

Appendix 3 - A555 UPDATE

1. Drainage Strategy

- 1.1 Prior to contract award AECOM working on behalf of SMBC prepared a drainage strategy for the project. The Drainage Strategy was submitted as part of the planning application for the scheme. This strategy was to be developed as part of the Design Development Contract with CMS.
- 1.2 The general approach to drainage in the strategy was to replicate the pre road pattern i.e. manage the flow of water to the watercourses. The drainage of the road (hard surfaces) was to be attenuated (slowed) to field run off rates before discharging to watercourses.
- 1.3 The A6MARR drainage system was to be split into networks and was to use the existing section of A555 between Wilmslow Road and Woodford Road.
- 1.4 Where possible the highway and earthworks networks would be separated with the earthwork's networks discharging directly to watercourses whilst highway drainage directed to ponds or tanks where the discharge to watercourses would be controlled.
- 1.5 Where watercourses were not in close proximity to the road highway and earthworks drainage would form combined networks and attenuated before discharging to watercourses.
- 1.6 CMS were required to design the new drainage infrastructure in accordance with: -
 - Design Manual for Roads and Bridges - HD 33/06 Surface and Sub-Surface Drainage Systems for Highways
 - CIRIA C697 The SUDS Manual
- 1.7 These standards have the following requirements: -
 - No surcharging of the manhole chambers for a 1 in 5-year design storm.
 - No significant unplanned flooding for a 1 in 30-year design storm.
 - Watercourses protected for a 1 in 100-year design storm.
 - An allowance for climate change of 20%.
- 1.8 The existing section of the A555 was designed some 25 years earlier than A6MARR and was constructed in 1995 by CEC. Limited design detail was available from CEC for consideration both during CMS's design or subsequent reviews.
- 1.9 The drainage strategy identified the design parameters to which CMS were to work.
- 1.10 The existing section of A555 from Woodford Road drained to a Pump Station 4 (PS 4) at Hall Moss Lane. The Hall Moss Lane pump station (PS4) was designed to accommodate 700m of new road to the east which was factored into the CMS design.
- 1.11 Hall Moss Lane Pump Station (PS 4) was designed to contain a 1 in 10-year design storm below ground level. Flooding would therefore be expected to occur

at the Hall Moss Lane Pump Station (PS4) in a storm that exceeded a 1 in 10-year storm.

2. Overview of Drainage

2.1 The A6MARR Drainage Networks set out in Table 3.2. below.

Table 3.2 – Drainage Networks

Network	Area
Network A	A6 to Ox Hey Brook
Network B	A6 to Mill Hill Hollow south/east pond to Lady Brook
Network C	West Coast Mainline to Mill Hill Hollow north/west pond to Lady Brook
Network E	West Coast Mainline to existing section of A555 at Woodford Road (Bramhall)
Network F	Styal Road to existing pumping station at Shadowmoss Road
Network L	East of Styal Road to existing pumping station at Wilmslow Road to Spath Brook
Network M	East of Styal Road to existing culvert at Ringway Road/Tedder Drive to Gatley Brook
Network P	East of A34 (widening of slip roads)
Existing section	Woodford Road to Wilmslow Road 2 pump stations, Hall Moss Lane & Wilmslow Road to Spath Brook

3. Flooding

3.1 A record of all the instances of flooding is contained in Table 3.3 below which also records the cause that was considered at the time and the actions that have been taken.

Table 3.3 – Flooding Timeline

Date	Description	Considered cause at time	Action taken
14 th Dec 2017	Pre completion. Flood at Hall Moss Lane pump station. Road Closed.	Pump fail, coincided with works activities	Pumps failed but were reset and flood quickly cleared. Dec 2017
16th Mar 2019	Heavy rain experienced which resulted in a flood at Hall Moss Lane pump station. Road Closed.	Failing pumps and silt in tanks.	Commissioned review of Hall Moss Lane pump station (PS 4) in Mar 2019. Scheme to replace Hall Moss Lane pump station (PS 4) pumps and clear tanks. Works were progressing up to

			mid Aug 2019.									
28th Jul to 5th Aug 2019	<p>Significant and prolonged rainfall.</p> <p>Multiple floods across A555, Stockport and nationally. Road closed.</p> <p>Met Office identified storms</p> <table><tr><td><u>Location</u></td><td><u>1 day</u></td><td><u>4 day</u></td></tr><tr><td>Prestbury</td><td>1 in 25 yr</td><td>1 in 75 yr</td></tr><tr><td>Cat & Fiddle</td><td>1 in 266 yr</td><td>1 in 540 yr</td></tr></table> <p>Rainfall radar data indicates that highest rainfall was centred around Poynton; the local event could have been more severe.</p> <p>It is also known that the ponds drain down slowly so would have been further impacted by the storm severity.</p>	<u>Location</u>	<u>1 day</u>	<u>4 day</u>	Prestbury	1 in 25 yr	1 in 75 yr	Cat & Fiddle	1 in 266 yr	1 in 540 yr	<p>Woodford Road, Poynton Pump Station C – fault reported.</p> <p>Hall Moss Lane PS 4 – temporary pumping arrangements</p> <p>Pond C & E - found to be constructed incorrectly.</p> <p>Wilmslow Road PS 3 – pump failure and silt in tanks.</p>	<p>Technical reviews of drainage. Sep/Oct 2019</p> <p>Wilmslow Road pump station (PS3) tanks cleared and pumps repaired. (initial works Nov 2019)</p> <p>Contractor & Designer engagement to review design. Oct 2019 through to Mar 2020</p> <p>Surveys of ponds. Nov 2019</p> <p>Siphon maintenance / clearance. Nov/Dec 2019</p>
<u>Location</u>	<u>1 day</u>	<u>4 day</u>										
Prestbury	1 in 25 yr	1 in 75 yr										
Cat & Fiddle	1 in 266 yr	1 in 540 yr										
1 st Oct 2019	<p>Heavy rainfall over a number of days was experienced.</p> <p>Flooding to fields adjacent to Lady Brook upstream of Brookside GC</p> <p>Network E ponds overflowing.</p> <p>Road open.</p>	<p>Penstock Valves had been incorrectly set at Pond E restricting flow out of the pond.</p>	<p>System checked and all valves set correctly following day.</p> <p>Oct 2019</p>									
26 th Oct 2019	<p>Heavy rainfall over a number of days was experienced.</p> <p>Flood at Hall Moss Lane pump station. Road closed.</p> <p>Network E ponds ok but hydrobrakes open at pond E.</p>	<p>Inflows exceeded capacity of Hall Moss Lane Pump Station (PS 4).</p>	<p>System checked and hydrobrakes set correctly in following days October 2019.</p>									
Jan 2021	<p>Prolonged rainfall over a number of days plus snow melt.</p> <p>Road was closed at Hall Moss Lane</p>	<p>Inflows exceeded capacity of Hall Moss</p>	<p>Pump station data reviewed. Jan/Feb 2021</p>									

	pump station (PS 4) ahead of ponds overtopping at Chester Road.	<p>Lane (PS 4).</p> <p>Ground and surface water entering systems considered greater than designed, surface water runoff from Woodford Recreational Area identified.</p> <p>This flood is considered to be the first time the system was operating correctly.</p>	<p>Consideration given to diverting surface / ground water from Woodford Recreational Area. Feb 2021</p> <p>Work to take place to address recommendations identified in S19 Report issued Nov 2020. Feb 2021</p>
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4. **Flooding Reviews**

4.1 Several reviews have been undertaken since the road was opened and the first flooding event occurred.

- The scheme design and construction has been reviewed to identify issues which have been addressed or are under further investigation.

4.2 An independent Section 19 report has been undertaken which: -

- Investigates which authorities within the borough had relevant flood risk management functions and whether those authorities exercised those functions in response to the flood.
- Reviews the findings of the 2016 reports in the context of the further flooding in 2019 to identify if there are common themes.
- Investigates whether the construction of the A555 has worsened, or has the potential to worsen, flood risk in the borough – with particular focus on the Poynton Brook/ Lady Brook/ Micker Brook watercourse and the adjacent communities.

5. **Conclusions & Action Taken**

5.1 A summary of recommendations to address the drainage issues identified via the reviews undertaken to date and action taken is provided in Table 3.4 below.

Table 3.4: Drainage Recommendations and Actions Taken

Preliminary Recommendation	Action taken
Review system characteristics and control procedures	Organic increase in working knowledge of the system. Telemetry installed at pump stations December 2020 Set up the hydro-brake and penstock for both E1 and E2 as designed. Various times throughout 2019
Consider overflow arrangements	Pond C overflow design developed. January 2020
Raise chamber levels at ponds	Not considered a priority a measure
Raise Hydrobrake bypass control cords	Works completed. Summer 2020
Consider allowing dry weather flow to bypass Pond E and/or variable discharge/revise hydrobrake specifications	Topo surveys carried out which identified that outlet pipe levels at Pond C & E were too high which reduced the storage capacity. November 2019. Remedial works have been completed to reduce the level to the design level and increase the storage capacity at pond E. Summer 2020 Obtained drainage design modelling information. January 2020 Held meetings and reviews with the contractor and original designers to discuss their approach and apparent issues. March 2020 Obtaining catchment area plans used in design models. Ongoing
Increase depth of Pond C / E, provide bigger tank at PS4	
Review permeable run off and catchments	
Investigate full system to PS 4 (old and new)	
Investigate Spath Brook tributaries, capacity for increased discharge	

6. Section 19 Report

- 6.1 A summary of the recommendations set out in the Section 19 report and actions taken is set out in Table 3.5 below.

Table 3.6: Section 19 Report Recommendations and Action Taken

Recommendation / Conclusion	Action taken
Correct construction defects, clear all drainage networks and in particular ensure catchment B attenuation pond	Schedule of remedial works agreed. Spring 2020

is functioning correctly.	Works completed Summer 2020 with exception of works to headwall in Network B and at Pond C – awaiting Environment Agency permit to carry out works on main river.
<p>Review practicality of enlargement of A555 attenuation storage, in all catchments, to achieve design intent of 100-year capacity.</p> <p>To achieve resilient highway infrastructure and to protect downstream communities.</p> <p>Review design storm conditions (duration and appropriate runoff coefficients) and attenuation drain down times.</p> <p>Action includes development of drainage models for each catchment, including all of catchment E (original construction + 2018 construction) taking input from Action 9.4.</p>	<p>Design reviews with contractor & designer. November 2019 to March 2020</p> <p>Catchment Area plans being reproduced. Ongoing</p> <p>Drainage models provided to SMBC; will be utilised to build complete model incorporating existing section of A555.</p> <p>Scope developed to review and deliver solutions addressing S19 recommendations.</p>
<p>Consider A555 resilience to flood exceedance events and prepare appropriate action plans.</p> <p>Understand inundation depths and potential impacts upon power supplies, pumping equipment and controls.</p>	
<p>Compile record drawings and data sheets for catchment E drainage network, storage tanks and as-existing pumping installation</p>	

7. Design Information

- 7.1 To enable the thorough review of the drainage modelling an understanding of the catchment areas the designers assumed would flow into the A555 drainage system is paramount. CMS were requested to provide this information following the drainage design review meeting held in March 2020. To date we have only received some of the plans which are being reproduced by the designers.

8. Next Steps

- 8.1 The next steps in terms of addressing the drainage issues are as follows:
- Focused efforts on identifying solutions to divert groundwater and greenfield run off away from the A6MARR system.
 - Complete remedial works to Pond C and Network B headwalls.
 - Construct combined drainage model (old & new) to identify solutions to increase resilience of drainage networks as per S19 recommendations.
 - Review practicality of enlargement of A555 attenuation storage to achieve resilient highway infrastructure and to protect downstream communities.
 - Review design storm conditions and attenuation drain down times.
 - Develop drainage models for each catchment.

- Consider A555 resilience to flood exceedance events and prepare appropriate action plans.
- Understand inundation depths and potential impacts upon power supplies, pumping equipment and controls.
- Compile record drawings and data sheets for catchment E drainage network, storage tanks and as-existing pumping installation.