4. THE GEOLOGY AROUND EASINGTON

The foundations of the solid geology of the area around Easington were laid down over 260 million years ago in a period of geological time known as the Permian Period. The landscape as we know it today however has only evolved since the end of the last Ice-Age around 10,000 years ago. These two stages in the ancient history of the area have combined to create the character of the countryside around the Village and Colliery and provide the present rural scenery which today forms an essential element of Easington's natural beauty. With some significant disused quarry sections and magnificent cliff exposures, these aspects of the area's dramatic local geology are readily accessible for all to enjoy.

The solid geological bedrock of the area is formed of a rock known as Magnesian Limestone, a rock which was formed in the closing few million years of the Permian period. It is represented by a series of sedimentary rocks deposited around 260 million years ago as layers of limey sediments in a shallow tropical sea. In the area around Easington, as in much of Co Durham, this solid bedrock is mantled by a series of soft, unconsolidated sediments of glacially derived drift deposits formed during the last ice-age, around 15,000 to 10,000 years ago. The last ice-age has also left its mark on the landscape by producing a series of surface features such as isolated hills, low ridges and deep valleys, related to the numerous processes taking place during and after the advance and retreat of the ice. Some of these features are very prominent in the landscape today. Finally the landscape has also been modified by human activity, mainly agriculture and the exploitation of the area's natural resources, particularly leading up to, and contributing to the industrial revolution which heralded the Victorian era.

At the beginning of the Permian period about 290 million years ago the surface of the Earth was a very different place to that we know today. At this time all the Earth's continents had become joined, into one massive super-continent known as Pangaea, which stretched almost from pole to pole. And during this global reorganisation dramatic changes had also taken place across the area that was eventually to become Co Durham. Massive coal swamps had dominated the region for over 30 million years, where the remains of dead trees from the massive tropical forests that covered the area were preserved in the stagnant muds, and were turned to coal. This was quite literally the fuel for the industrial revolution, and resulted in the prosperity of the Easington area as pits opened up to exploit these vast coal reserves. But at the dawn of the Permian these forests had now gone, and the once tropical rainforest climate of the preceding Carboniferous period was now replaced with something far more hostile. The area of Co Durham lay in a basin amid vast arid plains in a land of hot deserts and low rainfall towards the centre of the super-continent, far from any sea. At around latitude 20 degrees north, it was in the same region as the present day Sahara Desert. Vast sand dunes built up over time as the roaring south easterly trade winds relentlessly piled the desert sands into mounds and ridges. The only present day evidence of this episode lies further to the north west of our area, where exposures in Field House Sand Hole near Hetton reveal yellow desert sands, which are part of a dunal ridge. These sands are also visible in Eppleton Quarry.

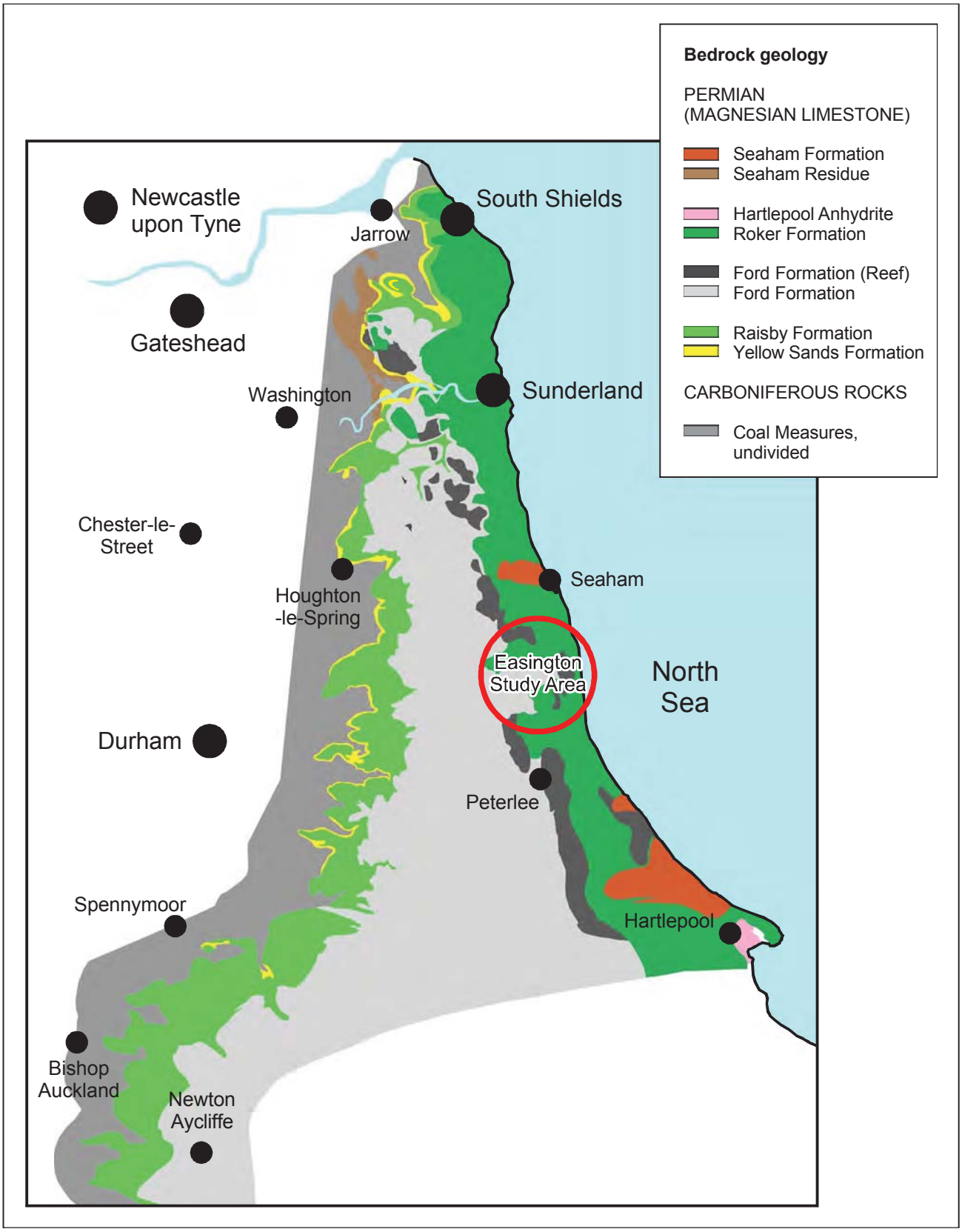
Eventually a seaway opened up to the north of the Pangaea super-continent connecting to the northerly Boreal Ocean. The desert basin became rapidly flooded as a shallow inland sea encroached from the north-east over the area covering what is now eastern Co Durham. This sea had much in common with the present-day Dead Sea, in being land-locked, relatively shallow, and formed under an arid and hot climate. The westerly fringes of this Zechstein Sea as it is known encroached and covered eastern Co. Durham, and its shoreline, although not preserved today, lay somewhere further west in the region of the

present-day Durham Dales. Eastwards into the area now occupied by the North Sea the Zechstein marine basin deepened, probably to around 300m water depth or more.

The first deposits of the Zechstein Sea were bottom muds which are now preserved as the rock formation known as the Marl Slate, formed from the tiny particles of mud being compressed over time to become hardened into rock. The rock is very finely and evenly layered, with particles hardly visible to the naked eye. This tells us that the muds were laid down in quiet conditions in the absence of any currents. The mud also contains bitumen, indicating that the sea bottom conditions were stagnant, and devoid of currents to mix various water layers. These stagnant bottom conditions were idea for the preservation of any dead marine life, and today the Marl Slate rocks yield many very well-preserved fossils of early fishes that were evolving at the time and thriving in the Zechstein Sea. These beds are now famous world-wide, and recognised for providing fossil examples so well preserved that detailed anatomy and evolutionary development can be unravelled. The Marl Slate can be seen today in the nearby area around Quarrington.

The Marl Slate Formation was only deposited for a short time before conditions changed somewhat, allowing numerous shelled sea creatures to develop and thrive in warm, tropical seas. On death the shells of this marine fauna collected on the sea-bed, becoming preserved as beds of limestone. This wasn't ordinary limestone however, because the climate was playing a significant role in governing the nature of the rocks that formed under the Zechstein Sea. The shallow connection to the north between the Boreal Ocean and the Zechstein Sea was very sensitive to global sea level changes, and to any changes in depth of the passageway caused by uplift of the sea bed through tectonic effects. Any fluctuations were likely to restrict the level of recharge of seawater between the ocean and Zechstein basin. At times when global sea levels were lowered, the marine basin became cut off from the boreal Ocean, compromising recharge. Under the hot and arid climate the Zechstein Sea was subject to intense evaporation resulting in increased salinity levels. One effect of this was to increase the concentration of magnesium in the seawater, impacting significantly of the nature of the limestone being formed. Ordinary limestone is made of calcium carbonate as a mineral known as "calcite", coming from the shells of the dead sea-creatures. During the formation of limestone in high-salinity, magnesium-rich waters, some of the magnesium becomes incorporated within the calcite forming a new mineral, "dolomite", a carbonate of both calcium and magnesium. And the resultant magnesium-containing limestone is called a dolomitic limestone. This is the origin of the Magnesian Limestone, the underlying bedrock of eastern Co Durham.

At some point during the last few million years of the Permian Period a remarkable barrier reef developed just off shore in the Zechstein Sea, and grew to a significant height in the warm tropical waters, probably breaking the surface in a number of places. Whilst it was nowhere near as extensive as the Australian Great Barrier reef the Australian example serves to create an appropriate mental image of the reef of Co Durham. Britain's Permian barrier reef stretched for around 20km at least, and has been identified running NNW-SSE from north of Sunderland to Hartlepool. Because the reef limestone is much harder than the general magnesian limestone and much more resistant to weathering, it forms prominent isolated hills in the landscape, notable Tunstall Hill, Humbledon Hill and Maiden Paps around Sunderland, to Beacon Hill in the Easington district. Unlike the Australian barrier reef the reef of north east England was built of organisms something like sponges called bryozoans rather than corals. The bryozoans formed a compact 3D network of branches that gave the reef structure and rigidity. Colonies of mat-forming calcareous algae also grew within, and as part of the reef, adding further structure and rigidity. The bryozoan colonies acted as a refuge for many shelly creatures, which lived in the safety of the reef. On the shoreward, westerly inland side of the reef shallow lagoons developed, and collected lime muds and shelly debris, which were exposed to wave action and rolling on the shallow lagoon floor, producing a particular type of rock comprised as tiny sub-millimetre sized


Bedrock geology
PERMIAN
(MAGNESIAN LIMESTONE)
Seaham Formation
Seaham Residue
Hartlepool Anhydrite
Roker Formation
Ford Formation (Reef)
Ford Formation
Raisby Formation
Yellow Sands Formation
CARBONIFEROUS ROCKS
Coal Measures, undivided
Newcastle upon Tyne
Jarrow
South Shields
Gateshead
Washington
Sunderland
Chester-le-Street
Houghton -le-Spring
Seaham
Easington Study Area
North Sea
Durham
Peterlee
Spennymoor
Hartlepool
Bishop Auckland
Newton Aycliffe

Geological Features of Easington

A rock-face at Townfield Quarry showing a section through the remains of the Permian barrier reef

The possible Ice Age meltwater channel in Memorial Park

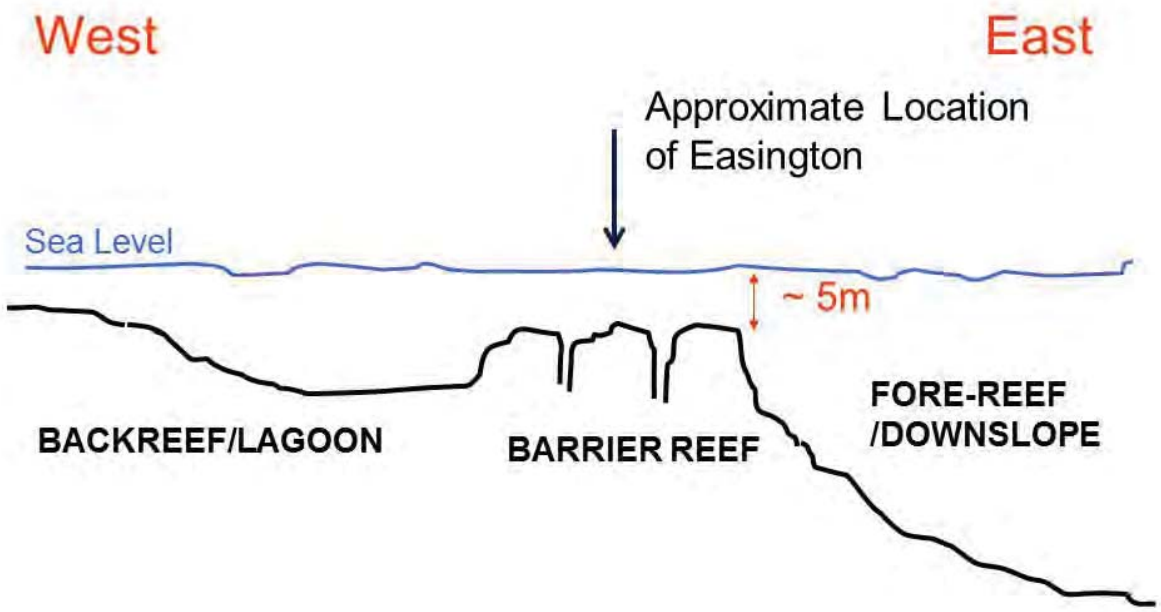
Cliffs at Shippersea Bay which contain the remains of the 240,000 - 200,000 year old interglacial raised beach

Close up of the cliffs showing the location of the raised beach deposits

Close up of the sand and gravel deposits of the raised beach which contain fossils of temperate climate marine molluscs

The Easington Atlas Group examining the raised beach with geologist Paul Williams (wearing shorts)

spherical grains of carbonate mineral called ooids, and forming a rock known as a ooidal (or oolitic) limestone. The isolated hills mentioned above are part of the reef crest, and would have all been joined during Permian times as one continuous structure. To the easterly, seaward side of the reef crest water depth increased, where limy muds and blocks of reef material broken off by wave action were deposited. These deposits are now preserved as the rocks of the Marsden area around South Shields. A diagrammatic section through the reef, with the approximate position of Easington identified, is shown below.



Diagrammatic West to East Cross Section through the Easington Area showing the relative position of the Barrier Reef and Easington Village

Easington Village sits squarely within the reef crest and its environs, and an excellent section through the crest and reef flat can be seen in the disused Townfield quarry. This is a rare section through this part of the reef, and one of only three such good exposures in Co Durham. Here unlayered and massive structureless dolomite is exposed, representing the main core of the reef, which when studied with a magnifying glass reveals numerous fossil remains. Areas of thinly layered, very fine-particled rock exposed in places in the quarry represents layers of calcareous algae that were also significant reef-builders. Shallow inclined shafts sunk in the vicinity of the former Easington colliery at one time gave an intriguing section through the reef, but sadly these shafts are now sealed. In the remains of the nearby Coulslaw Holes quarry oolitic dolomites are exposed indicating off-reef material on the landward side of the reef. Further north at Beacon Hill the reef-crest is again encountered. The rocks inaccessibly exposed on the sides of the railway cutting are in the reef-crest strata, and although there is very little in the way of exposed rock on Beacon Hill itself, the footpath up to the summit shows small exposures where fossil bryozoans have been found. Further north in Hawthorn quarry and Hawthorn Dene off-reef and post-reef strata are exposed, and similar sections are seen in the sea cliffs of Shippersea Bay. In part of Hawthorn quarry the reef-flat strata are again exposed, although here they are generally inaccessible.

Our local area today provides no evidence of solid deposits younger than these discussed above, but younger strata from the Permian and succeeding Triassic periods are preserved southwards towards the Tees. It is probable that similar strata were deposited over our area too, but have been removed by subsequent erosion in the intervening time-span after their formation.

The next chapter in our story of the geology of the Easington area begins around two and a half million years ago during the Quaternary Period, when the Northern Hemisphere's temperate climate began to cool, heralding the start of a series of Ice Ages. Over a period of more than 500,000 years Britain experienced a climate fluctuating between extreme cold and warmer conditions. During cold periods Ice sheets would have developed, and at times these were extensive enough to cover the whole country. During their development they would have scoured the solid bedrock sweeping it in front of the advancing ice-front, only to dump this debris when conditions ameliorated. This debris would be left, subsequently to form landscape features as mounds known as "moraines". The ice-sheets themselves would also leave their mark, carving out valleys and grinding down the bedrock. The evidence of most earlier ice-sheet activity in north-east England however has been lost, probably due to erosion by the last major ice activity which took place between around 26,000 years before present, and 13,000 years before present. Advance of this last ice sheet eroded the bedrock and produced moraine deposits, and also initiated processes, the effects of which are now left preserved as major landscape features. At the base of moving ice-sheets melt waters would have carved out sub-glacial drainage channels, often following lines of earlier drainage systems, but also developing directionally along lines of ice-movement. These were the beginnings of some of the dramatic incised "Denes" developed around Easington, running eastwards to the coast.

As the climate eventually warmed again the ice sheets finally began to melt and retreat around 12,000 years ago. Numerous landscape features resulted from the deposition of muds and sands entrained within and below the ice, which were released on melting. Sinuous ridges of sands and gravels can be seen which mark the position of sub-glacial melt channels and are preserved today as landscape features known as "eskers" and "kames". Kamiform deposits can be seen today in and around Sheraton and neighbouring areas.

Meltwaters would have flowed southwards and eastwards off the melting ice sheets producing their own range of features. Some of the most notable of these being characteristically shaped drainage channels, many of which may have been initiated originally as sub-glacial drainage systems under advancing ice. Many of them are steep sided, and give rise to the features of Hawthorn Dene and nearby Castle Eden Dene.

As the ice melting process continued, large bodies of meltwater collected in temporary lakes, dammed by ice barriers. Overflow and periodic breaching of these lakes would have released large volumes of meltwater, which would have flowed along these channels accentuating and sculpting them, giving them the characteristic shape that we recognise today. The presence of such a lake just to the north has been inferred by studying evidence from glacial deposits and channel orientations. Glacial Lake Wear, as it has been called, stretched from near Tynemouth along the Tyne to Dunston in its northern extremities, then south along the Team Valley to Chester-le-Street and Plawsworth, and across to Sunderland, with a branch down to Houghton-le-Spring. This would have collected the meltwaters from a wide area. Eastwards during deglaciation ice barriers were in existence effectively diverting much of the meltwaters and their deposits southwards. One such broadly south-directed meltwater overflow channel can be seen running through Easington's Welfare Park.

The cliffs southwards from Hawthorn Hive are capped by glacial deposits of the most recent of the glacial episodes, the Devensian, but our story for the area around Easington starts at a glacial period around 470,000 to 300,000 years ago. A series of sands and gravels preserved in Warren House Gill and nearby area are thought to represent a marine embayment at the edge of a pre-existing ice sheet. These are the oldest pre-Devensian glacial deposits in NE England and represent the most northerly sediments of this age anywhere in Britain. These deposits give us a fascinating glimpse into a period of earlier glacial history the evidence for which has been otherwise totally erased from the area. The other spectacular occurrence is on the coast a little to the north, at Shippersea Bay. High up on the cliff is preserved a series of sands and gravels no more than around 2-3 m in thickness, resting on an eroded surface of the Magnesian Limestone. The gravels contain fossils of temperate climate marine molluscs, and the outcrop is interpreted as an ancient beach deposit. It is dated at around 240-200,000 years old, at a warmer-climate interglacial period known as the "Ipswichian Interglacial". At this time relative sea level was higher due to extensive melting of former land-ice, but the effect of ice-unloading and resultant isostatic uplift of the land surface after the last glaciation has also contributed to the present elevation of this 200,000 year-old beach.

The final imprint on our local landscape was provided by the intervention of man in the exploitation of the area's natural resources of limestone, brick clay and coal and sand. The Magnesian limestone would have been quarried initially on a very local basis to provide building stone in pre-18th-century times. It is likely that the former quarry on Beacon Hill was initially opened for this purpose. Later, the use of lime mortar required limestone to be burnt in limekilns, and these would have started to appear in the landscape. These were very local operations, and little evidence of this remains today. By the beginning of the 19th century limestone quarrying and lime burning was on a much bigger, industrialised scale. Townfield quarry would have been operating in the mid-1800s, with much of the lime being for agricultural use, supporting the exploitation of stone for building. Further to the north the large Hawthorn quarry was operational until the 1970s again seeing significant use in Victorian times producing dolomite for the developing local steel industry as well as for building and lime production. Lime kilns were sited on Hawthorn Hive, the remnants of which are still visible today. Some of the local glacial clays were also exploited for brick making, and glacial sands extracted for building use. Scant identifiable evidence of any brickpits remains today, but some local dwellings are likely to have been built from bricks made from these locally derived clays.

The formerly worked quarry faces in the area now give an opportunity to study the geology of the region, and the limestone rubble heaps that once littered the area are now a natural wildlife habitat of great diversity and rarity.The establishment of coal mining in the wider area from the early 19th century onwards exploiting the region's vast coal reserves also had a significant impact on our landscape with colliery waste heaps, and beach dumping of spoil. Subsequent to the demise of the local coal industry clean-up and restoration of land and beaches has taken place. The geology also had a social impact. The local Easington Colliery started in 1899, and employed many thousands of men during the early 1900s, resulting in development of the village and providing work for many. The coal here is "concealed", meaning that the seams lie underneath the Magnesian Limestone, and shafts had to be sunk through the limestone to reach the commercially profitable coals. This in itself represented a pioneering step by the early mining engineers of the area.

Our landscape across the Easington area today is thus a combination of these three influences – a solid bedrock of Magnesian Limestone which underlies everything, and provides the solid foundation to the area. It makes its appearance only through isolated examples of natural weathering, but is prominent in the local disused quarries, and in the coastal cliffs. The effects of the last Ice-Age, providing a range of surface depositional and erosional landscape features that are very noticeable across the local countryside. And

finally we see the influence of man, in the remains of limekilns, disused quarries, and reclaimed coal-pit spoilheaps. All this has combined together to produce a greatly diverse landscape of significant natural beauty that is both a wildlife habitat to numerous species, and a recreational amenity for human relaxation and enjoyment.

THE LOST QUARRIES OF EASINGTON

Sunrise over Easington Village.

The coal industry has shaped East Durham as we know it today. Workers from all over the British Isles came here to work. It is difficult to find a person in Easington whose life has not been affected by the coal industry. The pits have now gone and barely a trace remains .

This essay will look at an industry which was present before the coal industry, during, and after the coal industry, it is interesting not just from a historical perspective but for the mysteries that it throws up, that industry is quarrying and this essay will look for some of the lost quarries of Easington .

Ice Age Deposits Of Stone On Thorpe Knowles.

In parts of Easington there is an area of concentration for glaciofluvial deposits these deposits come from the Devensian period. Superficial deposits formed up to two million years ago in the Quaternary Period. At one time this area was covered by an ice sheet more than two Kilometres thick. The deposits have left us with a surface of Durham boulder clay but also rocks ,stones, sand and gravel some brought by ice sheets from the North and some from the West, these same ice sheets are responsible for the coastal Denes and Gills of which we have many in our area. The quarries and gravel pits for extracting sand and gravel are numerous.

Quarrying in Easington is either for the sand and gravel of the Quaternary period (2 million years old) or for the Magnesian Limestone from the Permian period (250 million years ago). The formation of the Magnesian Limestone is an interesting story in itself, the Durham coastline for having the only coastal exposures of Magnesian Limestone in Britain. The story of the Permian Magnesian Limestone will not be discussed in this project but will form a separate project.

THORPE KNOWLES AND SAMMY'S HILL QUARRY

Mounds of Earth Indicating Quarrying Activity at Thorpe Knowles.

Just off Thorpe Road in Easington Village on a hill called Sammy's Hill lies a disused quarry, now privately owned, it was worked in the 1950's for sand and gravel. This quarry extended over a much larger area than at present, the quarry extended into Thorpe Knowles where evidence from the mounds of earth and depressions indicate quarrying as well as the large boulders strewn over the area. The quarry is currently a haven for birdlife.

Quarry On Sammys Hill . Overgrown but a haven for wildlife

OAK ROAD CHILDRENS PLAYGROUND.

The site of the playground used to be a gravel pit and creative use of the features has made it into a skateboard park.

EASINGTON PRIMARY SCHOOL

In the corner of the playground now occupied by a car park and vegetable patch was a quarry, most likely for gravel.

GLEBE TERRACE AND PARADISE CRESCENT

Both were areas of quarrying most likely for gravel.

THE SAND QUARRY JUST OFF HOLMEHILL LANE

Now filled in with a new estate on top, this quarry brings back many memories for the author. This was disused in the 1960's and was an adventure playground for children living in Wembley and Cavell Square.

There are memories of children sliding down the steep sides in a cardboard boxes , those were the days before theme parks.

The quarry extended to the North side of Holmehill Lane.

THE CLUB FIELD AND GLENDENE SCHOOL

The Club field still shows depressions and bumps that show quarrying activity and it is remembered that the site in front of Glendene school was once a site for Gravel quarrying.

RESIDENTIAL HOME

The area of Rutherford House residents home was once a site for limestone quarrying.

COUSLAW HOLES QUARRY

Moving down Seaside Lane again, we are actually travelling down the route of a geological fault line and opposite the former Black Diamond Public House is the Welfare Park Memorial drive. This drive is also the site of a glacial melt water channel, the site of an old limekiln in the banks of the drive can just be distinguished just before we reach Couslaw Holes Quarry, this quarry is very old and is composed of post reef oolitic limestone.

TOWNFIELD QUARRY AND THE EASINGTON TUNNELS

Easington Atlas enthusiasts study Townfield Quarry

Moving back past the site of the Welfare Hall further down from the Church of The Ascension is Townfield Hill.

Townfield Hill is the site of the Easington Tunnels, little is known about these tunnels other than the fact that they were used as air raid shelters in World War 2. Former Easington resident Bill Clark remembers two entrances to the tunnels from Townfield quarry and he recalls a medical station being situated in the tunnels. The South side of the quarry had a tunnel entrance as well as its own quarry just off Bede Street. Myrtle McPherson remembers as a child during the war sleeping in the tunnels, entering through the Bede Street entrance , Myrtle recalls seats in the tunnel side which were wide enough to put a mattress for sleeping, Myrtle and many others slept in the tunnels during air raids in the period of the war. Limestone was quarried from this site as well as from the side on Bede Street with smaller scale quarrying on the South side of Townfield Hill.

THE MINING ADIT AND NEARBY QUARRY

Moving North from Townfield to the site of the former pit Medical centre a small quarry existed at the corner of the hill but more interestingly an adit was made linking the Colliery. The tunnel was checked each week by the pit deputy and the electrician who maintained the pumps to remove water from the bore at the bottom of the adit. Alan Playle explained that the water was pumped out to a reservoir and the water was used for washing the coal. Alan

also explained that this tunnel was quite steep at the entrance but levelled out before coming to a Y junction, one of the tunnels would lead to the West pit and the other to a tunnel opening onto the beach. The tunnels had no supports probably because they were built of reef limestone.

This adit was also used an air raid shelter in World War 2 for people living in the North area of Easington.

THE QUARRIES ON FARMS

Whitelea farm, East Lea farm, Lea farm all had quarries and some even had their own limekilns , these have been used for landfill.

THE BRICK AND TILE WORKS

Clay was dug from a pit on a farm near the area of Canada and ovens on site made the bricks and tiles .This is clearly one to investigate further.

BEACON HILL QUARRY

The highest point on the Durham coast this is an important landmark in Easington. Beacon hill forms part of an ancient barrier reef and its limestone is rich in fossils. On the west side of Beacon Hill can be seen a significant depression in the ground. The old maps pf the area show this to be a quarry and it is likely that the limestone rocks taken from here built the enclosure walls which are on the area of Beacon Hill.

THE LIMEKILN ON HAWTHORNE BEACH

When lime was transported onto ships or barges which came onto the shore of Hawthorne Hive. Hawthorne does have many quarries including a huge quarry which was working in the 1970's. There are many interesting stories to be told about that quarry which used to export limestone all over the world.

HAWTHORNE QUARRY

An imposing quarry with lots of history and stories from the people who worked there.

The imposing Hawthorne quarry.

There are also quarries and limekilns in Hawthorne Dene

Limekiln in Hawthorne dene and disused quarry.

Conclusion: The quarry sites varying in size are of considerable historic and scientific interest. Some have been filled in and some have been transformed into playgrounds, others become overgrown and act as unofficial nature reserves. A disused quarry used to be looked upon as an eyesore but some people may agree with the author that their history and the mysteries they hold are worthy of preservation. Tunnels provide tourist opportunities for our area which is increasingly seeking out the industrial past of Easington which would otherwise be forgotten.

Jeff Playle January 2014

5. ECOLOGY, BIO-DIVERSITY & HYDROLOGY

5.1 Durham Magnesian Limestone Natural Area

The Durham Magnesian Limestone Natural Area extends from the mouth of the River Tyne down the North East coast to Hartlepool and inland as far as Shildon in the west. It covers an extent of over 44,000 ha.

The landscape is characterised by the steeper escarpment slope to the west, leading to gently rolling contours on the plateau itself which gently slopes towards the North Sea in the east. Glacial deposits are also found there resulting in more neutral grassland area in the hollows. However there are also a number of steeply cut denes in the area, as result of water erosion.

The underlying geology heavily influences the soil and vegetation types of the area. Steeper slopes and exposed cliff faces, including man-made features such as quarries, show the best examples of magnesian limestone flora.

The area also has a number of other important habitats, including wetlands, semi-ancient woodlands and unimproved grasslands. Easington, situated near the North Sea shows good examples of all of the above.

5.2 Landscape Assessment

The area has also been heavily influenced by mining and the old pit heap is one of the better ecological sites in the parish, having very little soil on the area so the subsoil is idea for local flora. An old pit shaft cage has been preserved as a distinctive feature within the site. The pit heap rises to the north of Easington Colliery and is now used as a recreational area, especially popular with dog walkers.

Beacon Hill forms the highest point within the Atlas study area and commands an impressive view over the North Sea and the surrounding area. The east-facing area of the site is grazed which has led to the reduction of trees and shrubs. Hedges are often damaged by grazing and any regeneration is prevented unless a secondary fence is used, so those around the farm are fairly sparse. However gorse scrub is present in fairly large blocks as the plant's spines helps reduce grazing.

Once away from the exposed east-facing slopes, the area is primarily used for intensive arable farming. It may be assumed that this is because the more sheltered area will reduce wind damage to standing crops. Satellite imaging shows a few field boundary hedges have been removed although the majority remain. While smaller field sizes and higher hedges would mean a larger percentage of the crop could not be harvested as economically, this would be more than offset the benefits in the reduction of wind damaged areas.

Interspersed among the arable fields are areas of cattle grazing as well as horses and even alpacas, especially near Easington Village and to the north of the parish near Hawthorn. Here the hedges are in much better condition and form an important ecological feature.

There is also a main railway line running North-South through the parish. The cuttings provide an excellent example of local flora and help form a wildlife corridor within the area. This is primarily due to the bedrock and subsoil being exposed during their creation, but due to the steepness of the slopes nutrient-rich soil is unable to develop.

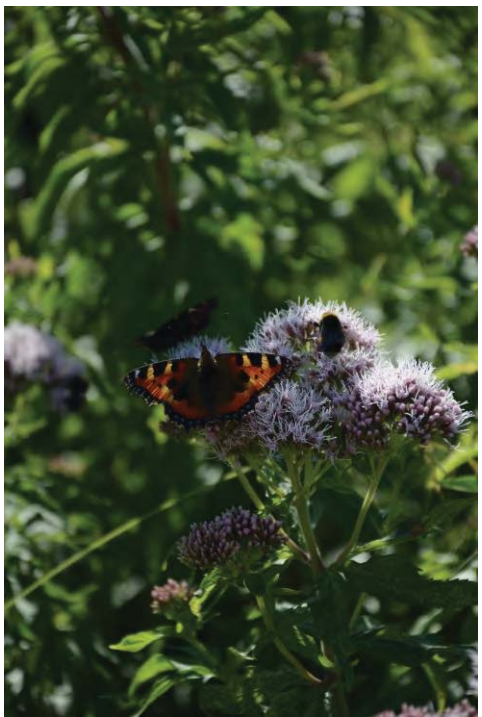
Details of the specific habitat types and what species was found there are listed below.

5.3 Coastal Cliffs

The coastal cliffs are probably the most important ecological habitat in the Village Atlas area. The shallow soils and exposed limestone outcroppings are ideal for calcareous plants and a number of regionally and nationally important species can be found there. Steep slopes will encourage nutrient leaching reducing the chance of certain species becoming dominant. Constant erosion is also providing bare ground for colonising species to take hold.

In one area there is a tiny remnant of lowland heath.

Some of the most numerous limestone species found there include Bloody Cranesbill, Sea Plantain, Bird's-foot Trefoil, Yellow-wort and Carline Thistle. The orchids were particularly impressive this year with huge numbers of Early Purple and Northern Marsh Orchids and substantial numbers of Twayblade, Pyramidal and Bee Orchids being seen.



The bottom of the cliffs also form an important habitat. Falling rock helps keep the habitat is a state of flux, providing opportunities for pioneer species, while at the same time the marginally higher nutrient rates allows species such as Hemp-Agrimony, Common Toadflax and Marjoram to thrive.

Areas of Bird's-foot Trefoil were especially important for Dingy Skipper, which were seen on a number of occasions. Other butterflies seen include Common Blue, Meadow Brown, Painted Lady, Red Admiral, Small Tortoiseshell, Small White and Green-veined White.

There are also a number of areas of gorse scrub providing ideal habitats for Linnets, Common Whitethroat, Chiffchaff and other smaller birds. Sea birds also use the cliffs to nest as well as Kestrel. Gulls seen included Fulmar, Herring Gull and Common Tern.

5.4 Beach and Rock Pools

The majority of the beach at Easington comprises of shingle, which includes sea coal and old brick rubble. Shingle beaches are the most hostile habitat to survive in. The reasons for this are;

- stones moving by tidal action can crush smaller creatures, so those which would normally borrow to avoid predators are even more likely to sustain injury by the stones themselves,
- moving stones make it difficult for sea weeds to anchor to
- and once the tide goes out the water drains off much quicker than sand or smaller particles meaning that marine creatures will need to be able to survive out of water for longer

This makes the upper shores of the shingle beach very inhospitable for life.

The other main hindrance to life on that beach is that suspended sediment reduces light levels in the water making it difficult for plant species to photosynthesise. Visibility in the water was less than 12” (30cm) when measured using a turbidity meter.

However the rock pools had a fairly healthy ecosystem. Once the sediment has settled visibility increased to over 24” (60cm) – as this was the deepest rock poll we found. Various sea weeds were noted including Toothed Wrack, Bladder Wrack, Kelp and Sea Lettuce. There was also a number of Molluscs the commonest being Periwinkles, Barnacles and Limpets, but shells of Blue Mussels and Dog Whelks were also found. We also found Common Shrimp, Shore Crab, Sand Eel, Goby(?) and various other smaller fish as well as worm casts in the sand.

Anemones were visible at low tide.

The shore has some extensive sandy areas at low tide. This provides cover for Sand Eels and worms and provides an important food source for birds and larger fish.

5.5 Easington Colliery

The old colliery site, situated to the east of the built-up settlement is an excellent example of habitat creation, although it may have been more by accident than design. It has been graded off and left to develop into a wild-flower meadow and the lack of top-soil on the site has been of great benefit to the flowering plant communities and has allowed a number of important species to establish themselves. In other areas top soil (and subsoil) have been imported which benefits rank grass species to the detriment of other flowering plants, but here the bare slag areas have allowed a wide variety of important wildflower species to colonise the site, most notably Bee Orchid, Common Milkwort, Kidney Vetch and Yellow-wort.

The area is heavily used for dog walking and a surfaced path runs through the site, so there is some disturbance to ground nesting birds, although a healthy population of Skylark have been recorded. Other common birds include Linnet, Swallow and Goldfinch. Partridge were also noted on frequent occasions, including a number of young.

The site had an amazing amount of 6-spot Burnet Moth caterpillars this year. Chrysalis cases were very abundant on grass stalks within the site. Butterflies found within the site include Common Blue, Speckled Wood and Meadow Brown.

5.6 Memorial Avenue

Memorial Avenue, heading SSE out of Easington Colliery is another site worthy of mention. The two rows of trees lining the avenue highlight the urban aspect of the area, but on the steeper slopes at either side the vegetation is more natural. The most important species of note here is Blue Moor-grass, which is found at the top of the banks near the play area. Once the area flattens out again scrub, including Hawthorn and Gorse take over. Other note-worthy plants found in this area include Cowslips, Wild Carrot and Salad Burnett.

Unfortunately other areas just outside the village have been used to fly tip. The contents are mainly household and garden waste, but some paints and other chemicals may have a longer lasting effect on the environment.

5.7 Easington Colliery & Easington Village Primary Schools

As part of the ecological evaluation of the area we also looked at species found within the school grounds. With the assistance of the children we found and recorded a number of species. Possibly the most important ones being the discovery of Snake's Head Fritillary and finding a number of newts in the school grounds.

The areas are in need of careful management to ensure that areas aren't overgrown or cut too regularly. Both schools have the potential to create very important wildlife areas.

Being situated inside the school perimeter obviously means that the areas are subject to a high level of disturbance, but the enjoyment that the children get from being in 'wild spaces' must outweigh that. It is hoped to encourage the children to care for the wildlife found there, and especially not to pick the flowers.

5.8 Agricultural areas

The areas around Easington are typical of the countryside in the area. There are large fields which grow commercial crops such as Oil-seed Rape, Wheat and Barley. Within the fields themselves crop intensity makes it difficult for anything but annual plants to survive, the headlands and field boundaries are much more important. Annual plants recorded included Common and Field Poppy, Knotgrass, Chamomile and Field Speedwell.

The hedgerow trees along the lanes around the villages are also important for wildlife. Here hedgerow trees are fairly diverse, with Ash, Hawthorn, Hazel, Blackthorn, Elder, Alder and Wych Elm all being fairly common. This habitat is also important for birds with a number of Finch and Tit species being recorded.

To the west of the village is mainly permanent grazing. Once again the field boundaries become important for wildlife as the heavy grazing reduces the number of plant species which can survive within the fields themselves.

5.9 The Denes – Horden, Foxholes and Hawthorn Denes

The steep sided denes are densely wooded and show the typical woodland flora that you would expect with semi-ancient woodland. As they would have no agricultural value, Denes in the area have been relatively undamaged through the ages and the trees and ground flora show this. In Spring the woodland floor is carpeted with Ramsons and Dog's Mercury. Wood-ruff, Bluebells, Wild Arum and Dog Violets are all common.

Hawthorn Dene is an important conservation area, managed by Durham Wildlife Trust. At 67 hectares it is the second largest Dene on the Durham coast. The steep sides cut through the Magnesian Limestone and have direct effect on the ground flora. The woodland consists primarily of Ash, Wych Elm and Sycamore, but other tree species such as Large-leaved Lime, Oak and Beech are also found there. Of particular note are the stands of Yew. The ground flora is also impressive, with various Orchids being recorded as well as an extensive population of Herb Paris.

The east end of the Dene consists of an important Magnesian Limestone grassland which abuts the National Trust-owned land above the cliff-tops.

Thorpe Gill and Thorpe Wood are situated to the South of the parish. Thorpe Gill is roughly east-west and is situated near the village of Little Thorpe, while Thorpe Wood runs from the South-West to the North-East and is directly influenced by the industrial estates outside Peterlee. The woodlands themselves are fairly healthy, although extensive areas of Himalayan Balsam, Meadowsweet and Butterbur have a detrimental effect on the woodland flora, shading out the majority of species that would normally be found there. Garden escapes, especially around Little Thorpe also have a direct effect on the flora.

Thorpe Gill and Thorpe Wood converge to form Horden Dene, which becomes Fox Holes Dene once it crosses the B1283. Horden Dene has more diverse woodland flora than Thorpe Gill and Thorpe Wood, including many species that are more often associated with semi-ancient woodland. This includes Ramsons, Wood-ruff and Dog's Mercury. Fox Holes Dene follows a similar pattern to Horden Dene, but has open areas which are now dominated by Bracken and Gorse.

5.10 Water Quality – Thorpe Gill, Horden Burn & Hawthorn Burn

Kick Samples were carried out to determine the water quality of the tributaries feeding into Horden and Hawthorn burns in accordance with the Riverfly Partnership's Angler's Monitoring Initiative (AMI). This involves catching and counting species which are known to have low pollution tolerance. It also includes Fresh Water Shrimp which has a higher tolerance.

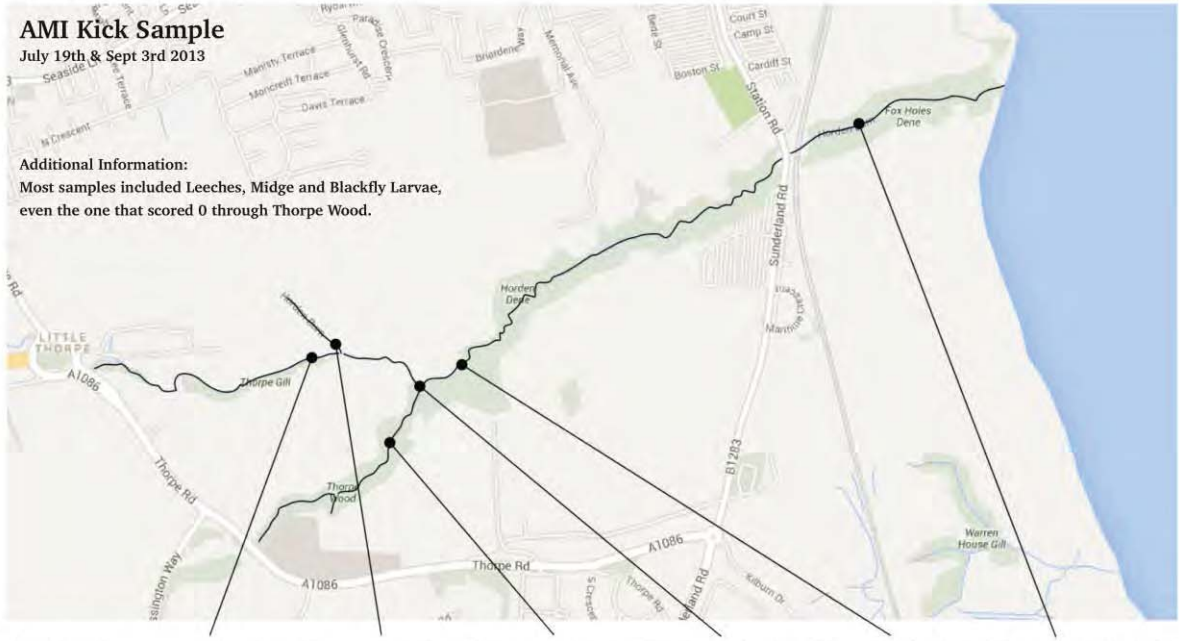
The results are shown on the sample location map.

The water from Horden and agricultural run-off near Thorpe Gill are having a marked effect on the water quality. These are significantly lower than expected, with part of Horden Burn scoring 0 on the AMI index for the first month and only 1 for the second month. The Environment Agency were aware of a sewerage spill earlier in the month and due to the weir/waterfall this section of river can't be repopulated by creatures which spend their entire lives underwater, but flying insects such as Mayfly, Midge and Mosquito could recolonise the stream.

The agricultural run-off from the north of the burn was also affecting the aquatic life. This has been extenuated by the warm, dry summer as the concentrations of the effluent would be higher in proportion. A series of oxygenating weirs and/or reed screens could be placed in the burn to help reduce the problem. Where the stream leaves the

village the aquatic life is much better, with Water-cress, Brooklime and various other wetland plants thriving.

Water quality in Hawthorn Burn was much better, scoring 8 and 9 in the AMI kick samples respectively. While Freshwater Shrimp was the most abundant species, Flat-bodied Mayfly was surprisingly the next common. However this may have been influenced by the choice of kick-sample location as access to the water was easiest where the water was flowing fairly fast. Both Olive Mayfly and Blue-winged Olive Mayfly were found in healthy numbers.



Species	Sample #1		Sample #2		Sample #3		Sample #4		Sample #5		Sample #6	
Case-less Caddisfly	2	0	1	0	0	0	1	1	0	0	0	0
Cased Caddisfly	0	1	0	0	0	0	1	0	0	0	1	0
Fresh-water Shrimp	2	3	0	0	0	0	1	1	1	1	2	2
Blue-winged Olive	2	2	0	0	0	0	1	1	1	1	2	1
Olive Mayfly	2	2	2	1	0	1	2	2	2	2	2	2
(AMI Index)	8	8	3	1	0	1	6	5	4	4	7	5

The AMI index gains a score based on the species count range. e.g. if the species count is more than 100 for a particular species then the score is 3. If it has more than 10 and less than 100 it scores 2. If it has less more than 0, but less than 10 it scores 1.

Species found as part of the Village Atlas WildWatch Project

Birds

Blackbird	Turdus merula
Blackcap	Sylvia atricapilla
Bullfinch	Pyrrhula pyrrhula
Bunting ,Reed	Emberiza schoeniclus
Chaffinch	Fringilla coelebs
Chiffchaff	Phylloscopus collybita
Dove, Collared	Streptopelia decaocto
Dunnock	Prunella modularis
Goldfinch	Carduelis carduelis
Greenfinch	Carduelis chloris
Jackdaw	Corvus monedula
Kestrel	Falco tinnunculus
Lapwing	Vanellus vanellus
Linnet	Carduelis cannabina
Magpie	Pica pica
Martin, House	Delichon urbica
Owl, Tawny	
Partridge ,Grey	Perdix perdix
Pheasant	Phasianus colchicus
Pigeon, Wood	Columba palumbus
Pipit, Meadow	Anthus pratensis
Robin	Erithacus rubecula
Rook	Corvus frugilegus
Siskin	Carduelis spinus
Sky Lark	Alauda arvensis
Sparrow, House	Passer domesticus
Sparrow, Tree	Passer montanus
Sparrowhawk	Accipiter nisus
Starling	Sturnus vulgaris
Swallow	Hirundo rustica
Swift	Apus apus
Tern, Common	Sterna hirundo
Tern, Sandwich	Sterna sandvicensis
Thrush ,Mistle	Turdus viscivorus
Thrush ,Song	Turdus philomelos
Tit ,Blue	Cyanistes caeruleus
Tit, Coal	Periparus ater
Tit ,Great	Parus major
Wagtail, Pied	
Whitethroat, Common	Sylvia communis
Woodpecker, Great Spotted	Dendrocopos major
Wren	Troglodytes troglodytes
Yellowhammer	Emberiza citrinella

Invertebrates

Buff-tailed bumblebee	Bombus terrestris
Common carder bee	Bombus pascuorum
Garden bumblebee	Bombus hortorum
Red-tailed bumblebee	Bombus lapidarius
Common Blue	Polyommatus icarus
Dingy Skipper	Erynnis tages
Gatekeeper	Pyronia tithonus
Green-veined White	Pieris napi
Large White	Pieris brassicae
Meadow Brown	Maniola jurtina
Orange-tip	Anthocharis cardamines
Painted Lady	Vanessa cardui
Peacock	Inachis io
Ringlet	Aphantopus hyperantus
Small Heath	Coenonympha pamphilus
Small Skipper	Thymelicus sylvestris
Small Tortoiseshell	Aglais urticae
Small White	Pieris rapae
Speckled Wood	Pararge aegeria
Wall	Lasiommata megera
Dot Moth	Melanchra persicariae

Mammals

Badger	
Brown Hare	
Brown Rat	
Field Vole	Microtus agrestis
Fox	
Grey Squirrel	
Hedgehog	
Mole	
Mouse, Harvest	Micromys minutus
Mouse, Wood	
Rabbit	
Roe Deer	
Shrew	
Stoat	
Weasel	Mustela nivalis

Reptile & Amphibians

Common Frog	Rana temporaria
Common Toad	Bufo bufo
Great Crested Newt	Triturus cristatus
Palmate Newt	Lissotriton helveticus
Slow-worm	Anguis fragilis
Smooth Newt	Lissotriton vulgaris
Toad, Common	Bufo bufo

Vascular Plants

Anemone, Wood	Anemone nemorosa

Avens, Water	Geum rivale
Avens, Wood	Geum urbanum
Balsam, Himalayan	Impatiens glandulifera
Bartsia, Red	Odontites vernus
Bedstraw, Ladys	Galium verum
Betony	Stachys officinalis
Bindweed, Hedge	Calystegia sepium
Bittersweet	Solanum dulcamara
Black Medick	Medicago lupulina
Bluebell	Hyacinthoides non-scripta
Brooklime	Veronica beccabunga
Bryony, Black	Tamus communis
Bugle	Ajuga reptans
Burnett, Salad	Sanguisorba minor
Butterbur	Petasites hybridus
Buttercup, Meadow	Ranunculus acris
Campion, Bladder	Silene vulgaris
Campion, Red	Silene dioica
Campion, White	Silene latifolia
Carrot, Wild	Daucus carota
Cats-ear	Hypochaeris radicata
Celandine, Lesser	Ranunculus ficaria
Centaury, Common	Centaurium erythraea
Cinquefoil, Creeping	Potentilla reptans
Clover, Red	Trifolium pratense
Clover, White	Trifolium repens
Clover, Zigzag	Trifolium medium
Colts-foot	Tussilago farfara
Cowslip	Primula veri
Cranes-bill, Bloody	Geranium sanguineum
Cranes-bill, Cut-leaved	Geranium dissectum
Cranes-bill, Meadow	Geranium pratense
Cranesbill, Meadow	Geranium pratense
Crosswort	Cruciata laevipes
Daisy, Ox-eye	Leucanthemum vulgare
Dead-nettle, White	Lamium album
Dogs Mercury	Mercurialis perennis
Eyebright	Euphrasia arctica
Figwort, Common	Scrophularia nodosa
Flax, Fairy	Linum catharticum
Fleabane, Common	Pulicaria dysenterica
Forget-me-not, Wood	Myosotis sylvatica
Fritillary, Snakes Head	Fritillaria meleagris
Goats-beard	Tragopogon pratensis
Gorse	Ulex europaeus
Ground Ivy	Glechoma hederacea
Harebell	Campanula rotundifolia
Hawkbit	Leontodon hispidus x saxatilis
Hemp-agrimony	Eupatorium cannabinum
Herb Robert	Geranium robertianum
Hogweed	Heracleum sphondylium
Horsetail, Great	Equisetum telmateia
Meadow Buttercup	Ranunculus acris
Nettle, White Dead	Lamium album
Ox-eye Daisy	Leucanthemum vulgare
Salad Burnett	Sanguisorba minor
Garlic Mustard	Alliaria petiolata

Harts-tongue Fern	Phyllitis scolopendrium
Knapweed	Centaurea nigra
Knapweed, Greater	Centaurea scabiosa
Knotweed, Japanese	Fallopia japonica
Ladys Mantle	Alchemilla sp.
Loosestrife, Yellow	Lysimachia vulgaris
Lords-and-Ladies	Arum maculatum
Marjoram	Origanum vulgare
Marsh-marigold	Caltha palustris
Meadowsweet	Filipendula ulmaria
Melilot, Tall	Melilotus altissimus
Milkwort, Common	Polygala vulgaris
Mouse-ear, Common	Cerastium fontanum
Mouse-ear, Field	Cerastium arvense
Mugwort	Artemisia vulgaris
Orchid, Bee	Ophrys apifera
Orchid, Common Spotted	Dactylorhiza fuchsii
Orchid, Early Purple	Orchis mascula
Orchid, Fragrant	Gymnadenia conopsea
Orchid, Northern Marsh	Dactylorhiza purpurella
Orchid, Pyramidal	Anacamptis pyramidalis
Periwinkle, Lesser	Vinca minor
Pignut	Conopodium majus
Pimpernel, Yellow	Lysimachia nemorum
Pineapple Weed	Matricaria discoidea
Plantain, Hoary	Plantago media
Plantain, Sea	Plantago maritima
Primrose	Primula vulgaris
Ragwort	Senecio jacobaea
Ramsons	Allium ursinum
Rock-rose, Common	Helianthemum nummularium
Water Mint	Mentha aquatica
Birds-foot-trefoil	Lotus corniculatus
Saw-wort	Serratua tinctoria
Scabious, Devils-bit	Succisa pratensis
Scabious, Small	Scabiosa columbaria
Sedge, Glaucous	Carex flacca
Self-heal	Prunella vulgaris x laciniata
Sneezewort	Achillea ptarmica
Speedwell, Field	Veronica persica
Speedwell, Germander	Veronica chamaedrys
Speedwell, Wood	Veronica montana
St Johns Wort	Hypericum sp.
Stitchwort, Greater	Stellaria holostea
Strawberry, Wild	Fragaria vesca
Tansy	Tanacetum vulgare
Thistle, Carline	Carlina vulgaris
Toadflax, Common	Linaria vulgaris
Tormentil	Potentilla erecta
Trefoil, Birds-foot	Lotus corniculatus
Trefoil, Hop	Trifolium campestre
Twayblade	Listera cordata
Vetch, Bush	Vicia sepium
Vetch, Kidney	Anthyllis vulneraria
Vetch, Tufted	Vicia cracca
Vetchling, Grass	Lathyrus nissolia
Vetchling, Meadow	Lathyrus pratensis

Violet, Common Dog	Viola riviniana
Weld	Reseda luteola
Willowherb, Broad-leaved	Epilobium montanum
Willowherb, Hoary	Epilobium parviflorum
Willowherb, Rosebay	Chamerion angustifolium
Woodruff	Galium odoratum
Woundwort	Stachys sylvatica
Woundwort, Field	Stachys arvensis
Yarrow	Achillea millefolium
Yellow Rattle	Rhinanthus minor
Yellow-wort	Blackstonia perfoliata
Moor-grass, Blue	Sesleria caerulea

Marine Species list (provided by Guy Tritton)

Toothed Wrack
Bladder Wrack
Spiral Wrack
Purple Laver
Edible Periwinkle
Keel Worm (p.t.)
Blue Mussel
Sea Lettuce
Dog Whelk
Beadlet Anemone
Edible Crab
Common Shore Crab
Butterfish
Green Leaf Worm
Dahlia Anemone
Mottled Red Chiton
Gutweed
Carpet Weed
Scale Worm
Hydroid (t.i.)
Limpets
Barnacles

Additional species surveyed in the sea.
Sand Eel,
Goby,
Common Shrimp

Marine Mammals
Seal, Grey
Seal, Common
Porpoise/Dolphin/Whale (noted offshore)

A Poem For Ben by Jeff Playle January 2014

This poem was inspired by my family, from being a toddler my son Ben and my wife Angela walked and enjoyed the former colliery site. We watched the frogs, then the spawn and tadpoles develop, we marvelled at the wild flowers especially the bee orchids. At a certain time of the summer something magical happens, thousands of Burnet moths emerge and cover this area, one of the few moths to fly in daytime my son would cup these moths in his hands and allow them to alight from his hands, a magical moment in nature and right on our doorstep.

It was then I had the idea that this former Colliery site should be a nature reserve and a heritage site. This was one of the aims I gave to the Easington Atlas team at our first meeting. I spoke to Easington Colliery regeneration partnership in 2012 who agreed that it was a special site, and I then contacted the ecologist from Durham County Council, some avenues led nowhere, speaking to the culture department at Durham was time wasted.

Just when I thought the battle is not going well, David Boyes, the County Councillor contacted me to say that the ecology department want to make the site a Local Nature Reserve and now the Regeneration Partnership have adopted this aim as their project. Councillor Boyes is using his range of contacts, and hopefully soon we will have a new Local Nature Reserve.

But let us not forget what used to be on this site, the lives of men and the community it created.

I attempted a poem, I am not a poet, but this place inspires me and was written for Ben and Angela for the many happy hours we have spent visiting our Local Nature Reserve.

Poem For Ben

The East Coast Line runs past here,

Once coal, now people from their glass case tender,

Gaze upon the Mag Lime splendour.

Move on , move on,

Come here ! Come now !,,,,,,,,,

Slow your speed ,

There are stories to be told ,

Bear with.....Bear with ,

On this site of grassland wonder ..... The Cage ,

Symbol of strength where spirits wander .

I will tell their silent tale ,

Bear with.....

A Big Meeting takes place here ,

And every year the skylarks dance ,

Oxeye daisy and frogs gaze on,

Orchids , grandees of rendzina soils , come party ,

The Burnet moth so friendly,

Coal dust runs in your veins, and blood red tears mottle your cape ,

A sign of hurt , take comfort in numbers ,

Come picnic this fine day.

Its ever so brief , two weeks in the summer.

Their forms remind us,

Look and listen now!

Injustice , past and present will not be forgotten.

Aeolian Brass continues to play,

Alas 'the Big Meeting' it ends today ,

Peace and Stillness is a gentle way,

Injustice not forgotten.

Move on dear friends , Move on .