

## Sefton - Coastal Road, Southport

### Overview

In November 2012 a long period of heavy rainfall caused a large area of flooding between Weld Road in Birkdale and Shore Road in Ainsdale, Southport. Running through the area of flooding is a main carriageway called the Coastal Road that connects Liverpool and Southport, surrounded on either side by a highly protected sand dune system.

The famous Royal Birkdale Golf Course is also located close to the road within the dunes. Known previous flood events in the same location occurred in 2000 and 2007.

### Catchment

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The area falls within the River Alt and Crossens catchment area which was formed upon Sherwood Sandstone and Mercia Mudstone of Triassic age (250 million years ago). The area was covered by deposits left from the melting of giant ice sheets (22,000 years ago), blown sands and peat layers.

The catchment, or drainage basin (an area of land that drains its rainfall into a specific body of water, such as a river) here is close to the sea and is very low lying; containing over 60% of North West England's grade 1 and 2 farm land and 28% of this land is within urban areas. The main urban areas within the catchment are the City of Liverpool, and the coastal towns of Formby and Southport. Further inland are the populated areas of Ormskirk, Maghull and Kirkby. There are around 300 properties across the catchment at risk from river flooding.

The hydrology in the catchment is complex as it is so low lying. This means that the area is at or below sea level, therefore the water has to be pumped out to sea. This job is done by two main pumping stations within Sefton called the Altmouth and Crossens pumping stations.

The Altmouth pumping station was built in the early 1970s to allow the river to still drain out to sea, even when the tide was in and to stop the sea water from flowing back up the river. This prevented a lot of potential flooding problems inland, especially in areas that were becoming more densely populated and built upon, further increasing the amount of rainfall flowing into the river.

The Crossens pumping station was built in the early 1960s to pump water out to sea. Since it was first built it has been refurbished and electrified. The Environment Agency currently operates these two main pumping stations and a number of smaller ones throughout the catchment. If these pumps were not in use, parts of the catchment would become flooded, affecting people and their homes and large amounts of valued farmland.

## Flood Incident

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The area that flooded was between Weld Road in Birkdale and Shore Road in Ainsdale, close to the coast at the northern end of the Borough of Sefton and just south of the Seaside town of Southport . The flooding occurred at:

- The Coastal Road, the main transport route connecting Southport to the Formby bypass into Liverpool.
- The protected sand dune system between Weld Road and Shore Road.
- Royal Birkdale golf course.

Flooding in the area caused severe transport disruption for 11 weeks. The Coastal Road was closed due to the flood water on the road and the freezing weather causing it to ice over. This made an already dangerous road unusable.

Within the dunes are ponds called dune slacks which form when the water below the ground (commonly referred to as groundwater) is high enough to reach the surface of a low point in the sand dunes. Due to the very high amount of rainfall over a long period these dune slacks became flooded. The water then began to flow out of the slacks onto the road which is at a lower level than the dunes. The dunes and the pathways that usually take the water out to the sea were blocked so the water had nowhere to drain so as the rain continued to fall, the water continued to rise, flooding the road, pathways and parts of the golf course too.

## Cause

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2012 was the wettest year on record in England. The rainfall data in table 1 shows that it has been the wettest year since 2000 with a total of 1183.4mm of rainfall. The majority (778mm) of the rain fell between July and December.

This caused flooding to the sand dunes, the Coastal Road and sections of the golf course because the groundwater was unable to drain away to the sea due to a lack of maintenance of the pipes and channels within the area. This led to water emerging from the drainage system onto the road and water running off the dunes onto the road.

## Impact

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### People

- Severe delays on the road transport network in and around Southport/Ainsdale due to temporary traffic lights and road closures. People needing to allow extra time for journeys.
- Concerns raised about the added traffic diverted into built up residential areas.

- Reduced access through the dunes for recreational users.
- Cyclists unable to use the cycle path due to flood water.
- Increased air pollution from standing traffic and the use of pumps to clear the water affecting people's health.
- Disruption to members of the golf course.

#### Environment

- Disturbance to protected habitats in order to carry out emergency works to clear drains and pathways for the water to pass through into the highly protected dunes. Permission had to be granted from Natural England to undertake these works.
- Increased air pollution from traffic and pumps trying to clear the flood water.
- Habitats being submerged under water for a long period of time can lead to toxic substances building up in the soil as the plants die off.
- As it has been one of the wettest years on record the impacts of this on rare animal and plant species found within the dunes, such as Natterjack toads, sand lizards and orchids will need to be monitored over the coming year to see the true impact of the flood event on their growth.

#### Economy

- Costs to local businesses due to congestion.
- Effects on tourism and money coming into the area due to people avoiding the area due to increasing delays in the road network.
- Costs of carrying out the emergency works to investigate and resolve the issue on the Councils already tight budgets.
- Cost to the golf course, who also have a duty to maintain their drainage and watercourses, and the closure of some holes may have impacted upon members attending the course.

#### Response

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Temporary traffic lights were installed around the worst affected side of the road to still allow the flow of traffic to continue. But as the flood became larger and the weather became colder the water on the road soon froze and subsequently the road was closed for safety reasons.

At the start of February the road was still closed. This allowed machinery into the area to unblock pipes and clear pathways to enable the water to flow back out to the sea. This involved pumping a large amount of water, clearing the sand and mud that had built up within the pipes. This was successful and the road was re-opened in late February.

## Future Risk Management

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Sefton Council have looked into the flooding to try to understand how and why the flooding happened. After investigating the drains and watercourses in the area and carrying out emergency works to ease the problems, it was discovered that poor maintenance of some drains and watercourses coupled with the extremely high amount of rainfall over a long period of time caused the flooding.

Going forward the Council are developing a maintenance plan to keep the drains and watercourses clear and also have a plan in place to manage the water levels in the dune system. This will improve the conditions for valuable habitats in the area as well as reducing the risk of flooding. The maintenance plan will detail the routine work to be carried out to protect the function of the drainage system, and when carried out on a planned basis will help to prevent some types of failure that sometimes occur predictably. An example of planned maintenance can be the clearing of gullies during autumn as the leaves fall off the trees, often blocking drains at the sides of roads. It is best to plan this maintenance, as if a flood does occur it can be difficult to investigate the drainage system when full of water. This would increase the amount of time and money it would take to clear the flood water.

In July 2014 a penstock within a chamber under the carriageway/cycle path was installed. A penstock is used to control flow through a watercourse similar to a gate. By raising the 'gate' more water is allowed to flow through draining the area quicker and closing it will stop water flowing. Stopping the water is useful for maintenance purposes by allowing water to build up on the upstream side. Once the water has sufficient head (pressure), the penstock can be reopened allowing the water to flow down with significant velocity and clear any build up of silt in the rest of the pipe. Within the chamber there is also a sump where sediment will collect and this will allow for easier maintenance.

Both these measures are there to try and stop the build up of silt in the system which can create a blockage. Clearing any blockage in that system is an expensive job as specialist jetting equipment has to be used because of the distances involved.

More work is planned on the original sustainable drainage system next to the cycle path, which will involve installing more manhole covers at more frequent intervals along the pipe to enable better access for maintenance purposes. By ensuring the system is running as efficiently as possible through maintenance it is hoped future flooding can be avoided.

## Contacts

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