



Engineering Report

WA34

Lakestones Drive Shoreline Stabilization

Prepared for

Village of Sodus Point

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1. Executive Summary

The “Lake Ontario Resiliency and Economic Development Initiative” has designated this project for funding to specifically address shoreline restoration, bank stabilization, and infrastructure protection. Items in the “Engineering Report Template” that are not relevant to this intent are not included in this report. This revised report is based on comments received from the DEC and the State, additional information from the Owner, and subsequent discussions with suppliers and contractors.

The project area is located along the south shore of Lake Ontario in the Village of Sodus Point, Wayne County, New York. It is a residential area consisting of year-round and seasonal homes served by Village owned and maintained sanitary sewers and water mains. The Lakestones Drive properties are relatively flat and situated above the normal (historic) mean high water level (247.3) of the lake. The higher-than-normal water levels and waves have caused extensive erosion along the shoreline and yards to the point of endangering homes and inundating the sanitary sewers in the area.

The factors that have contributed to the higher-than-normal water levels, erosion, and the resulting damages, are attributed to a number of factors. Above average precipitation throughout the Great Lakes Basin and implementation of a new plan to regulate Lake Ontario water levels have been identified as probable causes for the damages.

The implementation of the plan, by the International Joint Commission (IJC) in 2017, coincided with the highest recorded water level (248.95) for Lake Ontario dating back to 1918. That mark was then surpassed in the spring of 2019 with an elevation of 249.08.

As a result of the high water and erosion in 2017 the Village had to take emergency measures to protect the sanitary sewer from collapsing. Medium to large riprap, stone rubble, and concrete barriers were placed to protect the sewer. These are still in place and require monitoring to prevent additional erosion.

Prior to 2017 the closest sanitary manhole to the shoreline sat about 20 feet back from the top of bank and the yards fronting on Lake Ontario extended approximately 35 to 65 feet, from the west end to the east end, out from the structures. Due to the limited funding available, in order to restore a portion of the area to the conditions that existed prior to 2017 and stop the erosion threatening the infrastructure, the Village of Sodus Point is proposing to construct an armor stone revetment along the shoreline that will protect the majority of the infrastructure from the higher water levels, and wave and ice damage. Furthermore, to help protect the sewer, the existing sanitary manhole at the shoreline is proposed to be abandoned along with portions of the sewer main. A new manhole and sewer are proposed to be installed ranging from about 35 to 50 feet back from the top of bank.

The design of the revetment is determined by the topography of the shore, the anticipated water level, and wave height. The revetment will consist of sloped, heavy armor stone, designed to dissipate wave energy; a crest or horizontal section at the upper level of the armor stone slope, to further reduce wave impacts; and, a sloped splash apron above the crest to dissipate any remaining wave run-up and splash conditions. When properly designed and constructed in accordance with the NYSDEC and Army Corps of Engineers (ACOE) recommendations this can be the most effective long-term solution for the Lakestones Drive area. In fact, the ACOE states that this design is the “preferred method of shore

protection”, providing “the most effective structure for absorbing wave energy” and “easily repaired with low maintenance cost.”

In addition, the proposed revetment and sanitary sewer and manhole relocation:

- will protect the area around the existing and proposed sanitary sewer and manholes from excessive flooding and overloading the waste water treatment plant and/or collapsing due to bank erosion, both of which would release raw sewage into Lake Ontario;
- will not cause a noticeable increase in flooding or erosion to adjacent properties, and;
- will benefit water quality and could provide aquatic and wildlife habitats.

The budget allowed by the State for this project is \$342,000.

Although it would be wise to extend the revetment further along the shoreline through the proposed change to the FEMA floodplain mapping in this area to protect the homes and remaining infrastructure for many years (which would help to stabilize the local property tax base, benefiting the Village, local school district, and the County) it is not possible at this time due to the funding constraints.

2. Project Background and History

2.1 – Location

Lakestones Drive is situated along the shoreline of Lake Ontario, in a residential section of the Village of Sodus Point, Wayne County, New York. The site has experienced heavy erosion caused by excessively high lake levels, and wave action, that occurred in both 2017 and again in 2019.

The Lakestones Drive area is a relatively flat area, slightly above the normal high water level. The 2017 and 2019 water levels and waves have eroded the shoreline to a point where a sanitary sewer line is in danger of being severely damaged, as are a number of homes within the area.

The Village currently has an easement across the lots in this area for the sanitary sewer. Additional easements will be needed along the reclaimed shoreline for the placement and construction of improvements to protect the sanitary sewer line and manholes from higher water levels and damaging waves.

Refer to Appendix E for aerial mapping of the location, showing the shoreline prior to 2017 and as it currently exists.

2.2 – Geological Conditions

According to the USDA Natural Resources Conservation Services’ Web Soil Survey website and the Soil Survey of Wayne County, New York, the majority of the Lakestones Dr. project is classified as Beaches (Be), with a small portion of the site as Colonie and Dunkirk soils, hilly (CTE) near the historic light house property already protected by stone revetment.

Beaches is defined as a “miscellaneous area consisting mainly of sand and gravel deposits built up by wave action along the shore of Lake Ontario. These sand and gravel deposits are susceptible to

overwash during stormy periods, when the lake level is high. Vegetation generally is sparse and often is temporary. These areas are used mainly for recreation. A few of the highest beach levels are sites for cottages, summer homes, or camps. Capability subclass not assigned.” The soil layer is considered deep, with very minimal water capacity, and rapid permeability. The slope through this soil area is relatively flat.

Colonie and Dunkirk soils, hilly is an undifferentiated group of soils defined as “a deep, hilly, well drained and moderately well drained, medium to low lime, sandy and silty soils formed in outwash and lacustrine deposits, dominated by very fine sand and clay.” These soils are highly erodible with a seasonal high water table below 6 feet. Generally coarse fragments are not more than two percent and consisting of scattered sandstone or limestone gravel. The slope through this soil area is considered moderately steep to steep and can range from 15 to 45 percent.

The bedrock bordering Lake Ontario is bordered by rocks of the Medina and Queenston Formations, with depths being greater than eighty inches.

According to the National Oceanic and Atmospheric Administration (NOAA) the near shore bathymetry shows a very gradual lakeward slope of about a five feet depth out around 500 feet lakeward (references the low water datum of 243.3 ft.

Reported in a Draft Environmental Impact Statement of the Lake Bluff Shoreline Protection prepared by Thomas A.V. Cassel, Ph.D., P.E. in May 2000, a study of various reaches along Sodus Point (this project area is located at the western edge of Reach 1 of the study which appears to have gone from 8th St. to the western side of the Sodus Point Lighthouse pier) states that the Sodus Point beach material increases in percentage the further west from the pier because the velocity of the west-to-east littoral current decreases as it approaches the pier construction causing the heavier gravel particles to settle prior to the lighter sand particles. Also stated, is that the beach has been in a state of equilibrium since the 1930’s with neither any appreciable growing nor shrinking. Therefore, the littoral sediments from the west (near the project area) are being transported past the lighthouse pier. Based on this information, the proposed scope of revetment in a portion of the existing emergency rip rap to protect this project area will not have a noticeable impact on downstream littoral sediment transportation or deposition.

2.3 – Environmental Conditions

The factors that have contributed to the higher-than-normal water levels, erosion and the resulting damages, are attributed to a number of factors. Above average precipitation throughout the Great Lakes Basin and implementation of a new plan to regulate Lake Ontario water levels have been identified as probable causes for the damages.

The implementation of the plan, by the International Joint Commission (IJC) in 2017, coincided with the highest recorded water level (248.95) for Lake Ontario dating back to 1918. That mark was then surpassed in the spring of 2019 with an elevation of 249.08.

Lakestones Drive properties are relatively flat and situated above the normal (historic) mean high water level (247.3) of the lake. High water and waves have caused extensive erosion along the shoreline and yards to the point of endangering homes and inundating the sanitary sewers in the area.

Prior to 2017 the top of the bank across the Lakestones properties was 4 -5 feet above the normal mean high water level and varied from 65 feet to 35 feet from the homes foundations. The top of the bank was 20 feet from the sanitary sewer near the west end of the project area. A wide beach ran along the shoreline, between the bank and the normal waterline.

The 1988 “Coastal Erosion Hazard Area Map” for this area shows an extensive beach across the shoreline from the historic lighthouse site on the west end all the way to the pier on the east end. This beach is designated as a “Natural Protective Feature”. Today the beach is practically nonexistent along the westerly portion and the top of the bank is at the sanitary sewer on the west end and varies from 5 feet to 40 feet from those same Lakestone property foundations (refer to Appendix E).

There are no wetlands located within or adjacent to the Lakestones area.

Based on effective FEMA floodplain mapping, the properties are within a floodplain, however the finish floors of the homes are above the flood elevation. Per the recent FEMA mapping, not yet official, the structures appear to be just outside the high velocity Coastal V zone. The existing manhole at the shoreline is currently within the floodplain but most of the sewer is not. The proposed manhole and sewer will be moved outside of the effective floodplain; however, it will mostly fall within the floodplain according to the unofficial FEMA mapping.

2.4 – Ownership

The properties are privately owned, up to the mean high water line of Lake Ontario. Any work to be located within the mean high water line of the lake and/or the Coastal Erosion Hazard Area will be subject to State and Federal review.

Easements will be required from the individual lot owners along the project area. A short portion of the west end of the proposed improvements will connect into an existing stone ‘breakwall’ located on the site of the Old Sodus Point Lighthouse. This will provide additional protection for this property in an area that is beginning to experience some shoreline erosion.

The sanitary sewers are owned and maintained by the Village of Sodus Point.

Individual property owners have been contacted by e-mail and presented with plans and exhibits showing the overall project area and how the proposed improvement will impact their property. The material is also available on the Village of Sodus Point website and has been the topic of discussion at numerous Village Board meetings.

2.5 – Existing Facilities and Conditions

The Lakestones Drive area is a relatively flat, residential area, sitting 3 to 4 feet above the mean high water level of 247.3. Since 2017 the higher water levels and waves have caused flooding and extensive erosion along the shoreline and yards to the point of endangering some houses, and inundating the sanitary sewers and manhole in the area.

2.6 – Definition of the Problem

Existing conditions, as previously outlined, have threatened to flood and/or undermine residences on Lakestones Drive, along with sections of the Village’s sanitary sewer collection system. This area would involve approximately 290 feet of shoreline mitigation measures to replace and improve a portion of the shoreline stabilization that was previously installed during emergency efforts to protect the sanitary sewer and residences.

Flooding or undermining of the sanitary sewers would create a situation where the sewers could overflow or collapse resulting in the discharge of raw sewage into Lake Ontario. In addition, the flooding could also overload the waste water treatment plant, causing the treatment operation to fail and also discharge untreated sewage into the lake.

The intent of the proposed improvements is to:

1. restore the shoreline to the footprint that existed prior to 2017;
2. provide a barrier to the high water levels experienced in 2017 and 2019 to help partially prevent flooding from excessive wave run-up, splash, and water elevation; and,
3. dissipate the wave energy so that the shoreline does not continue to erode, threatening the Village’s infrastructure.

These improvements would be in compliance with the NYSDEC and the US Army Corps of Engineers (ACOE) guidance documents for shoreline protection and wave energy dissipation.

2.7 – Financial Status

At this time the Village is committed to four (4) reclamation projects dealing with the flooding and erosion problems caused by the high water levels of Lake Ontario, Lakestones being one of them.

Based on current estimates for these projects the Village portion of the funding is \$441,100. These costs will be paid over the current fiscal year and at least the following 2 years, with approximately 75% anticipated for fiscal years 2019-2020 and 2020-2021.

The Village currently has \$221,000 in an unreserved fund account that will be used for a portion of the costs. They anticipate using the fund balance from the current year and the next 2 fiscal years to pay the balance.

In the unlikely event that the unreserved fund balance does not materialize there are reserved monies that can be considered.

3. Permit and Regulatory Compliance

Compliance with the State Environmental Quality Review Act (SEQR) will be required. This review will also involve the State Historical Preservation Office (SHPO). It is the intent of the Village of Sodus Point Village Board to act as lead agency.

The State Historical Preservation Office (SHPO) will be contacted as part of the SEQR review. As these proposed improvements are restoring the shoreline with minimal disturbance to the existing grounds, we do not anticipate any complications from this office.

The Village planning board will also have to review any proposed improvements to determine if they are in compliance with the Village's adopted, and NYS approved, Local Waterfront Revitalization Plan.

At this time we anticipate needing the following permits: an ACOE Nationwide Permit No. 13 for Bank Stabilization, an Article 15 Protection of Water; an Article 34 Coastal Erosion Management; a Section 401 Water Quality Certificate; and, a Coastal Consistency Certificate. Any stabilization activity taking place below the mean high water level of Lake Ontario will require a joint permit application to NYSDEC and the Army Corps of Engineers (ACOE). This will also be referred to NYS Department of State and NYS Office of General Services.

4. Alternatives Analysis

4.1 - Description

1. No-Action Alternative - preventative action is needed to protect the Village's infrastructure and avoid risk to the environment as a result of the failure of the sanitary sewer collection and treatment system. There are also seasonal and year-round residences at risk. Over the last few years the shoreline has eroded 25 – 30 feet. New York State government and the IJC have both predicted that the lake levels will be higher over the long term. No-Action is not an acceptable option for the Lakestones Drive area because of these stated risks to the infrastructure and homes mainly due to excessive erosion.

2. Re-locating the homes and utilities – this is not realistic due to the size of the lots, there is limited to no space to relocate structures. Upon further evaluation, a portion of the sewer main, however, may be able to be relocated by connecting into an upstream manhole, and a new manhole downstream. The existing manhole at the shoreline and sewers between would be abandoned in place. Relocation of homes and the sewer would still require shoreline stabilization to prevent continued erosion.

3. Breakwall or Seawall Construction – in the Lakestones Drive area this would be a free-standing wall which would require reinforced backing on the upland side in order to withstand buffeting from water and wave forces. During the winter months ice building up and being pushed against the wall would create additional concerns relative to stability. This option is commonly used along an upland bank or bluff, not in the level ground conditions along Lakestones Drive. A free-standing, reinforced wall would have to be approximately 6 to 8 feet high. Drainage on the upland side would be an additional concern, as would annual maintenance.

4. Stone rip-rap – this may work for some vertical bank stabilization projects, however it may not be suitable for coastal erosion hazard areas and excessive flood protection, particularly in the Lakestones Drive area. It is also not generally suitable for areas that are subject to fluctuating water levels with significant wave activity and ice build-up, as this can move rip-rap and continue to cause erosion. One property owner in the area had already placed rip-rap and there is still substantial erosion around and behind the placement of the stone. Annual maintenance is also a concern.

5. Green infrastructure – is not feasible with the wave action, ice build-up and movement along the relatively flat shoreline.

6. Armor stone revetments - this option, in combination with a soil backed slope, addresses both high water levels and dissipates wave energy (excessive flooding and erosion concerns). Consisting of sloped, heavy armor stone, designed to dissipate wave energy; a crest or horizontal section at the upper level of the armor stone slope, to further reduce wave impacts; a sloped splash apron above the crest to dissipate any remaining wave run-up and splash conditions, and a sloped soil over fabric on the backside slope to help prevent excess flooding from the high waters and waves through the revetment. When properly designed and constructed in accordance with the NYSDEC and Army Corps of Engineers (ACOE) recommendations this can be the most effective long-term solution for the Lakestones Drive area. This type of improvement is constructed of natural material, is most effective for dissipating wave and ice forces, and has a relatively low annual maintenance cost.

The Village has used this option at other locations along the lakeshore and on Sodus Bay. In addition, the ACOE is proposing this option to address similar flooding and erosion problems on the east side of the Sodus Bay approach channel, along the lakeshore, to provide protection to residences at Charles Point.

7. Sanitary sewer relocation – as previously mentioned, a portion of the sewer and manhole may be able to be relocated further inland about 35 to 50 feet. The manhole at the shoreline would be abandoned in place and filled with concrete. The new sewer main would tap into the next upstream manhole and connect to a new manhole intersecting the existing sewer main. The old portion of the sewer main between these two manholes would also be abandoned in place. This option would protect the sewer from immediate damage and excessive inundation of the sewer and manhole but would not be a permanent solution if the erosion of the shoreline was not addressed.

8. Combination of sewer relocation and armor stone revetment – this option is the most practical for this area to provide immediate and long term protection for the infrastructure. In order to cut costs and protect as much of the shoreline in front of the closest portions of the infrastructure while staying within the project budget, certain assumptions are made. Those assumptions are that there will not be a soil backed slope against the backside of the revetment, the revetment slope will be at a 1.5H:1V to provide the smallest footprint and thus least amount of material, and the Village will try to acquire the stone material through either the County or State bid. Based on the assumptions, and removing the remaining costs of the project, approximately 290 feet of the shoreline can potentially be protected with new armor stone revetment, heading east from existing lighthouse point revetment to about 100 feet short of the end of the emergency riprap.

4.2 – Cost Estimate

Due to the nature and location of the improvements for Lakestones Drive the cost estimates are directed at the options that are generally recommended by the ACOE and NYSDEC for erosion control and wave energy dissipation on Lake Ontario. The estimate shown below is based on similar projects bid within the last two (2) years and limiting the project scope of work to remain within the State's estimated available project funding.

The armor stone revetment is designed to withstand and dissipate wave and ice impacts, thereby minimizing annual maintenance costs. The design of the revetment also absorbs and dissipates the wave energy, minimizing any impact on adjacent properties; and is helped further by the remaining emergency rip rap eastward of the end of the revetment. The revetment is comprised of natural material and is projected to have a useful life of at least 30 years with minimal annual maintenance anticipated.

The relocation of the sanitary sewer and manhole further back from the shoreline will help prevent against failures and possibly against excessive inundation from the Lake.

The positive impact from this improvement is to protect Village infrastructure, sanitary sewer and water main, along the shoreline properties.

6. Recommendation

High water levels, wave action, ice build-up and topography limit the types of improvements that are acceptable to the reviewing and permitting agencies. In considering those conditions, with emphasis on the topography, the armor stone revetment combined with the sewer relocation is the recommended option for this project. When properly designed and constructed in accordance with the NYSDEC and Army Corps of Engineers (ACOE) recommendations this can be the most effective long-term solution for the Lakestones Drive area (refer to Section 4, Alternative Analysis).

The Village has used the revetment portion of this option at other locations along the lakeshore and on Sodus Bay. In addition, the ACOE has proposed this option to address similar flooding and erosion problems throughout the Great Lakes. The ACOE maintains that this design is the “preferred method of shore protection”, providing “the most effective structure for absorbing wave energy” and “easily repaired with low maintenance cost.”

This type of revetment is designed to absorb and dissipate wave energy, thereby minimizing impacts to nearby shorelines.

Projected schedule for this project:

Submit Engineers Report – February, 2020

Resubmit Engineers Report – April, 2020

Preliminary Design and Estimate – April - May, 2020

Agency Reviews and Comments – May - July, 2020

Final Design – August - September, 2020

Agency Reviews and Permitting Process – October 2020 - February, 2021

Prepare Contract Documents and Bidding Process – March - April, 2021

Award Contract – May, 2021

Construction – June - August, 2021

The Village will continue discussions with the affected property owners and negotiate easements for the construction of the revetment.

Appendix A
Design Information

Design Basis:

Although moving the sewer is a resilient option, if the shoreline is not protected against further erosion the Village will be back in the same situation with fewer options in the future.

As described throughout this report, the Village recently received approvals for a similarly designed revetment project. The Site Plan (sheet C-100) is attached in this Appendix.

Both the NYSDEC (in its “Protection Against Wave-Based Erosion” guidance manual) and the ACOE (“Coastal Engineering Manual”) recommend the proposed armor stone revetment for this situation along the Lake Ontario shoreline. As advised by the DEC during the aforementioned recent project’s review process, DEC also refers to the “Ohio Coastal Design Manual – Guidance for professionals designing structures along Lake Erie” for further guidance and design examples, especially relating to the recommended size of the stone in the revetment.

The manuals referenced above are not included with this Report as they are publically available on the internet.

Appendix B
Cost Estimate Information

Appendix C
Public Involvement Summary

Public Involvement

The Village of Sodus Point has contacted the individual property owners in conjunction with the proposed improvements to stabilize the shoreline. During the preliminary and final design phases additional meetings will be held with the residents to review plans and obtain feedback. In addition to the meetings there will be emails to insure that all interested parties can participate.

Plans and details will also be posted on the Village's website.

Appendix D
Smart Growth Assessment

Appendix E

Aerial Mapping, Photos and Plans