Construction Plan Report

Toronto Zoo Anaerobic Digester

Riepma Consultants Inc.

August 2013

Construction Plan Report

1.0 Introduction

This report is provided as part of the Renewable Energy Approval for the proposed 500kW anaerobic digester to be constructed at the Toronto Zoo. The project has received a FIT contract Number F-003038-BIG-211-203.

2.0 Project Location

The location of the proposed 500kW biogas plant is shown on the drawing in Appendix 1. The land required is currently part of the Zoo's composting operation and will occupy an area of approximately 50m x 100m (5000 sq. m. or 1.3 acres) of the site. The digester will replace the zoo's current composting operation. To the north is an area used occasionally for overflow parking purposes.

It is located on the east side of Meadowvale Road, south of Beare Road and is described as Lot 3, Concession 3.

The point of common coupling for the grid connection is located at the northeast corner of Meadowvale Road and Beare Road, approximately 200 metres north of the project site. (GPS coordinates: 43°49'06.16"N, 79°10'23.76"W). An overhead pole line will be constructed from the new digester, along the existing access road to the connection point.

3.0 Timing

Construction of the facility is scheduled for summer 2014 with completion and grid connection expected in the fall of 2014.

4.0 Construction Activities

The general design of the project is attached as Appendix 2. The construction of the project involves the following activities:

4.1 Site Preparation

No site preparation is required as the site is currently clear and is used for the Zoo's composting operation. The entire composting site is surrounded by vegetated earthen berms which will control any siltation that might occur as a result of construction and constrain the movement of construction vehicles.

The Zoo will relocate any compost windrows that will interfere with the construction of the project. While digester construction is underway, the Zoo will continue to dump manure in windrows on the southern part of the site which is outside of the area affected by construction. Currently the composting

operation consists only of the dumping of manure in windrows and no turning, mixing or screening occurs. The dumping of manure will cease when the digester is complete and the manure can be digested. The Zoo will then decommission the compost facility.

4.2 Excavation

Footings for the engine / control / educational building will be excavated first. When the shell of the building is underway, the excavation for the vessels will commence. Excavation will proceed in an easterly direction and the vessels will be poured immediately after excavation.

4.3 Building Construction

The pole line will be installed to supply temporary construction hydro to the site. The shell of the building will then be constructed to permit it to be used as a site office and equipment lay down area. Immediately after excavation for the building footings is complete, excavation of the vessels footings will commence.

When the shell of the building is complete, work will continue installing the switchgear, heat manifold, control system etc. When available, the engine will be delivered and installed. Finally classroom finishes and electronics will be completed.

4.4 Vessel Construction

Each vessel will be poured in turn. All vessels are slip formed with tie-less forms to prevent potential leakage. Insulation, heat lines, liquid lines and electrical conduit will be placed and the entire are backfilled. The cut and fill of the site is designed to be balanced so that no excavated material is removed from site or fill materials imported.

The mixers will then be installed in the digester and the wooden deck constructed before the membrane roofs are installed. At this point the remaining insulation will be added and the metal cladding installed around the digester. Heat and fluid lines will then be connected and power run to all mixers, pumps, cameras, sensors, etc in all of the vessels. Catwalks, stairs, over/under pressure controls, flare and miscellaneous equipment will be installed.

Finally the gas cooling field will be installed and connected to the engine and flare. At this point final grading will be completed and seeding of disturbed areas done.

4.6 Testing

All assemblies will be pressure tested to ensure that there are no leaks. All mixers and pumps will be bumped to ensure that they are connected properly and all sensors tested to be certain that they are working as designed.

4.6 Commissioning

When construction is complete the digester will be filled with liquid cattle manure and heated to 38 degrees C. As biogas starts to be produced, it will start the automatic flare which will burn off the initial gas. When gas production has stabilized and gas quality is acceptable, the engine will be started. All

systems will be checked to confirm that operation is to specifications. When this work has been completed, the facility is turned over to the owner for operation.

5.0 Materials Brought on Site

No soil will be brought on site nor will any be removed. Some gravel to construct / reinforce the access road will be required. The extent of this work will be determined in the field. The only other materials brought onto the site are the materials used for the construction of the facility. This includes concrete, lumber, insulation, steel cladding, windows, doors, engine, electrical equipment, mixers, pumps, valves and other parts required. Transport will all be by truck. Truck traffic will be the heaviest when the vessels are being poured. There are no neighbours in the area that would be inconvenienced by this short term traffic.

6.0 Construction Equipment Used

The major piece of equipment that will be on the site during the excavation period of about three weeks is an excavator. During the daily concrete pour a concrete pump will be on site as trucks are unloaded. A crane will be required for 1 hour to of load the engine and place it into the building. A small rubber tired excavator will be required on site periodically to backfill or excavate small trenches. The remainder of the work is done by skilled tradesmen using hand tools.

7.0 Timing

Constructing the building shell will take about three weeks. Pouring the vessels will be completed over a three week period. Installing the equipment and connecting it will take 8 weeks. Finishes and grid connection work will be another three weeks. Total construction period will be about 4 months. Testing and commissioning will then take another 6 weeks before the plant is fully operational.

It is expected that during the construction period, working hours will be will between 7 am and 6pm, 5 days per week.

8.0 Temporary Uses

There will be no temporary uses on the site. The excavated materials will be stockpiled in close proximity to the excavation and will be backfilled as soon as possible.

9.0 Material Generated

Any surplus material generated as a result of the construction will be minimized because it is expensive and inefficient. Any unused material will be returned to the supplier. Packaging and strapping will be recycled as much as possible. Material that cannot be recycled or returned will be disposed of in an appropriate manner.

10.0 Negative Effects

10.1 Storm Water Management

The site is now completely surrounded by earthen berms and these are expected to remain in place. Currently all storm water drains to the shallow pond in the northeastern corner of the site. The general grading and the existing pond area will be maintained. The existing compost operation will continue to be drained to the existing pond. As a result there will be no change in the storm drainage during the construction period. After construction, the disturbed area will be graded and seeded and storm runoff quality will be improved as the compost piles are removed.

10.2 Dust and Noise

The construction site is well over 400 meters to the nearest residence and the intervening Meadowvale Road which is a major arterial road has far more noise impact the construction activity will produce. As a result, construction noise is not considered to be an issue. There is no dust sensitive receptor in the vicinity of the construction site. Should dust suppression be required, the contractor can be asked to spray Calcium Chloride.

10.3 Vegetation and Habitat

There is no vegetation or natural habitat at or near the construction site. The earthen berms will serve as a boundary for construction activity. The composting operation is currently contained within the earthen berms and there is no vegetation or natural habitat within this area. There is no reason to expect that construction activity would affect the surrounding woodland area.

10.4 Water Bodies

There are no natural water bodies in the vicinity of the construction.

10.5 Water Taking

No water taking is required as part of the construction of the project.

10.6 Fuel Spills

Should a fuel spill occur during the operation of construction equipment, the spill area will be contained and the appropriate spill response plan put into action. The Ministry of Environment will be notified and appropriate clean up procedures implemented.

10.7 Archeological Resources

No archeological resources have been identified on the site or in the vicinity. Should archeological material be uncovered during construction, the project will be stopped and the Ministry of Culture contacted to ensure that the appropriate professionals are retained to provide recovery or other services.

11.0 Mitigation

In view of the current use of the site and the surrounding environment, no required mitigation measures have been identified. The existing drainage and storm water management for the existing compost operation will be maintained during construction. No additional mitigation is required. After construction is complete the disturbed areas will be topsoiled and seeded and the composting operation will be decommissioned. The existing storm water management system will be maintained and used for the digester installation.

12.0 Environmental Effects Monitoring

Environmental effects monitoring is not warranted during the construction period of this project.

Appendix 1

Location Plan

Appendix 2

Design Plan