

**FEASIBILITY STUDY TO RELOCATE COUNTY FACILITIES
TO GUDE LANDFILL**

MONTGOMERY COUNTY, MARYLAND

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SECTION 1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF SERVICES

This report presents the findings, conclusions and recommendations of a study of the feasibility of relocating selected Montgomery County (Maryland) government facilities and operations to the closed landfill located on Gude Drive in Rockville, Maryland. The Shady Grove Sector Plan proposes removing existing government facilities and operations from the Shady Grove Metrorail Station vicinity and redeveloping the area with a mix of residential, office, retail and commercial space. The county is considering the use of the landfill to relocate some facilities. The purpose of the study is to provide the county staff with an analysis that is useful in selecting the most feasible option for use of the landfill. The following is an outline of the methodology used for this feasibility study.

1.1.1 Describe Existing Inventory and Determine New Requirements

Where possible SCS visited facilities and spoke with occupants about their needs. SCS obtained several documents that describe the space and utilization of the buildings proposed for relocation. Partial plans were obtained for the driver training track. In the limited time available for this task, SCS did not obtain utility requirements or representative water, gas or electricity bills or usage reports. The cost of installing utility connections and service entrances to support the facilities is included in the per square foot estimate for each building type used to calculate the cost of construction. Geographical Information System (GIS) and topographical data were obtained to enable mapping the proposed facilities on the landfill to optimize use of available acreage for each scenario. Facility requirements and current utilization were clarified, when necessary, with personnel from the appropriate organization.

1.1.2 Configure Layout on Landfill Plan

Proposed building configurations, sizes and land requirements were compared with useable area available on the landfill. Several combinations of facilities were considered to optimize the use of the landfill. Feasible scenarios were plotted on the landfill. The drawings show the building area footprints. Additional area requirements for driveways, storage and parking are not shown on the drawings but are included in the facility area requirements considered for land use. (The facilities were positioned to attempt to minimize and anticipate potential conflicts with ongoing and planned uses of the landfill.) The area planned for yard waste handling and the entrance to that area are avoided. The existing landfill gas recovery system will be preserved and relocated where conflict exists. However, since the existing landfill gas system is above grade, modification will be required in all redeveloped areas. Gas system modification must consider that the planned use of the landfill gas for emergency power generation requires at least 80% availability of gas to fuel the generator. This additional cost has been included in the estimates.

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1.1.3 Prepare Facility Construction Cost Estimates

SCS has prepared budgetary cost estimates for the construction of the facilities to be relocated. These costs are for construction on any useable property not including a landfill. The special costs of construction on the landfill are included separately. These estimates are for building, specialty systems (such as material handling equipment), driveways and other access requirements, loading docks, parking areas and other site improvements.

1.1.4 Assess Special Needs and Controls for Construction on Landfill

SCS developed pre-conceptual foundation types for each building in each scenario and assumed landfill depth and settlement potential in various areas. Geotechnical investigation of the landfill is required prior to preliminary facility design. The additional cost of constructing each facility on the closed landfill was estimated based on recently completed similar landfill construction projects. This estimate includes the cost of installing a Methane gas mitigation system for each facility.

1.2 RESOURCES AND REFERENCES

Request for Expressions of Interest (REOI): Sites for All or a Portion of a Relocated County Services Park dated March 30, 2007, issued by Montgomery County Government.

DLC Relocation Cost Study dated September 25, 2007 prepared by Staubach consultants.

MDE Guidance on the Use of Gude Landfill for Relocating County Facilities dated October 18, 2007 prepared by Mr. Ed Dexter (email). ✓

Excerpts from plans for the Multi-Agency Driver Training Facility.

A Morton Thomas & Associates Cost Estimate for Driver Training Facility dated January 7, 2005.

1.3 GENERAL ASSUMPTIONS AND SPECIAL CONSIDERATIONS

1.3.1 Landfill ✓

The Gude landfill shows obvious signs of above-normal settlement. The fill material is assumed to be a co-mingled mixture of construction and demolition debris, incinerator ash and municipal solid waste. A comparison of historical GIS data with recent topographic data indicates that the depth of fill averages 90 feet. Assume average depth to embedment to bedrock is 10 feet below bottom of fill. Assuming this is an accurate representation of landfill conditions, it would not be feasible to surcharge the landfill or to utilize deep dynamic compaction in preparation for construction of the buildings. Also, due to the assumed depth of debris, waste removal and replacement with compacted suitable fill is not feasible.

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Therefore, it is assumed that only the use of deep piles is feasible for construction on Gude Landfill.

Settlement analysis and load tests will be required for all pavement construction and any other features supported by the landfill surface during preliminary engineering. This cost is included in the estimates for additional cost to construct on the landfill. Due to the high probability of differential settlement over time, non-structural components of the facilities should not be rigid or impacted by the settlement of ground level near the building. Entrances should be hinged and flexible.

For protection of the nearby residential community, construction must not interfere with the existing gas mitigation system along the boundary road. Buildings are conceptually located on the landfill to minimize impact to the existing gas collection wells and collection piping. As mentioned previously, the existing gas collection piping needs to be lowered below grade. Piping in conflict with the design layout of deep piles will need to be relocated. The slope of the existing access road is adequate for tractor trailer traffic, but will need to be widened and paved.

Budget contingency is included in the estimates to change or enhance storm water management to direct increased runoff from impervious pavement away from the existing southwestern pond across the watershed divide to the eastern pond and to the north end of the site.

1.3.2 Department of Liquor Control (DLC) Warehouse (WH) and Offices

This building is currently served by rail, but rail is not available at Gude Landfill. It is assumed that offices can be constructed on two floors reducing the footprint of the building. It is also assumed that it is not feasible to place warehouse space on multiple floors. SCS assumes the existing fixed material handling equipment will be reused and relocation is included in the estimate to move from the existing facility to the new one. The continuous storage of pallets and cases of liquor and the installed equipment results in this building weight on the foundation being above average. This is accounted for in the estimate. Some information used for estimating the construction cost was taken from the Staubach cost study.

1.3.3 M-NCPPC Facilities

As noted in Chart B of the REOI, it is a requirement the training facility be separated from the maintenance areas so that training does not interfere with routine maintenance operations. To avoid the construction of two buildings it is assumed that it is acceptable to locate the training facility in the same building as the maintenance shops.

It is assumed that it is acceptable to locate the exhibit shop in the maintenance building with other shops. The preference for two entrances to the landfill area is not addressed or provided in this study.

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If the M-NCPPC Maintenance and Training Facility is relocated to the landfill, the tanks and piping must be above ground and with secondary containment and preferably located off the waste, possibly at the landfill entrance.

1.3.4 Public Schools Depot

The bus parking should be located in the vicinity of depot operations, the maintenance facility, bus wash and refueling stations.

1.3.5 Public Schools Maintenance Shop

It is assumed these are the shops and dispatch area for the school maintenance crews and vehicles. It would be inconvenient to have a multi-story building with shops on a second floor; therefore a single story building is assumed.

1.3.6 Public Schools Food Services Facility

SCS assumed that it would be inconvenient for the kitchen staff to have storage and the food preparation area on different levels so this facility is assumed to be on one floor.

1.3.7 Driver Training Facility (Track and Classroom)

It is assumed that uneven pavement caused by differential settlement over time would result in unsafe driving conditions on the high-speed track. SCS considered foundation designs to prevent settlement of the track and pads that could result in loss of control at high speeds.

To optimize space utilization, SCS will assume it is acceptable to place the classroom in the track infield without impacting the features of the track layout. A driver viewing area could be constructed above the classroom to provide 360-degree vision.

1.3.8 Fire Training Facility (Burn Building)

A seven-story masonry building having a 3,500 square foot building area is assumed. No other ancillary buildings have been included. It is assumed that a total of one acre of 10 acres of grounds is paved for parking of trainee vehicles and fire and rescue equipment. An average cost of \$250 per square foot was obtained from Elliott, LeBoeuf & Associates, a structural engineering company with specialized experience in these types of facilities.

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**SECTION 2
INVENTORY OF FACILITIES**

2.1 Existing Facilities Data

Dimensions and descriptions of existing land area, building space, parking area and other special needs for each facility were obtained from the following documents:

Driver Training Track – Analysis of aerial photography.

All other facilities – Chart A of the REOI.

Table 2.1 presents a summary of the existing facilities areas, spaces and uses.

Table 2.1: Existing Facilities

Facility & REOI #	Land Area (acres)	Building Space (SF)	Parking & Other
DLC Warehouse & Offices	15	180,500	190 employees & visitors; parking & circulation for 50+ delivery trucks and tractor trailers
M-NCPPC Maintenance & Training	12	135,920	200 employees; 280 trainees; tractor trailer docks, parking and circulation
MCPS Transportation & Schools Maintenance	35	94,800	354 bus parking; 660 employees; 75 substitute vehicles; 330 for maintenance employees and vehicles
MCPS Food Service	4	70,000	150 employees; 25 trucks; tractor trailer docks, staging and circulation
Driver Training Track and Classroom	10	6,343	Unknown

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2.2 Preferred Land Area and Building Space Requirements

Dimensions and descriptions of the preferred land area, parking space, outdoor storage area and building space requirements for the new facilities was obtained from the following sources:

DLC Warehouse and offices - DLC Relocation Cost Study dated September 25, 2007 prepared by Staubach consultants, except land area requirement from Chart B of the REOI.

Driver Training Track - Excerpts from plans for the Multi-Agency Driver Training Facility and the A Morton Thomas & Associates Cost Estimate for Driver Training Facility dated January 7, 2005.

Fire Training Facility – Discussion with Elliott, LeBoeuf & Associates, a structural engineering company with specialized experience in these types of facilities and assumptions based upon similar facilities in a similar-sized Maryland county.

All other facilities – Chart B of the REOI.

Table 2.2: Potential Relocation Land and Building Needs

Facility & REOI #	Land Area (acres)	Building Space (SF)	Parking & Other
DLC Warehouse & Offices	20	270,000	190 employees & visitors; parking & circulation for 50+ delivery trucks and tractor trailers
M-NCPPC Maintenance & Training	25	162,332	200 employees; 280 trainees; tractor trailer docks, parking and circulation
MCPS Transportation Depot	58	87,231 admin offices; 43,360 depot operations	354 bus parking; 660 employees; 75 substitute vehicles;
MCPS Schools Maintenance	11	96,672 offices and shops	330 for maintenance employees and vehicles
MCPS Food Service	10	36,700 warehouse; 26,300 production area; 8,000 admin	150 employees; 25 trucks; tractor trailer docks, staging and circulation
Driver Training Track and Classroom	10	6,343	Unknown

**SECTION 3
GUDE LANDFILL LAYOUT**

3.1 Landfill Description

The Gude Landfill is a pre-RCRA landfill that has experienced above-average settlement since closure. The top surface of the landfill has been affected by erosion from runoff and waste settlement. The existing topography of the landfill is presented in Figure 1 (Storm water Management Concept Plan) in Appendix A, which also indicates the post-construction direction of flow from the top of the landfill. The landfill surface has irregular relief with only two relatively flat crowns acceptable for construction of buildings on piles. Between the two crowns there is a drainage swale of sufficient depth to preclude filling prior to construction of a building. It is recommended that this area be developed for parking between two building sites. Figure 1 also shows the steeply sloped sides of the landfill.

3.2 Findings

Because of the steeply sloped sides of the landfill and the irregular relief of the landfill surface, SCS initially identified seven acres on one mound and 19 acres on another mound as acceptable for construction without cutting and filling landfill debris. However, if the intermediate saddle between the two mounds is filled and compacted, it is acceptable for at grade parking or a parking garage. Further adequate construction area can be obtained by leveling the existing top of landfill cover and debris. Pavement and parking on these cut and fill regions will require more frequent maintenance than pavement on suitably filled and compacted non-landfill property. Based on this, SCS has identified a total of 31 acres that are acceptable for construction of buildings, pavement and driveways.

Within the 31 acres identified for construction of relocated government facilities, building construction will require the installation of deep piles embedded in the underlying bedrock to support the buildings and prevent settlement. The driver training high-speed track must also be supported on deep piles and grade beams to prevent any effect of settlement on the roadway that would introduce unevenness resulting in a loss of control at high speeds. The additional cost of construction of a roadway independent of the landfill surface is nearly eight times the cost to construct the track elsewhere on undeveloped land.

**SECTION 4
BUILDING CONSTRUCTION COSTS**

4.1 Normal Construction Costs

The cost of constructing each facility was based upon the type of construction and facility layout that currently exists. This basis was modified to include specific facility requirements as provided in the documentation and interviews. The normal costs of construction do not include any modifications in material type, foundation enhancements or gas mitigation. The cost estimates include a 25% contingency to cover any additional requirements of which we were unaware during the study period. This contingency should contain any future additions to the scope of work once the county is in the preliminary engineering or design phases.

4.2 Assumptions

The following assumptions were made in estimating the costs to construct the facilities under normal circumstances on undeveloped land:

- Pricing information taken from RS Means CustomCost Estimator online service, NTH Consultant May 19, 2006 memo, Staubach 2007 DLC Relocation Study, and PS-E Estimate January 7, 2005
- Does not include land cost, developer fee, or financing/transaction costs
- Contractor's overhead & profit = 25%
- Architectural fees for the warehouse and office building range from 4.9 – 5.7% and 6.8 - 8.6%, respectively
- LEED Silver certification is assumed at 5% of construction cost
- Engineering & permitting = 2% of construction cost.
- Quality Assurance & Certification is 5% of construction cost
- Bonds, permits, legal, utility is 1% of construction cost
- Warehouse has galvanized steel siding/steel frame; Story height = 24'
- Office building is 1-story EIFS on metal studs/steel roof deck; story height = 12'
- High-speed track – assumed 3,300' and 60 feet wide
- Fire Training Smoke Building – assumed 3,500 sf footprint, seven stories, 17,500 total useable space, one acre of paving around the building, 10 acres of total area required

**SECTION 5
ADDITIONAL COSTS TO CONSTRUCT ON LANDFILL**

5.1 Construction on Landfill

The additional cost to construct each facility on the landfill includes the cost of deep piles, grade beams, other structural enhancements, gas mitigation and a contingency for modification to building façade and approaches to adapt to settlement. The cost estimates include a 25% contingency to cover any additional requirements of which we were unaware during the study period. This contingency should contain any future additions to the scope of work once the county is in the preliminary engineering or design phases.

5.2 Assumptions

The following assumptions were made in estimating the costs to construct special foundation requirements to site the facilities on the landfill:

- Deep foundation using H-piles are considered for buildings due to over 90' thick MSW waste
- Piles will be driven 10' on-centers; HP 14x117 is assumed
- Grade beams will be placed 10' on-center with section at 2' x 3', reinforced
- LFG management system will be required within all building and warehouse footprint, including membrane, piping, and utility sealant.
- Existing LFG well field will be relocated and/or modified to accommodate the new construction atop of the existing ground
- The existing SWM pond may be enlarged or deepened and an additional pond may be constructed.
- Parking area will need to have sub grade reinforced to ensure more uniform settlement and avoid abrupt differential settlement
- Race track foundation will be on H-piling, 9 piles in a group, 2 groups in a row 50' on-center. Grade beams will be 50' on-center and 4 grade beams length-wide. The grade beam will be 3'x4'. Pile cap is 20'x60'x3' thick 50' on-center.

5.3 Construction Costs

Normal building construction costs were estimated using RS Means CustomCost Estimator. Printouts of each different building component, by use type, are provided in Appendix B. Cost estimate worksheets for non-landfill sites that include costs for additional required components of the facilities such as paving, storm water management, etc, are Appendix C. Appendix D is the cost estimate worksheets for the same construction but on the landfill site. Table 5.1 on page 10 summarizes the project costs and lists separately the additional cost to construct the facility on the landfill. To attempt to create more usable landfill area for additional use a parking garage was proposed for the swale between the two mounds. A 5-story garage with separate entrance and exit ramps and driveways sufficient for any of the options was estimated. However, it was determined that the use of a garage of this size will

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only provide an additional 2 acres (one half acre for each of the four floors above the first floor) for additional building construction. Therefore the cost of a parking garage is not included in the cost estimates for the options.

TABLE 5.1: SUMMARY OF CONSTRUCTION COSTS

REOI ID #	FACILITY DESCRIPTION	AREA (acre)	NORMAL CONSTRUCTION COST	ADDITIONAL COST TO CONSTRUCT ON LANDFILL	TOTAL PROJECT ON LANDFILL
1b	DLC - Warehouse And Offices	20	\$29,402,000	\$40,598,000	\$70,000,000
2a	M-NCPPC – Shady Grove Maintenance And Training Facility And Exhibit Shop	25	\$17,004,000	\$26,781,000	\$43,785,000
3a	MCPS – Transportation depot	58	\$23,341,000	\$20,574,000	\$43,915,000
3b	MCPS – Maintenance Shop	11	\$11,478,000	\$14,042,000	\$25,520,000
3c	MCPS – Food Services Facilities	10	\$9,009,000	\$10,450,000	\$19,459,000
	PSTA High-Speed Race Track	10	\$7,133,000	\$20,708,000	\$27,841,000
	Fire Training Facility	10	\$6,422,000	\$743,000	\$7,165,000
	5-story parking garage	2	\$7,142,000	\$3,217,000	\$10,359,000

**SECTION 6
CONCLUSIONS AND RECOMMENDATIONS**

6.1 Conclusions

With 31 acres of build-able land area available on Gude Drive Landfill, three options are feasible:

Option 1 (DLC Liquor Warehouse and Schools Maintenance Shop) is Figure 2 in Appendix A.

Option 2 (DLC Liquor Warehouse and Schools Food Service Facility) is Figure 3 in Appendix A.

Option 3 (M-NCPPC Maintenance and Training Facility) is Figure 4 in Appendix A.

Option 4 (DLC Liquor Warehouse and Fire Training Building) is Figure 5 in Appendix A.

The following are not considered feasible for the reasons cited:

MCPS Transportation Depot Bus Parking and Depot Operations: insufficient build-able area (58 acres) available to have bus parking collocated with depot operations and maintenance. A basement for working under buses is not feasible construction on this landfill.

PTSA Driver Training High Speed Driving Track and Classroom: additional cost to construct a safe high-speed track is three times the cost to construct the facility elsewhere and the relative cost per acre to use the landfill is twice the cost of the other two options (\$2.2 M per acre).

Table 6.1 on page 13 summarizes the construction costs of the four options on the landfill. For comparison with property prices throughout the county, the relative unit cost of each option is provided in Table 6.1 as a cost per acre. This metric is the additional cost to construct each option on the landfill divided by the number of acres that would have to be acquired to construct elsewhere.

6.2 Recommendations

SCS Engineers recommends the county staff investigate the availability of land elsewhere for all facilities and determine the acquisition cost to compare with the estimated additional cost to construct on Gude Drive Landfill. Of the four options that are physically feasible, relocating the M-NCPPC Maintenance and Training Facility has the least relative cost per acre (\$1.1 M per acre).

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TABLE 6.1: SUMMARY OF OPTION COSTS

	OPTION DESCRIPTION	AREA (acres)	NORMAL CONSTRUCTION COST	ADDITIONAL COST TO CONSTRUCT ON LANDFILL	TOTAL PROJECT ON LANDFILL	COST PER ACRE TO BUILD ON LANDFILL
1	DLC – Warehouse And Offices & MCPS Maintenance	31	\$40,880,000	\$54,640,000	\$95,520,000	\$1,763,000
2	DLC – Warehouse And Offices & MCPS Food Service	30	\$38,411,000	\$51,048,000	\$89,459,000	\$1,702,000
3	M-NCPPC – Shady Grove Maintenance And Training Facility And Exhibit Shop	25	\$17,710,000	\$26,781,000	\$44,491,000	\$1,071,000
4	DLC – Warehouse and Offices & Fire Training Building	30	\$35,824,000	\$41,341,000	\$77,165,000	\$1,378,000

APPENDIX A

FIGURES
