

**LENA ROAD CLASS I LANDFILL CLOSURE COST ESTIMATE**

**Manatee County has installed the final cap on 30 acres of the Stage I Landfill. Thus the closure cost estimate is for 286 acres. The Long-term care cost estimate is for 316 acres.**

Every effort was made to collect the most recent unit pricing data available; however, due to the recent economic downturn and resulting lack of landfill construction projects, some unit cost data of more than one year old had to be used. In these cases, the available data was adjusted for inflation over the relatively short period from the date of the data to the date of the cost estimate. These cases are explained under each of the line item descriptions below.

1. Proposed monitoring wells – Not applicable. Monitoring wells exist at time of closure.
2. Slope and Fill (bedding layer between waste and barrier layer) – The remaining landfill foot print for closure is 286 acres, which multiplied by 43,560 square feet per acre, equals 12,458,160 square feet. It is assumed that an average of one foot of fill is required to level up the landfill surface and provide a minimum of six inches of bedding soil for the geomembrane. The volume of in-place soil is estimated at 12,458,160 square feet times 1 foot thick divided by 27 cubic feet per cubic yard, which equals 461,413 cubic yards, which is rounded to 460,000 cubic yards. Quote for delivery of fill to the top of the landfill is \$6.44 per cubic yard based on a recent bid for cover soil (See Attachment 1, Purchase Order dated 02/11/14). The unit cost was increase by 15% to \$7.40 per cubic yard in-place to allow for the difference between truck cubic yards and in-place cubic yards. In the cost estimate sheet, this is broken down into \$3.70 per cubic yard for material and \$3.70 per cubic yard for delivery. The cost for placement and spreading by dozer comes from page 1098 of RS Means (Attachment 2), and for compaction by vibrating roller, the cost is shown on page 1108 (Attachment 3).
3. Cover Material (Barrier Layer) – The remaining landfill footprint is 286 acres, which multiplied by 43,560 square feet per acre and divided by 9 square feet per square yard, equals 1,384,240 square yards. The proposed barrier layer is a 40 mil LLDPE geomembrane, textured on the side slopes, and smooth on the top. A high flow capping geocomposite is required on the landfill side slopes over the geomembrane and under the cover soil to drain seepage through the cover soil and stabilize the slope. Based on a 2009 bid for Desoto County Landfill Zone Closure of Zone 2 and Partial Zone 3, (Attachment 4) which was increased at 1.5% per year, the unit price is \$0.45/SF (\$4.05/SY) for the 40 mil LLDPE geomembrane and \$0.57/SF (\$5.13/SY) for the high flow capping geocomposite. The unit prices are installed prices and include material and labor.

4. Top Soil Cover - The landfill footprint is 286 acres, which multiplied by 43,560 square feet per acre, equals 12,458,160 square feet. Two feet of fill is required to cover the geomembrane. The volume of in-place soil is estimated at 12,458,160 square feet times 2-feet thick divided by 27 cubic feet per cubic yard, which equals 923,000 cubic yards. The unit cost for off-site material and delivery is the same as in Item 2.
5. Vegetative Layer – The vegetative layer will be sod. The quantity is 1,384,240 square yards, which is the same as the barrier layer estimated in Item 3. The estimated unit cost is \$0.175 per square foot (or \$1.575 per square yard) based on the vendor quote from 06/30/14 (Attachment 5), which was increased at 1.5% for one year. The equals \$1.60 per square yard. The unit price includes irrigation, maintenance and a year warranty.
6. Stormwater Control System – The stormwater control system is already in-place on the west side of the Stage I Landfill. The remaining system consists of 54 down-comers spaced 300-foot on-center along the perimeter of the landfill. The average size of corrugated plastic pipe (CPP) down comers is 24-inch. Attachment 6 contains a recent quote for 18-inch CPP (\$9.73 per foot) and also page 1173 of RS Means which provides representative costing of HDPE water line piping. The Means pipe costs provides a relative comparison between material price and installed price (180%) and difference between 18-inch and 24-inch pipe (150%). Thus from the material price of \$9.73 we get an installed price of \$17.51 and for 24-inch we get a price of **\$26.27 per foot**. The down comers are an average of 350-feet each with three inlet structures and one outlet structure. The inlet control structures will be similar to FDOT Type ditch bottom inlets, and the outlet control structure will be “U” Type concrete endwalls with grates and energy dissipaters. Attachment 7 provides recent FDOT pricing for these Type C drop inlets (\$2,870) and for 18-inch U-type end walls (\$2,015). Since the actual end walls will be 30-inch we double the unit price for that item to \$4,000. Taking the weighted average for all four structures per down comer we get a average unit price of **\$3,153** for each structure.
7. Gas Controls: Passive – Not applicable since an active extraction system is proposed.
8. Gas Control: Active Extraction – An active gas collection system with a flare is in place for the Stage I Landfill and for the first and second phases of the Stage III Landfill. In 2010 an estimate was prepared for the cost of the remaining gas collection system in Stage III and Stage II. The 2011 Manatee County Stage III Landfill Phase II Landfill Gas System was constructed. The 2010 cost estimate was updated (Attachment 8) based on removing the quantities that were constructed in 2011 and updating the unit costs based on the 2011 bid results (Attachment 9). The 2011 bid costs were increased at 1.5% per year.
9. Security System – Not applicable. Landfill security system is in place.

10. Engineering – Estimate provided by Atkins based on recent similar engineering assignments.
11. Professional Services - Estimate provided by Atkins based on recent similar engineering assignments.
12. Contingency – 5% based on Atkins experience with other similar closure projects.
13. Site Specific Costs – Mobilization for a large scale project is \$500,000. The Lena Road Waste Tire Processing Facility Closure Estimate approved by FDEP in the permit issued June 3, 2009 was \$33,030, which was increased at 1.5% per year to **\$36,116**. Since the white goods are scrap metal that can be recycled, no closure cost estimate is required for this facility. The Household Hazardous Waste Drop-off closure cost is estimated at **\$87,500** to account for contracted removal of the most material that could be stored on-site. This estimate is based on the most recent invoices from Clean Harbors Environmental Services Inc., resulting in an annual costs for this service was \$350,000. Clean Harbors removes hazardous waste monthly. The Operation Plan calls for removal of hazardous waste at least quarterly. Thus dividing the most recent annual cost by four we obtain the maximum potential closure costs.

**LENA ROAD CLASS I LANDFILL ANNUAL COST FOR LONG-TERM CARE**

- 1. Groundwater Monitoring – Based on current costs for monitoring 18 wells as provided in Attachment 10 and allocated based on the percentage of the analyses costs the sampling and monitoring costs are currently \$5,555.40 per event for 18 wells or \$308.63 per well per event.
- 2. Surface Water Monitoring – Based on current costs as provided in Attachment 10 and allocated based on the percentage of the analyses costs the sampling and monitoring costs are currently \$3,451.80 per event for two locations or \$1,725.90 per location per event.
- 3. Gas Monitoring – Estimate provided by Atkins are as summarized below:

|   |              |
|---|--------------|
| Technician @ \$90/hr and 8 hours on site        | \$720        |
| One day truck rental, gas, etc.                 | \$150        |
| One day equipment rental                        | \$125        |
| Office time to prepare report 2 hours @ \$90/hr | \$180        |
| Two hours of PE review time @ \$150/hr          | \$300        |
| Mailing and miscellaneous                       | <u>\$ 50</u> |
| Total   | \$1,525      |

Based on reading 20 probes or points, the cost per point is \$76.25 per point.

- 4. Leachate Monitoring – Leachate monitoring is no longer required.
- 5. Leachate Collection/Treatment Systems Maintenance – Stage I, II and III has 35,176 feet of leachate collection pipe based on the recent cleaning done by Florida Jetclean at \$27,418.48, which includes overlap footage (Attachment 11). Thus the average cost was \$0.78 per foot of existing collection pipe. There are 42 manholes and 4 lift stations that must be maintained and cleaned out.

Leachate generation for a slurry wall landfill is a result of infiltration of stormwater through the cover surface and infiltration of groundwater horizontally through the slurry wall. The following table represents the amount of leachate recently collected from the 198 acre Stage I and Stage III Landfills. These areas are currently filled to near final grades and has a 30 acre cap on a portion of the landfill. The ~~201~~ month ~~rolling~~ average of leachate generation is ~~3,409,799~~ thousand gallons per year. This equals ~~17, 2179,187~~ gallons per acre per year, or 47 gallons per acre per day.

Calculations of seepage rates through the slurry wall are provided as Attachment 11B. These calculations indicate that the seepage quantities represent a relatively small contribution to the overall amount of leachate generation. Based on the geometry of the facility the calculated seepage amount is approximately 1 gallon per acre per day.

After final closure and the installation of an impervious cap, leachate generation through the cover soils will be reduced significantly. The following reference is sited in many articles regarding post closure leachate generation:

“Flow Rates through Landfill Liners. Actual measurements from landfills with Subtitle D liners show that flow rates of a typical leachate detection system (LDS) in the post-closure period range from 0.5 to 22 gallons per acre per day. Analyses conducted for single- and double-lined cells, utilizing average monthly leachate flow data, indicated that flow rates of the leachate collection system (LCS) decreased by a factor of 4, approximately 1 year after closure and by 1 order of magnitude 2 to 4 years after closure. Nine years after closure, these flow rates were negligible. These values are for landfills with covers and are not specific to a certain liner type (Bonaparte, et al., US EPA, accepted for publication).”

Assuming 316 acres at closure, and using the upper limit of the referenced range of 22 gallons per acre per day, the estimated leachate generation rate is 6,952 gallons per day or this equates to 2,537,063 thousand gallons per year. Treatment is provided at the adjacent Manatee County Southeast WWTP at a cost of \$4.44 per thousand gallons plus a monthly customer charge of \$861.69. Thus the annual cost will be (2,537 x \$4.44) + (\$861.69 x 12) = \$21,604.56. Converting to an annual unit cost we get \$21,604.56 / 2,537 = \$8.52 per thousand gallons.

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| Leachate Historical Costs |               |  |                           |                    |
|---------------------------|---------------|--|---------------------------|--------------------|
| Month / Year              | Total Gallons | Total Cost<br>(Including Customer<br>Charge) | Cost Per 1,000<br>Gallons | Customer<br>Charge |
| Oct-13                    | 97,000        | \$1,233.90                                   | \$4.24                    | \$822.62           |
| Nov-13                    | 255,000       | \$1,903.82                                   | \$4.24                    | \$822.62           |
| Dec-13                    | 227,000       | \$1,785.10                                   | \$4.24                    | \$822.62           |
| Jan-14                    | 164,000       | \$1,517.98                                   | \$4.24                    | \$822.62           |
| Feb-14                    | 202,000       | \$1,679.10                                   | \$4.24                    | \$822.62           |
| Mar-14                    | 261,000       | \$1,929.26                                   | \$4.24                    | \$822.62           |
| Apr-14                    | 265,000       | \$1,946.22                                   | \$4.24                    | \$822.62           |
| May-14                    | 414,000       | \$2,577.98                                   | \$4.24                    | \$822.62           |
| Jun-14                    | 393,000       | \$2,488.94                                   | \$4.24                    | \$822.62           |
| Jul-14                    | 387,000       | \$2,463.50                                   | \$4.24                    | \$822.62           |
| Aug-14                    | 345,000       | \$2,285.00                                   | \$4.24                    | \$822.62           |
| Sep-14                    | 340,000       | \$2,264.62                                   | \$4.24                    | \$822.62           |

Attachment to Financial Assurance Cost Estimate Form for the Lena Road Landfill

|               |                  |                    |        |          |
|---------------|------------------|--------------------|--------|----------|
| Oct-14        | 435,000          | \$2,667.62         | \$4.24 | \$822.62 |
| Nov-14        | 293,000          | \$2,064.94         | \$4.24 | \$822.62 |
| Dec-14        | 312,000          | \$2,145.50         | \$4.24 | \$822.62 |
| Jan-15        | 254,000          | \$1,989.45         | \$4.44 | \$861.69 |
| Feb-15        | 269,000          | \$2,056.05         | \$4.44 | \$861.69 |
| Mar-15        | 270,000          | \$2,060.49         | \$4.44 | \$861.69 |
| Apr-15        | 258,000          | \$2,007.21         | \$4.44 | \$861.69 |
| May-15        | 240,000          | \$1,927.79         | \$4.44 | \$861.69 |
| <b>TOTALS</b> | <b>5,681,000</b> | <b>\$40,994.47</b> |        |          |

6. Groundwater Monitoring Well Maintenance – Allowance for redevelopment of two wells per year at **\$500** per well (2 hours at \$100 per hour plus \$300 mobilization).
7. Gas System Maintenance – Allowance for replacement of pipes, valves, flexible connections, etc. We assumed an annual allowance for maintenance of the flare, which includes the blowers, meters, etc., at 5% per year based on a capital replacement cost of \$400,000, or **\$20,000 per year**. The operating costs are based on a technician checking and adjusting the wells and flare station monthly plus six additional days for miscellaneous work, or about 60 days per year at \$1,000 per day, or **\$60,000 per year**. Costs include transportation.
8. Landscape Maintenance – Mowing costs are based on mowing 8 times a year at \$32.67 per acre (\$0.75 per 1000 SF) based on R. S. Means cost guide page 1130 (Attachment 12). At \$32.67 per acre and 8 events per year yields **\$261.36** per acre per year. The 350 acres for mowing includes the 316-acre landfill footprint, and 34-acres of miscellaneous grassed areas adjacent to the landfill footprint.
9. Erosion Control & Cover Maintenance – Allowance for filling depressions and replacing sod. Price for sodding is based on the description for Item 5 of the construction cost estimate. The price for re-grading is based on 2015 Means page 1087, finished grading on steep slopes at \$0.27 per SY or **\$1,307** per acre (Attachment 13). One acre per year is assumed for regrading. An allowance for 25 SY of liner repair is also included. The unit price for liner repair includes mobilization.
10. Stormwater Management System Maintenance – Allowance for cleaning out catch basins, ditches, etc. is based on a three-man crew and truck at \$150 per hour and 40 hours per year to yield **\$6,000** per year.
11. Security System Maintenance – Allowance for fence, gate and sign repair and replacement.

12. Utilities – **\$17,168**. Landfill gas management system: based on \$0.12 per kilowatt hour, and a 20 hp motor using 15 Kilowatts of electricity or \$1.80 per hour for 24 hours per day and 365 days per year for a total annual cost of **\$15,768**. Four leachate pump stations with 10 hp motors pumping 100 GPM for a total of 6 million gallons per year (see item 5 above) would operate a total of 1,000 hours per year using 7.5 Kilowatts of electricity at \$0.12 per kilowatt hour or about **\$900** per year. For lights and miscellaneous, allow about **\$500** per year.
13. Leachate Collection/Treatment System Operation – There is no treatment system. There is operation and maintenance for the pump stations.
14. Administrative – Estimate provided by Atkins based on administration of similar projects. The estimate includes monthly site inspections to check the height and condition of vegetation, condition of the cap, the stormwater management system, landfill gas collection and flaring system and general condition of the closed landfill. The estimate also includes preparation of the leachate generation reports, landfill gas reports and annual update for the financial assurance cost estimate form.
15. Contingency — The contingency is 5% based on Atkins experience with other similar closure projects.

Site Specific Costs – There are three site-specific costs: 1) preparation of the annual and biennial groundwater; surface water and leachate monitoring reports and annual update of the Financial Assurance Cost Estimate Form; 2) renewal of the long-term care permit; and 3) NSPS Title V Monitoring. The costs for Items 1 and 2 are given in Table 1 and Table 2 respectively, of Attachment 14. The NSPS Title V Monitoring costs are summarized in Table 3, which follows this paragraph. The distance for surface monitoring at the 316-acre site is based on walking a 3.5-mile perimeter plus a minimum of 100-foot grid on the landfill or about 26 miles. The total distance is estimated at 30-miles, and a production rate of at least 10-miles per day for an estimate of 3-days.

**TABLE 3 – ESTIMATE OF SURFACE MONITORING COSTS**

|   |               |
|---|---------------|
| Technician @ \$90/hr and 24 hours on site       | \$2,160       |
| Three day truck rental, gas, etc.               | \$ 300        |
| Hotel - two nights                              | \$ 200        |
| Per diem @ \$50/day                             | \$ 150        |
| Three day equipment rental @ \$100/day          | \$ 300        |
| Office time to prepare report 4 hours @ \$90/hr | \$ 360        |
| Two hour of PE review time @ \$150/hr           | \$ 300        |
| Mailing, miscellaneous and contingency          | <u>\$ 160</u> |
| Total   | \$3,930       |

For closed landfills, the surface emissions are checked only once per year