

Condition of Bulkhead, Great Kills Marina

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This brief report describes a situation in the Great Kills Marina. Essentially, it is related to a sifting of the margin of the line of pilings and the land fill inland of the pilings in the marina.

The marina was visited five times to ascertain the conditions and to plan for and conduct a survey of the site. It was visited twice in 2008, once in 2009, and twice in 2010.

From a geomorphological perspective, there is evidence of movement of the sediment underlying the upland at the marina. There are several observations that are pertinent to the geomorphological condition:

1. The land surface is lowering. At several locations along the inland margin of the line of pilings, there is evidence of a relative lowering of the sediment surface compared to concrete or wooden platforms. In some cases, the differences are minor, but in some cases the differences are on the order of 7-8 cm (Fig. 1).
2. The land is lowering. At one case, at the base of a 'flag' pole in the parking area, the depression of the surface is on the order of 10-12 cm (Fig. 2).
3. The land is shifting into the marina basin. In the northern portion of the marina, the displacement is less than 10 cm (Fig. 3). In the southwestern end of the marina, near the boat launch site, the pilings have shifted marineward about 25-30 cm. The pilings are leaning and there is a loss of land along the inland margin of the pilings. There are a few places where the pilings are shifting into the marina and the hole extends to the water level (Fig. 4).
4. Sediment is flowing and gaps are being created at the inland margin of the line of pilings in the marina (Fig. 5).

The variety of land surface changes in the marina are all indicative of some deformation of the materials underlying the land surface in the marina. It could be related to decomposition of the underlying sediment that is oxidizing and creating voids in the fill material. It could also be related to mobilization of the sediment as it responds to hydraulic pressure and flows "downhill".

The lowering of the surface could be the product of decomposition and a general compaction of the mass of material that was originally placed at the marina. Through time, a combination of dewatering and oxidation could lower the surface and cause modest changes in the surface elevation.



Figure 1. Lowering of the concrete surface adjacent to the marina bulkhead, 7-8 cm. May 24, 2010.



Figure 2. Lowering of parking lot surface relative to flag pole, 10-12 cm. March 24, 2009



Figure 3. Shift of bulkhead and pilings into marina, less than 10 cm. northern end of marina. May 24, 2010.



Figure 4. Major shift of pilings and bulkhead into marina, 25-30 cm, May 24, 2010.



Figure 5. Sediment lost at inland margin of bulkhead, some gaps 10s of cm deep. March 24, 2009.

However, there are gaps and holes that are more indicative of flow and a loss of mass as material is removed and voids are created. In these cases, the sediment is being transferred and is causing voids to develop along the margins of the fill (Fig. 5).

Another situation is the general flow of the fill that is also displacing the pilings in the fill. In this instance the flow is of sufficient depth that the pilings are being dragged along. They are tilting, indicating that the flow is faster forward the surface (Fig. 4).

There may be fluid flows that are affecting the marina fill and the pilings. If it is water, the opportunity for enhance displacement with frost action exists. That is, freezing of the water in the winter adjacent to the pilings may further displace the pilings and the horizontal movement may be the product of the general fluid flow as well as the frost displacement.

Whichever the cause, there is evidence that differential displacement is occurring along parts of the bulkhead of the Great Kills Marina (Figs. 6 and 7).



Figure 6. The shifts of the bulkhead and its pilings toward the marina basin are evident in the foreground of this photo and in the middle ground. Date of photo is unknown.

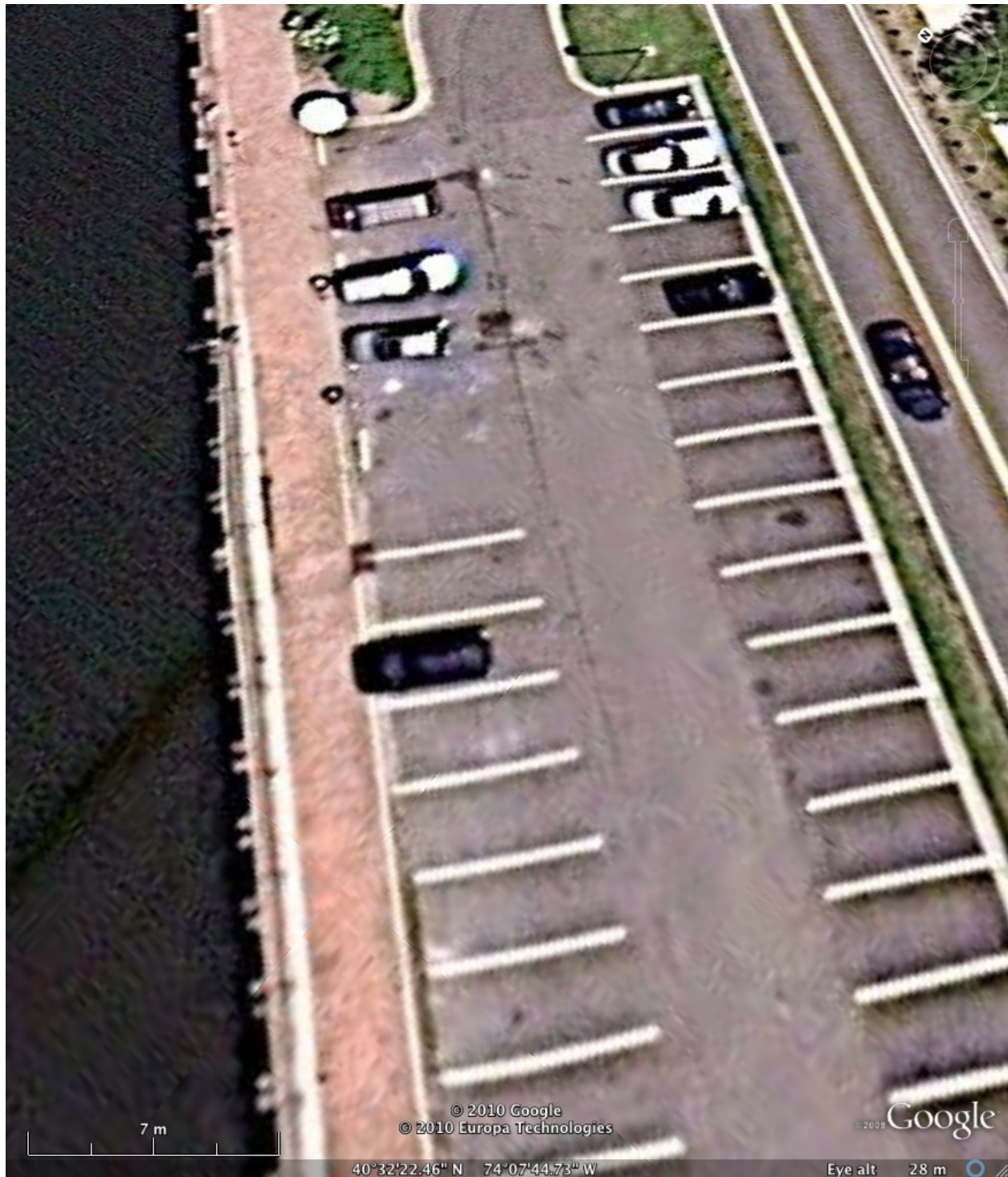


Figure 7. Bowing of bulkhead and pilings toward the marina basin is evident in middle ground of the photo of the northern portion of marina. Date of photo is unknown.