3 |
|---|---|---|---|---|
| Remarks | issue | Table text | Table text | Table text |
| Date | Aug 2018 | Table text | Table text | |
| Prepared by | H Grayson | Table text | Table text | |
| Signature | | | | |
| Checked by | J Pickering | Table text | Table text | Table text |
| Signature | | | | |
| Authorised by | T Jolley | Table text | Table text | Table text |
| Signature | | | | |
| Project number | 62240851 | Table text | Table text | Table text |
| Report number | 62240851-001 | | | |
| File reference | \\uk.wspgroup.com\central data\Projects\62240xxx\62240851 - Malton Feasibility\02 WIP\DR Drainage engineer\Economic study | Table text | Table text | Table text |

# CONTENTS

# 4 CONCLUSIONS 16

# 1

# INTRODUCTION

# 1 INTRODUCTION

## 1.1 APPOINTMENT

WSP was commissioned by North Yorkshire County Council (NYCC) to assess the wider economic impacts of delivering improved flood alleviation measures in Malton.

This study will assess the wider economic impacts of flood alleviation works at Malton to provide data to support the application for a contribution from the Growth Fund via York, North Yorkshire, East Riding Local Enterprise Partnership (Y/NY/ER LEP). In addition, the opportunity will be taken to update the initial economic assessment to reflect more recent changes in MCM data.

## 1.2 BACKGROUND

### 1.2.1 FLOODING HISTORY

Malton, Norton and Old Malton are located on the River Derwent in North Yorkshire, sixteen miles north east of York. All three communities, which form a single urban area straddling the river, have a long history of flooding from the River Derwent, and were particularly badly affected in 1999 and 2000. The Regional Flood Defence Committee subsequently requested that the Environment Agency fast-track a project to reduce flood risk in the town. This led to the c. £9m Malton Flood Alleviation Scheme being completed in 2002. The defences comprised a combination of earth embankments (at Old Malton) and floodwalls (through the town centre) to prevent flooding from the river. Pumps were installed at the outfalls of Mill Beck and Priorpot Beck (Internal Drainage Board watercourses that are now Main River).

Since the construction of the River Derwent defences, the communities have been subject to flooding due to the accumulation of surface water behind the defences as well as being affected by groundwater emergence. The fast track nature of the 2002 river defences works did not allow surface water and ground water to be considered. Hence there is a residual risk of flooding to the community from these sources. This has resulted in properties flooding; transport links being disrupted and long periods of temporary pumping taking place. Whilst emergency response plans have been developed for Malton, Norton and Old Malton, the frequency and duration of the responses by flood risk management authorities is considered unsustainable and hence a more robust system is being sought.

### 1.2.2 RISK MANAGEMENT AUTHORITIES

As Lead Local Flood Authority, NYCC has responsibility for delivery of flood risk management in its area by co-ordinating the activities of all relevant agencies. It has specific management functions relating to ‘local flood risk’ from Surface water, Ground Water and Ordinary Watercourses. NYCC commissioned an investigation across the county following the flooding in December 2012, which included a case study of the effects in Malton Norton and Old Malton. Furthermore, it commissioned Arup to undertake the Malton, Norton and Old Malton Flood Study published in October 2015.

North Yorkshire County Council in its capacity as Lead Local Flood Authority has committed to funding up to £450k of the eventual scheme costs.

As Highways Authority, NYCC has a duty to manage and coordinate all works programmes that affect the highway; this includes works affecting roads, pavement, cycle lanes and paths. Work is carried out to ensure the Highway is safe and to keep people and goods moving. This work can include resurfacing; repainting road markings; repairs to lighting, drains and bridges; and winter gritting.

The resilience and emergencies unit is responsible for planning for a wide variety of potential incidents and emergencies that could affect the population of North Yorkshire. The unit supports regional and national responses, working with partner agencies in ensuring a co-ordinated effort to minimise disruption. It supports the North Yorkshire local resilience forum, which is made up of key responders in the community such as police, fire, utility providers and health, who come together to plan for and respond to the risks to our county.

In respect of flooding response in Malton a Pumping Plan has been developed to identify the location and sequencing of pump deployment in the community. It sets out where pumps need to go when, which risk management authority (RMA), provides contact details, the resources held by each party and trigger levels for bringing individual pumping locations in action.

Ryedale District Council (RDC) work with the Environment Agency, police, fire and rescue service and other support organisations to provide help to residents and businesses affected by flooding. RDC staff are deployed to provide support and to disseminate information to affected residents about flood warnings and actions to take. They hold stores of sand bags and have arrangements for their distribution in the case of severe flooding.

In 2017 RDC members approved a proposal to contribute to 20% of the shortfall in the scheme costs up to £350k. It has also made additional contributions towards the investigation of drainage systems in Old Malton. They have been proactive in initiating a bid to Y/NY/ER LEP to attract additional funding towards the scheme costs.

### 1.2.3 FCERM ECONOMIC APPRAISAL

Previous economic appraisal was completed in October 2015 by Arup (“Malton, Norton and Old Malton Flood Study”) in accordance with the Environment Agency’s Flood and Coastal Erosion Risk Management appraisal guidance (FCERM – AG). This appraisal utilised data from the Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal (MCM). This was based on the MCM 2013 dataset which has now been superseded by the 2018 dataset. However, the economic assessment for Malton had not been updated previously until this study (2018). The economic values derived by Arup were used within the Outline Business Case prepared by WSP in 2018.

Whilst the economic values have been acceptable by the EA and have enabled FD GiA grant funding towards a scheme to be identified in their Medium-Term Plan (MTP), like many other projects in the programme, this grant allocation is not sufficient to meet the total scheme costs. Hence NYCC have investigated a range of alternative funding sources to make up the shortfall between the grant allocation and the total cost of the scheme.

By economic activities we include all businesses and employees and all households and consumers within the local area selected for analysis. If the area is a tourist area, then tourists will make purchases with the local economy and they can then also be included. However, nationally the impact on tourism is less likely to affect the national economy, as it is assumed that the activity is transferred elsewhere in the country. Thus, when considering the impact on tourism the loss of business is considered a direct financial impact on the local area.

### 1.2.4 FUNDING

Funding contributions of £450k have been secured from the NYCC FRM budget and a contribution of up to £350k has been allocated by RDC.

Following an expression of interest made by RDC on behalf of NYCC, Y/NY/ER LEP have identified the potential for a £500k grant from the Growth Fund to be made towards flood alleviation works at Malton. To secure this funding it will be necessary to complete an application form which represents a business case to justify how flood alleviation measures contribute to the growth in the local community. This study will contribute additional information about the wider benefits of the scheme to the local economy that are needed to support this application.

### 1.2.5 WHAT IS MEANT BY A LOCAL ECONOMY?

By local economy we mean all those economic activities which take place in a locally defined geographical area such as the area defined by a local authority boundary, a group of local authority areas or a sub-region or even a much smaller area such as the area protected by a flood risk management scheme. In this case we are referring to the collective communities of Malton, Norton and Old Malton, which for ease may be simply referred to as Malton in this report.

### 1.2.6 WIDER ECONOMIC IMPACTS

Economic damages are resource costs to the nation and damages exclude VAT and assume a damaged item is half way through its life. This underpins the FCERM – AG and the methods that it defines. Financial damages are the losses to the consumer and include VAT and assume goods are replaced on a 'new for old' basis. Assessment of financial damages more closely reflects the damage and costs associated with flooding within the local community.

The difference between financial damages and economic damages can be added as a legitimate additional local benefit. MCM Datasets include financial depth damage data that applies to both residential and non-residential properties.

The joint EA/Defra FCERM R&D project FD 2662 "Flood and coastal erosion flood risk management and the local economy" was completed by Frontier Economics in March 2014. This project produced a toolkit of methods to explore the local economic benefits of FCERM and land drainage and moves beyond the estimation of avoided damages to consider the wider impact on local income or gross value added (GVA). In relation to Malton and the administration of Growth Fund allocations by the Y/NY/ER LEP, the measures of GVA and the PV of financial damages are relevant indicators of local economic impacts associated with the implementation of flood risk management measures.

Hence consideration of financial damages/benefits and gross value added enable further monetary valuation of local economic impacts. These can be used to illustrate the added value and hence indicate the growth potential arising from the implementation flood risk management measures.

## 1.3 PROBLEM DEFINITION

The primary cause of the flooding problems experienced in 2012 is 'flood locking', whereby gravity drainage systems cannot discharge to the river because of high river levels. Surface water flooding generally occurs when flows in the River Derwent exceed 80m$^3$/s, which corresponds broadly with the threshold at which gravity drainage becomes impeded. There have been seven occasions when a flow of greater than 80m$^3$/s has occurred in the River Derwent, Malton since 2003. In 2012 this flow was exceeded for ten days and this required a major operation to over-pump Main River flood defences using temporary pumps. Further flooding in 2015 resulted in 19 properties being flooded. The problems resulting from flood locking can be summarised as follows:

- sewer flooding from the overloaded combined sewer network makes it particularly unpleasant for the residents and businesses affected;
- Flood warnings in Malton are based on river levels and hence flood warning response to surface water and groundwater is reactive. Knowing when and where temporary surface water pumps need to be deployed has had to rely on anecdotal and eyewitness accounts;
- The residual risk of surface water flooding in Malton, Norton and Old Malton is potentially too high for the emergency response procedures developed by the Multi-Agency group to fully make sense as a long-term solution, if an economically viable investment now could save costs in the longer term;
- Relying on temporary pumping in emergencies is not an ideal arrangement because:
    - the pumps are not absolutely guaranteed to be available when required;
    - there are no formal 'well' points connected into the drainage systems in which to deploy them;
    - the arrangements still result in disruption to local residents and the local transport network.
- High groundwater levels can cause infiltration into the combined sewer network, which reduces the networks capacity for wastewater and storm water, especially during flood-locked periods.

## 1.4 THE PROPOSED SCHEME

The proposed measures include measures for Malton, Norton and Old Malton. The solution builds upon and seeks to formalise existing reactive measures and operations that occur within the community. These measures have already been found to be effective in reducing incidence of flooding, however further investment is needed to ensure that the resources are available to ensure this response can be continued and that suitable equipment is available and in working order to sustain these measures. In addition, it is necessary that the roles of all local risk management authorities are clearly defined and that adequate funds are ringfenced to ensure there are funds to enable and sustain the chosen solution.

The following measures are common to Malton, Norton and Old Malton:

- Construction of permanent chambers for the deployment of temporary pumps in the event of high river levels limiting discharge the river;
- Individual property protection to properties in the areas at risk of flooding; and
- Improvements to local flood warning and telemetry.

Additionally, at Malton measures are included to control surface water exceedance flow paths and groundwater flows in Castlegate. At Old Malton measures also include the diversion of the Riggs Road Drain and undertaking maintenance of the urban drainage systems.

## 1.5 INVESTMENT OBJECTIVES

The outline business case for the Malton Norton and Old Malton scheme established a set of investment objectives for the project. These are summarised a s follows:

1. To identify effective and sustainable flood risk management measures for the community of Malton, Norton and Old Malton
2. To make best use of all potential funding opportunities to deliver flood risk management measures
3. To improve knowledge and understanding of flood risk and management responsibilities within NYCC and amongst partners, stakeholders, communities and the media
4. To provide flood risk management measures that deliver social, economic and environmental benefits
5. To provide a greater role for communities in managing flood risk

Hence this report will support investment objectives 2 and 4 set out above.

# 2 EFFECTS OF FLOOD RISK ON THE COMMUNITY

Flooding in Malton, Norton and Old Malton is having severely adverse impacts on residents and businesses. This is undermining the confidence of investors and is preventing existing landowners from regenerating and developing key parts of the urban area. Hence there has been a need to identify solutions that will enable, rather than inhibit, future growth potential.

## 2.1 RESIDENTIAL PROPERTIES

The numbers of residential properties at risk of internal flooding for a range of flood events are shown in Table 1.

**Table 1 – Residential properties at risk by return period**

| 2yr | 5yr | 10yr | 25yr | 50yr | 100yr | 200yr | 500yr | 1000yr |
|---|---|---|---|---|---|---|---|---|
| 2 | 30 | 88 | 140 | 174 | 206 | 217 | 237 | 239 |

The number of residential properties and the depth of flooding are used to assess the economic losses and the financial losses for Malton. This is assessed over a one-hundred-year appraisal period and presented as a net present value (NPV)

## 2.2 NON- RESIDENTIAL PROPERTIES

The numbers of non-residential properties at risk of internal flooding for a range of flood events are shown in Table 2.

**Table 2 – Non-residential properties at risk by return period**

| 2yr | 5yr | 10yr | 25yr | 50yr | 100yr | 200yr | 500yr | 1000yr |
|---|---|---|---|---|---|---|---|---|
| 0 | 2 | 7 | 11 | 19 | 22 | 23 | 24 | 27 |

The number of non-residential properties and the depth of flooding are used to assess the economic losses and the financial losses for Malton. This is assessed over a one-hundred-year appraisal period and presented as a net present value (NPV).

In addition, the number of commercial properties, their number of employees and local average salary are used to calculate the growth value added (GVA). This represents the contribution made by the locally affected businesses to the local economy.

## 2.3 EMERGENCY RESPONSE & RECOVERY

As river level in the River Derwent rise, automatic alerts trigger the Environment Agency to issue alerts and warning to properties at risk, to risk management authorities and to initiate predefined operational responses. Water levels are monitored via telemetry and via manual site observations and as triggers are reached

additional actions are implemented as the situation escalates. There is a set command and control structure established which enables North Yorkshire Local Resilience Forum (NYLRF) to come into action to coordinate the response. This response is based on information and actions defined in the Malton Pumping Plan.

The Environment Agency operate the riverside defences, RDC provide local support to the community in the form of providing sandbags and monitoring the welfare of residents, Yorkshire water monitoring the performance of the sewer system and pumping station and NYCC monitor the operation and safety of the road network. This all feeds into the flooding Advisory Service communications within the NYLRF and enables decisions to be made about bringing the pumping plan into action.

It is noted that even with the invoking of the plan, in some instances the operation of pumps may require the closure of some highways to discharge flood water to a suitable outlet. The purpose of the plan is to reduce the accumulation of flood water at a location to limit the extent of damage from flooding and to reduce the duration of flooding to allow everyday day life, and in particular traffic flow, to return to normal as soon as possible.

The cost of emergency response is incorporated into the assessment of economic and financial damages for Malton.

## 2.4 HIGHWAYS

NYCC undertook a case study for Malton following the 2012 flooding events across the county. Table 1 shows the highways in Malton that were recorded by NYCC as flooding in 2012. The following highways have been affected by flooding the Malton area:

**Table 3 - Highways flooded in in 2012**

| Community | Highway |
|---|---|
| Old Malton | Town Street |
| | Lascelles Lane |
| Malton | Railway Street |
| | Wells Lane |
| | Sheepfoot Hill |
| | Castlegate |
| | Chandlers Wharf |
| Norton | Norton Road |
| | Church Street |
| | Welham Road |
| | St Nicholas Street |

The effect of flooding to highways limits accessibility for residents, businesses and emergency responders. Main thoroughfares such as Town Street in Old Malton, Castlegate in Malton and Church Street in Norton can become impassable and hence traffic circulation becomes impaired and can result in the need for lengthy detours as it becomes necessary to adopt traffic restrictions and diversions in times of flood. This can leave some parts of the community isolated and vulnerable and can also restrict access for emergency pumping operations or relief efforts being provided to individuals.

In particular, in Old Malton flooding prevents traffic movement along the B1257 between Malton and the A64 roundabout, placing a greater demand of already congested roads in Malton. Flooding on Castlegate and Church Street prevents the flow of traffic across County bridge between Malton & Norton. In addition, flooding

at Sheepfoot Hill impairs access to homes, businesses and the local Fire Station. The Fire & Rescue service are a key player in responding to flooding in Malton and it is important to sustain their access for them to make their vital contribution as an emergency responder.

The impact of disruption to traffic flow by flooding has now been assessed as of part of the calculation of economic and financial damages.

## 2.5 BUILT ENVIRONMENT

The urban settlement contains structures and buildings of historical interest. The ability to conserve and protect these characteristics will enable the aesthetics and heritage of the town to be recognised more widely. By managing the risk of flooding and reducing the intervention required to repair the damage caused by flooding, the character of the built environment will emerge.

When owners and occupiers are reassured that good building can be sustained they are more likely to invest in the external appearance of these properties. Hence the visual appearance of the town can progressively improve and the historical and aesthetic character enhanced and so contribute to the improvement in amenity of the area.

Similarly, the improved awareness of how and where flooding is likely to occur will enable greater focus in monitoring water levels where flooding is expected so that warning and assistance can be provided in a timely manner. Where locations are vulnerable to flooding, additional attention can be given to maintenance or protection works to identify the necessary measures that may be required in the future. This approach may guard against catastrophic failure or rapid deterioration. Hence retaining and sustaining the quality and character of the existing built environment.

This improved confidence arising from the implementation of flood risk management measures has not been quantified in economic or financial values. However, is recognised as a positive influence on Malton that will be recognised as previously affected areas become more serviceable and attractive for people to live and work.

## 2.6 DEVELOPMENT POTENTIAL

The Ryedale Local Plan was adopted in March 2002 and contained a range of planning policies. Most of these policies have now been superseded by the adoption of the Local Plan Strategy. Ryedale District Council have updated their Local Plan Sites Document and along with the accompanying Policies Map were submitted for independent scrutiny by a Planning Inspector appointed on behalf of the Secretary of State on the 29 March 2018. The submission documents and supporting documents have been viewed on their website.

It can be seen that a considerable number of sites have been identified in the plan for development in and around the existing communities in Malton Norton and Old Malton. This indicates a community that has a positive outlook with ambitions to grow and regenerate itself. From observation it appears that only a small number of the sites identified occur within areas where flooding has occurred or where it may be predicted to occur. On first appearance this would suggest that proposed developments will not be at risk of flooding, however it should be ne noted that changes resulting from that development and climatic changes may increase the risk of flooding unless proactive flood risk management is integrated with those developments.

Recent studies have allowed a greater understanding of the sources of flooding and the associated risks. Hence the solutions presented now are seeking to address the current risk. In the longer term there will need to be extension and improvement of drainage and flooding defence infrastructure to accommodate new development. Investment in flood risk management now will serve to encourage ongoing growth and set the precedent for flood risk management to be integrated into future development. Taking a positive approach to FRM may enable improvements to the built environment to be realised. The development potential and possibly the land use allocation of some proposed locations may need to be adapted to create different development outcomes due to flood risk. However, the existing flooding risk does not have to have a detrimental effect on potential growth in Malton. Adoption of effective FRM strategies may support opportunities for growth and improvement in the Malton area in the longer term.

## 2.7 TOURISM

According to the "Welcome to Yorkshire" website Malton is known as a "top foodie" destination and was dubbed "Yorkshire's Food Capital" by Antonio Carluccio. The town hosts its famous food festivals in May and September, a monthly food market, Malton Cookery School, traditional food shops and "Made in Malton" artisan producers. Hence the ability of tourists to access the excellent food and drink facilities is key to sustaining the vibrancy and attraction the town provides to tourists.

If the risk of flooding implies that the town is closed or inaccessible, then this may lead potential visitors to bypass the town and go elsewhere. This represents a consequential loss to the local community associated with flooding. Hence measures to reduce the impact and duration of flooding to the town, especially the highway, will ensure that the town can be accessed, is open for business and continues to thrive.

Although the role of tourism is recognised as important to the local area, no specific assessment of its economic value has been included in this report.

## 2.8 NATURAL ENVIRONMENT

The River Derwent is recognised for the richness of its environmental character and diversity through its environmental designations. These features need to be conserved and opportunities for their enhancement identified alongside any flood risk management implementation. These can all be opportunities for Natural Capital gains in Malton.

Current arrangements where flood water is drained temporarily into the river at multiple locations can result in disturbance and damage to the river banks, which in turn may adversely affect local flora and habitat on an ad hoc basis. The implementation of a more formal flood risk management regime, may reduce or remove this potential to damage the environment. Although there is likely to be disruption associated with the initial construction, which can be mitigated for, and the potential for ongoing adverse impacts on the environment can be reduced. For example, the installation of a smaller number of pumping points and establishment of specific discharge points, will enable these features to become integrated within the river corridor.

Where diversion of the existing drainage system is implemented and additional flood storage capacity is created, these can create the opportunity for environmental enhancements. For example, in the case of Old Malton the proposed measures include the diversion of an existing drainage channel and creation of flood storage ponds. These both will increase the area of water based habitat and restore an area of historical fish ponds.

Although methods to calculate the economic and financial benefits of such environmental enhancements are available, these have not been included here. However, it is recognised as a positive influence that will be recognised in the extent and quality of the environment in Malton.

# 3 ECONOMIC CONSEQUENCES

## 3.1 STUDY APPROACH

This study builds on the economic assessment carried out by Arup. The analysis includes the execution of the following tasks to develop a monetary evaluation of damages and losses that are relevant to Malton.

- Update existing economic benefits assessment
- Assess financial benefits
- Dynamic analysis of wider economic benefits

## 3.2 UPDATE ECONOMIC BENEFITS

The original economic analysis for Malton was completed by Arup and based on MCM 2013 guidance and loss data. Following further research and development by the Flood Hazard Research Centre at Middlesex University the MCM was updated and reissued in 2018. The update incorporated revised methodologies, new depth damage datasets and improved guidance on the assessment of economic values for flood FCERM projects.

The data and spreadsheets from the original analysis were provide to WSP by Arup, however there were gaps in the data and information provided that meant that some of their outputs could not be replicated as supporting information and assumptions used were incomplete. This was particularly true in the case of the Do-Nothing scenario, which they developed as the initial baseline. WSP were confident that there was sufficient information to assess the Do Minimum scenario as a new baseline and this could be compared against the Do Minimum scenario reported by Arup.

WSP verified the residential and non-residential properties listed by Arup by inspection of online maps and imaging. The property types and classifications were cross checked between the EA's National Property Database and MCM 2018 data. Updated residential property values were extracted from Land registry open source data. The values of non-residential properties were derived using open source business rate date available from the Valuation Office Agency. Valuations were adjusted using the Housing Price index and damage value's uplifting from the base month (January 2018) using the Consumer Price index as appropriate to bring them to current day values.

Emergency and clean-up costs were included in the assessment as a factor of property damage (10.7%) in accordance with MCM guidance and appropriate figures for factor of urbanisation observed in Malton. Indirect damages associated with vehicle damage, road closures and evacuation were also included in the updated damages. Within the assessment damages to properties are capped at the market value of the property to avoid over estimation of damages.

Climate change has been taken into account in accordance with EA guidance on Flood Risk and Coastal Change by applying uplift estimates on peak flows for basins within England and Wales. The uplift factors relate to the '2020s', '2050s' and '2080s' taking into account the statistical probability of occurrence Upper end (90$^{th}$ Percentile), Higher Central (70$^{th}$ Percentile) and Central (50$^{th}$ Percentile). The uplift factors were taken for the River Derwent (part of the Humber Catchment).

Climate change has been applied to the economic benefit sheets by generating a peak flow vs return period logarithmic curve. Then, a 20%, 30% and 50% peak flow uplift scenario (EA Upper Climate Change Horizon has been used as the scheme falls within Flood Zone 2 and 3) has been applied for climate change with associated peak flow vs return period curves. For instance, a 100 year flow now would effectively become a 20 year flow after a 40% climate change increase had occurred. The climate change return periods are therefore converted to their respective probabilities which are used for generating the present value (PV) damages. Each epoch's Average Annual Damage is discounted with its relative proportional PV factor and then the damage for all epochs is effectively summed (taking care to apply capping appropriately).

The net present value (NPV) of economic damage has been calculated over a 100-year appraisal period for the Do Minimum scenario. Table 2 below shows the updated assessment of economic damages compared with the original values derived by Arup.

**Table 4 – NPV Economic Damages for Do Minimum scenario**

| Description | Location | Arup analysis 2015 * | WSP update 2018 |
|---|---|---|---|
| Direct damages | Malton | £4,527,152 | £1,626,051 |
| | Norton | £12,046,668 | £13,598,290 |
| | Old Malton | £2,671,431 | £8,852,618 |
| Indirect damages - Road closures | All areas | NA | £460,221 |
| Indirect damages - Vehicles | All Areas | NA | £286,561 |
| | **TOTAL** | **£19,245,251** | **£24,086,959** |
| | | *Difference* | ***£4,841,708*** |

This shows that the updated economic analysis has incorporated further indirect damages, previously not included by Arup. Also, it appears that the revisions to the MCM guidance, the use of updated loss datasets and the revision of property valuations to current market values have all contributed to increasing the NPV of the Do Minimum economic benefits by £4.8M, which is 25% greater than value generated by the original analysis.

## 3.3 ASSESSMENT OF FINANCIAL BENEFITS

Having established the worksheets to calculate the economic benefits, calculation of financial damages for Malton was completed by substituting the MCM 2018 economic loss data for MCM 2018 financial loss data. As described earlier, the estimation of financial damages provides an indication of the financial impacts to the local area, as it reflects actual losses in a particular community.

The NPV of financial damage has been calculated over a 100-year appraisal period for the Do Minimum scenario. Table 3 shows the assessment of the financial damages compared with the updated economic damages.

**Table 5 - NPV Damages for Do Minimum scenario**

| Description | Location | Economic damages 2018 | Financial damages 2018 | *Difference* |
|---|---|---|---|---|
| Direct damages | Malton | £1,626,051 | £1,997,507 | *£371,456* |
| | Norton | £13,598,290 | £15,504,428 | *£1,906,138* |
| | Old Malton | £8,852,618 | £10,529,863 | *£1,677,245* |
| Indirect damages - Road closures | All areas | £460,221 | £460,221 | *£0* |
| Indirect damages - Vehicles | All Areas | £286,561 | £286,561 | *£0* |
| | **TOTAL** | **£24,086,959** | **£28,031.561** | ***£3,944,839*** |

This shows that the analysis of financial damage is greater than the economic damage. Also, it appears that the revisions to MCM guidance, the use of financial loss datasets and the revision of property valuations to current market values generated the NPV of the Do Minimum financial benefits of £28M. Hence the financial benefits exceed the economic benefits by £3.9M, which reflects a 16 % increase.

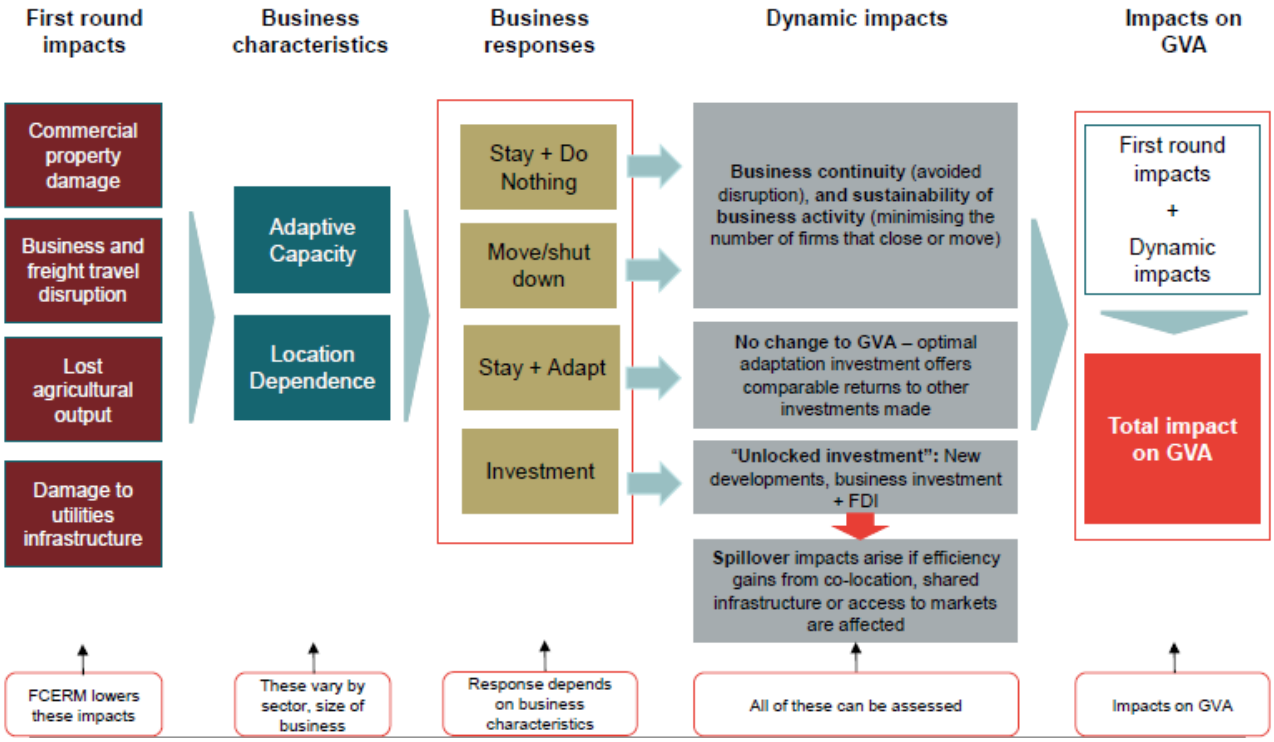
## 3.4 DYNAMIC ANALYSIS OF WIDER ECONOMIC BENEFITS

Fontier Economics produced a Toolkit to assess "Flood and coastal erosion flood risk management and the local economy" in March 2014 as part of the Joint EA/Defra FCERM R&D programme project No FD2662. The toolkit focuses on methods to assess the local economic benefits of FCER and land drainage, and moves beyond the estimation of avoided damages to consider wider impacts on local income or Gross Value Added (GVA).

In the local area there can be further consequential losses to the local economy arising from inactivity of a business due to flooding. This relates to loss of earnings and can be determined by using data from the Office of National statistics (ONS) for Ryedale

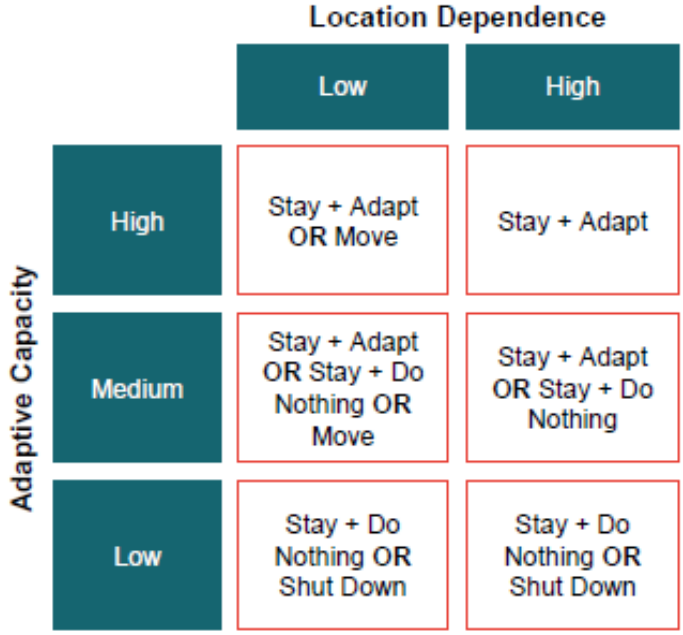
Figure 1 is taken from the Toolkit and shows the steps followed in determining wider impacts. The toolkit provides a light touch approach that recognises that primary data collection is resource intensive and may not be justified for some smaller-scale FCERM appraisals which are considered inappropriate for estimating the scale of impact. Credible secondary data sources are therefore suggested, along with more simple approaches to undertaking the assessment. This approach has been used in this assessment

**Figure 1 Transmission mechanism – FCERM impact on local economic activity**




The first-round impacts build upon the impacts on commercial property that have been assessed in the economic and financial analysis, described above. It considers the business characteristics in terms of their adaptive capacity and location dependency. These influence the businesses decision to stay, move, or cease trading; and if they choose to stay whether they do nothing or adapt. See Figure 2.

**Figure 2 Adaptive capacity against Location Dependence**



An estimated dynamic impact was applied to all businesses identified to be at risk of flooding in the previous Economic and Financial Analysis. For this impact assessment it was assumed that all businesses will remain in the 'stay do nothing' scenario. A light touch approach was followed assuming a hypothetical scheme providing a 1 in 2 year, 1 in 5 year, 1 in 10 year, 1 in 25 year, 1 in 50 year, 1 in 100 year, 1 in 200 year, 1 in 500 year and 1 in 1000 year standard of protection to a total of 25 businesses in Malton and Norton. Total Annual Gross Value Added was calculated using a weekly GVA per person of £445 in the Malton area and different disruption lengths based on the size of the business as shown in Table 4

**Table 6 – Disruption Lengths**

| Business Size (no. of employees in UK) | Distribution Period | Notes |
|---|---|---|
| **Micro (<10)** | 24 Weeks | Unlikely to have the resources to adapt prior to the event or recover quickly after the event. Building repairs likely to be more significant. |
| Small/Medium (11-199) | 4 weeks | Some adaptation/preparation prior to the event may have been possible |
| Large (200+) | 2 weeks | Most likely to have the resources to adapt prior to the event or recover quickly after the event |

GVA Annual value was calculated for a range of probabilities of flooding and by allowing different businesses varying recovery times based on the number of employees at each of the 25 businesses affected. Present Value GVA values were calculated for each year for a ten-year period as per GVA guidance. The total GVA calculated for Malton was £589,150.

# 4 CONCLUSIONS

An update of the economic appraisal for Malton, Norton and Old Malton has been carried out. This has taken account of changes in the MCM guidance 2018 which has been published since the analysis reported by Arup in October 2015. This has shown that for the Do Minimum case, that the net present value of economic damages is £24M over a 100-year appraisal period. Compared with the Arup assessment, this represents an increase of £4.8M

In consideration of wider economic benefits, these have been assessed in terms of financial damages and gross value added.

Financial damages have been derived using MCM guidance 2018. This has shown that for the Do Minimum case, that the net present value of financial damages is £28M over a 100-year appraisal period. Compared with the economic appraisal, this illustrates that the financial losses exceed the calculated economic losses. This illustrates that there is a local impact of £3.9M

In consideration of wider benefits on local income, a light touch approach has been adopted in accordance with the Frontier Toolkit. This has taken account of the businesses and their numbers of employees in the areas at risk of flooding in Malton, Norton and Old Malton. This has shown that the potential gross value added in Malton is £589k.

Other wider economic impacts have been considered, but have not been subject to monetary evaluation of benefits. These include: the aesthetic character and heritage of the built environment, the potential for development, tourism and the opportunity to enhance the natural environment.

This study has confirmed that the baseline economic case for flood risk management intervention is strong as the value of benefits has increased by £4.8m for the Do Minimum case.

Considering the wider economic case and the impact to the local community, it has been shown that the financial impacts to Malton are greater than the economic impacts. Financial loss assessment has found there to be a further £3.9M in damages over economic damages when considering wider impacts to the community. In terms of gross value added it can be suggested that keeping existing businesses and jobs in the areas affected by flooding has an additional benefit of £589k.

These additional benefits indicate that there is a good case to show that investment in flood risk management in Malton can contribute to sustaining and enabling further growth to occur in the local area. Hence it is considered that this study has provided additional data to support NYCC's application for a contribution towards scheme cost from the Growth Fund via the Y/NY/ER LEP.

1st Floor LS1 Headrow,
Unit 113 The Headrow
Leeds
LS1 5JW

**wsp.com**