CASE STUDY – GRP Lining, Old Vic Culvert, Sicklesmere

When a structure is in danger of collapse and needs its structural integrity restoring with minimal disruption then iLine Technologies have a range of rehabilitation solutions to suit most situations. With unrivalled installation experience & complete service include full design service-you need look nowhere else - iLine are your first call; we offer great services and products to all our clients.

Old Victoria Culvert is a single span brick-arch with a concrete extension carrying a tributary of the River Lark beneath the single carriageway A134 (Sudbury Road) and private gardens located between Sicklesmere & Great Whelnetham in Suffolk.

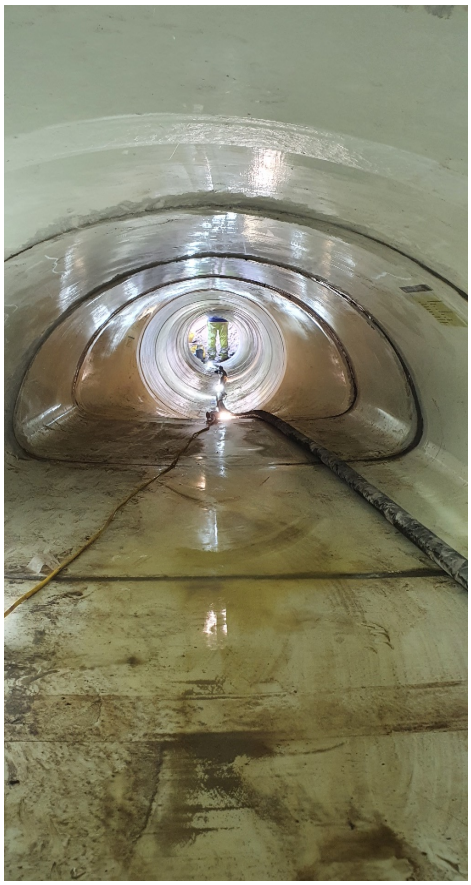
As with many old brick-arch culverts it has differing cross sectional areas with a width of 1.72m x 1.07m high for the first 34m including 6 bends, which then changes from the flat bottom brick-arch into a 1.2m diameter circular concrete pipe for the last 10m. Overall length of the culvert is 44m.

Repairs to brick-arch had previously been carried out. However, the concrete pipes had significant cracks in the crown and was badly deformed caused by settlement of the pipes and there was evidence of scour to the invert. Overall, the structure was considered in danger of possible collapse.

Suffolk Highways and their framework contractor (Kier Infrastructure Services) approached iLine to discuss potential solutions to restore the structural integrity of the culvert. Because of the varying sizes, transition from one shape and size to another and the presence of bends, GRP prefabricated units was chosen as the best and most cost-effective solution.

Working with Suffolk CC structural engineers, an initial WRc Type 1 structural design was then undertaken by iLine and Channeline International (supplier of the GRP units) to enable the units to carry loads in accordance with LM1 of the BS EN-1991-2-2003 Eurocode 1-traffic loadings on bridges. Bespoke purpose-made units were designed to accommodate not only the 6 bends but the transition from 1.72m x 0.875 flat bottom brick-arch, into the 1.2m circular concrete pipes for the last 10m. Specialist point cloud & topographical surveys were commissioned to confirm an accurate shape and profile of the original culvert to enable confirmation of the GRP units shape & sizes.

Following discussions with the Suffolk CC flood team to ensure maximum flood capacity, it was agreed to lower the invert in the arch section by digging out the soft silt and gravel to enable a larger liner to be installed achieving a greater storage capacity. Flow calculations



confirmed that due to the manning coefficient of friction an increase of 110% of the original capacity was achieved.

After further discussions and site investigation work, it was decided to manufacture shorter GRP sections to enable all the arch shape units include the transition piece to be installed from the inlet ends so that they could easily pass through the 6 bends. A double collar transition piece was designed to allow installation both u/s & d/s from this point. The circular units being installed from downstream end up to the transition piece.

34 m of flat bottom GRP arch shape units 1.5m x 0.875m x 26mm thick and 10m of circular GRP units 1.0m dia. x 17mm thick including 6 bends panels and a double collar transition piece were all manufactured and shipped from the Middle-East by Channeline International.

iLine's experienced installation team then completed the installation works to the satisfaction of both the client and residents. An initial road closure was required for a week of night shifts to cleaning & dam off the flows through the original culvert to allow installation of the new GRP units.

During cleaning of the culvert, soft spots were discovered along the line of the brick arch section. These required full removal and a firm base was installed. The GRP units were then installed from both the inlet and downstream end.

Grouting between the newly installed GRP units and the Host structures was completed on site using 12 N/mm^2 cementitious materials. This work was carried during the day under 2-way traffic lights. Despite the additional works, the project was completed within the prescribed timescale of 8 days to the satisfaction of all parties involved, with minimal disruption to both the residents and local traffic.

Yet again, an exceedingly difficult rehabilitation job completed by iLine with minimal fuss and to the satisfaction of all.