District of Columbia Office of Planning

MEMORANDUM

TO: District of Columbia Zoning Commission

FROM: Travis Parker, Zoning Review Project Manager TP

DATE: February 21, 2011

SUBJECT: Supplemental Hearing Report for ZC #08-06 – Zoning Regulations Review
- Subtitle B: Green Area Ratio Chapter

Zoning Review Process to Date

At a public hearing held on December 20, 2010, the Zoning Commission requested supplemental information regarding the R-1 to R-4 zones and the calculation of construction cost estimates. The following supplemental report has been prepared in response to that request.

Review of R-1 through R-4 Zones

Where R-1 through R-4 Zones Currently Apply

In the public hearing the Zoning Commission inquired into the amount of land area covered by R-1 through R-4 zones. In response, OP gave the answer of approximately less than 80% of zoned land (30% of land in the District is unzoned) which was incorrect. The correct figure is approximately 58.5% of zoned land, or 40.6% of all land in the District. A full explanation of the amount of land area in each zone R-1 through R-4 is included in the following table below.

Zone	Area in Zone (acres)	% of DC's land area
R-1-A	1603.1	3.7%
R-1-B	6649.4	15.4%
R-2	3405.7	7.9%
R-3	2167.9	5.0%
R-4	3722.5	8.6%
Totals	17548.5	40.6%

Figure 1: Area of Residential Zones

GAR Existing Conditions in R-1 through R-4 Zones

As a part of the city-wide analysis of existing GAR conditions by zone, detailed data was developed for R-1 through R-4 zones existing conditions. Details of existing conditions follow in the below charts. The R-1 through R-4 zones have the highest average existing GAR of any zones in the city.

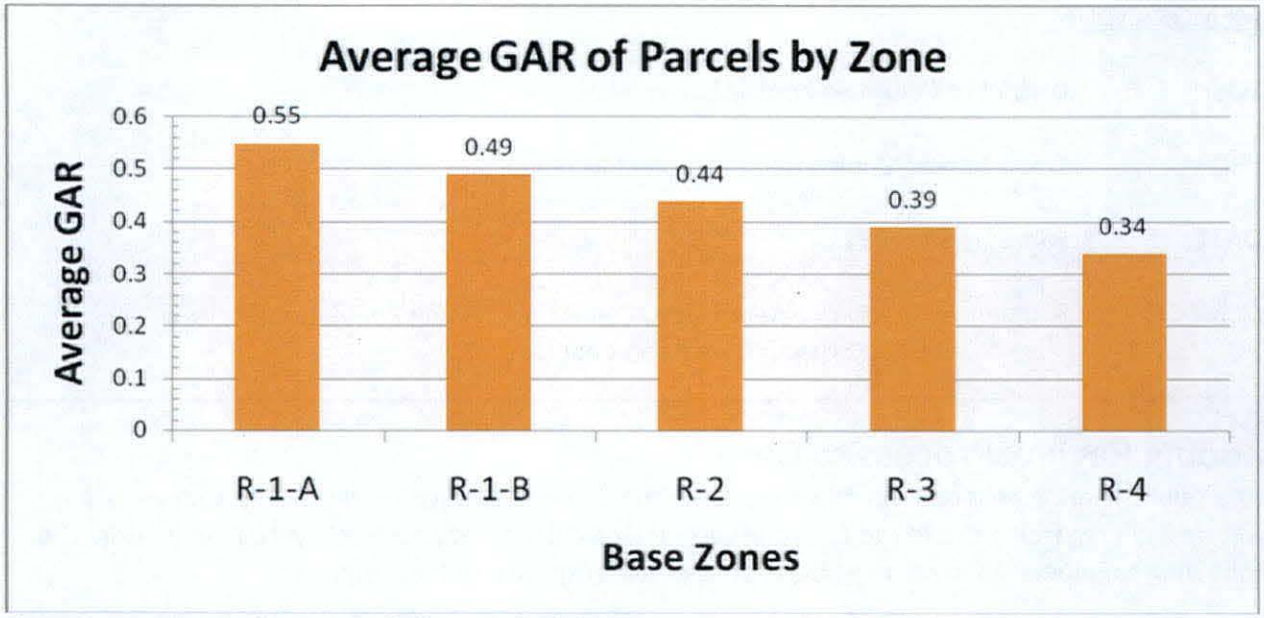

Figure 2: Average GAR by zone, including standard deviation

Landcover type from the aerial photography data was also examined for parcels within a given zone. This data enabled a further level of detail within each zone for the types of existing landcovers. Although every zone may not contain every type of landcover, the range of land coverages examined are; roof, grass/shrubs; asphalt; concrete; tree canopy over vegetation; tree canopy over roof; tree canopy over concrete; or tree canopy over asphalt. For example, the following chart shows the average landcover in residential zones R-1 through R-4.

Zoning	% Landcover Type	Asphalt	Concrete	Grass/Shrubs	Roof	Tree Over Asphalt	Tree Over Concrete	Tree Over Roof	Tree Over Vegetation
R-1-A		5%	2%	19%	12%	2%	0%	3%	**57%**
R-1-B		4%	3%	31%	19%	1%	0%	3%	**39%**
R-2		4%	4%	**41%**	24%	1%	0%	2%	25%
R-3		7%	7%	32%	**33%**	1%	0%	1%	19%
R-4		6%	9%	30%	**42%**	1%	0%	1%	11%

Figure 3: Type of landcover by zone

The following charts of GAR for zones R-1 through R-4 show the average GAR as it relates to lot occupancy.

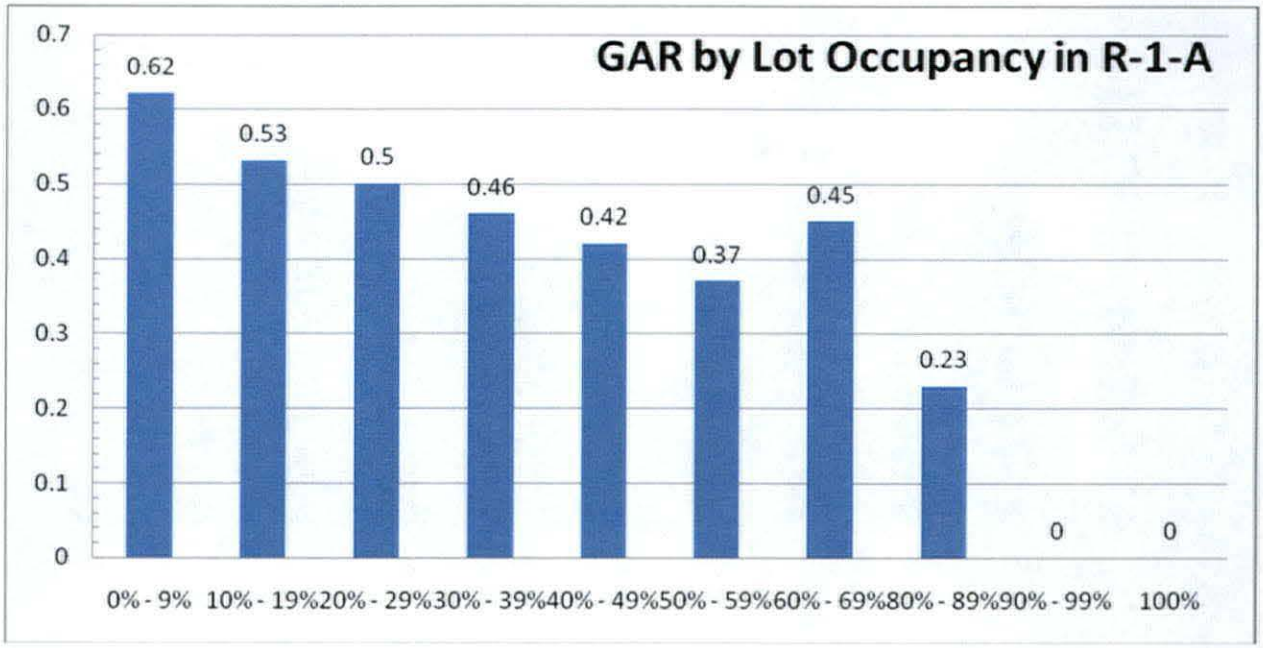

Figure 4. Relation of GAR to Lot Occupancy in the R-1-A Zone

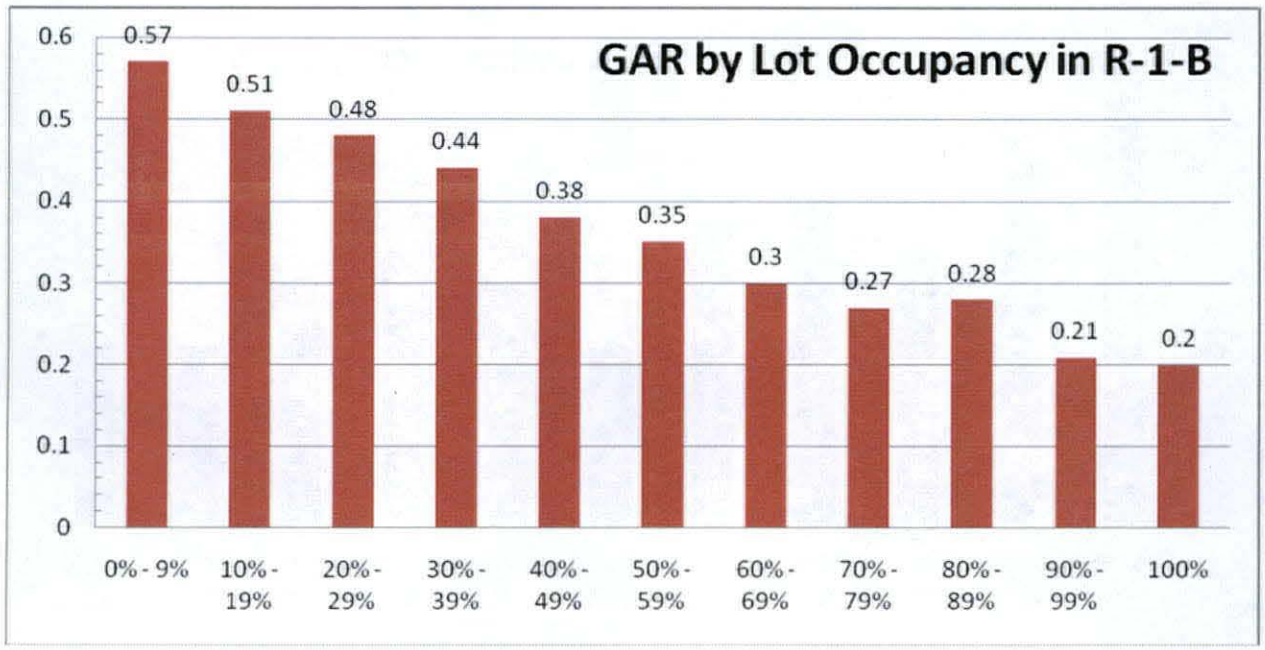

Figure 5: Relation of GAR to Lot Occupancy in the R-1-B Zone

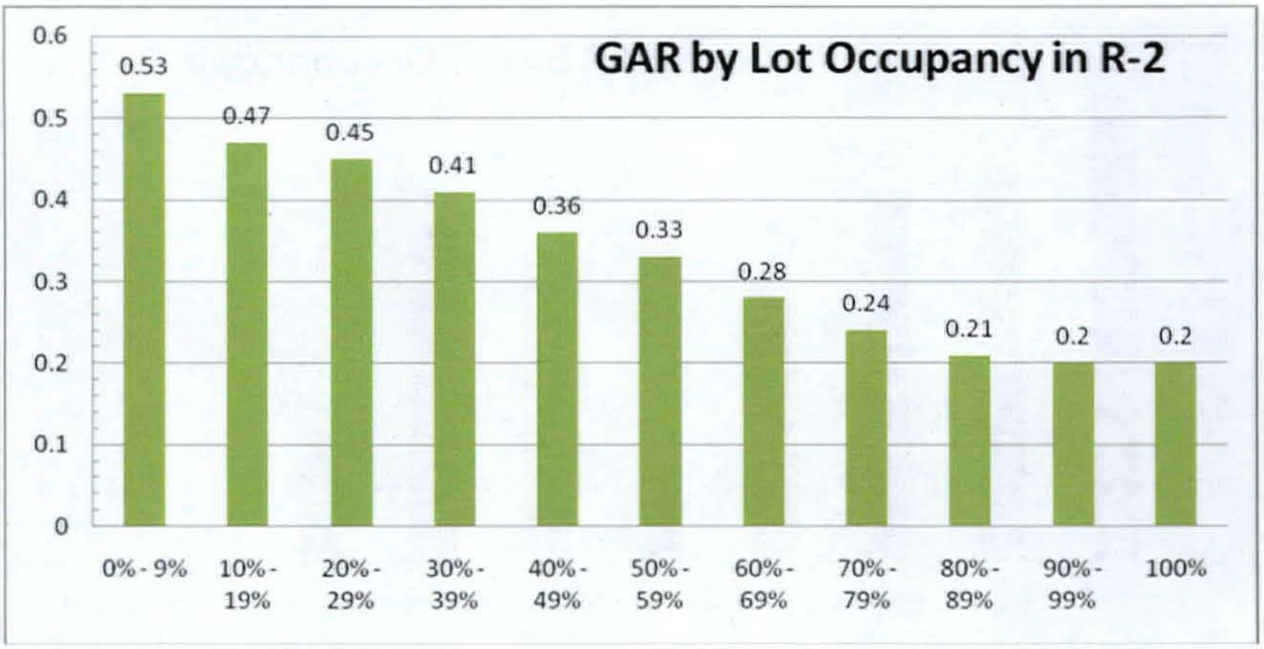

Figure 6: Relation of GAR to Lot Occupancy in the R-2 Zone

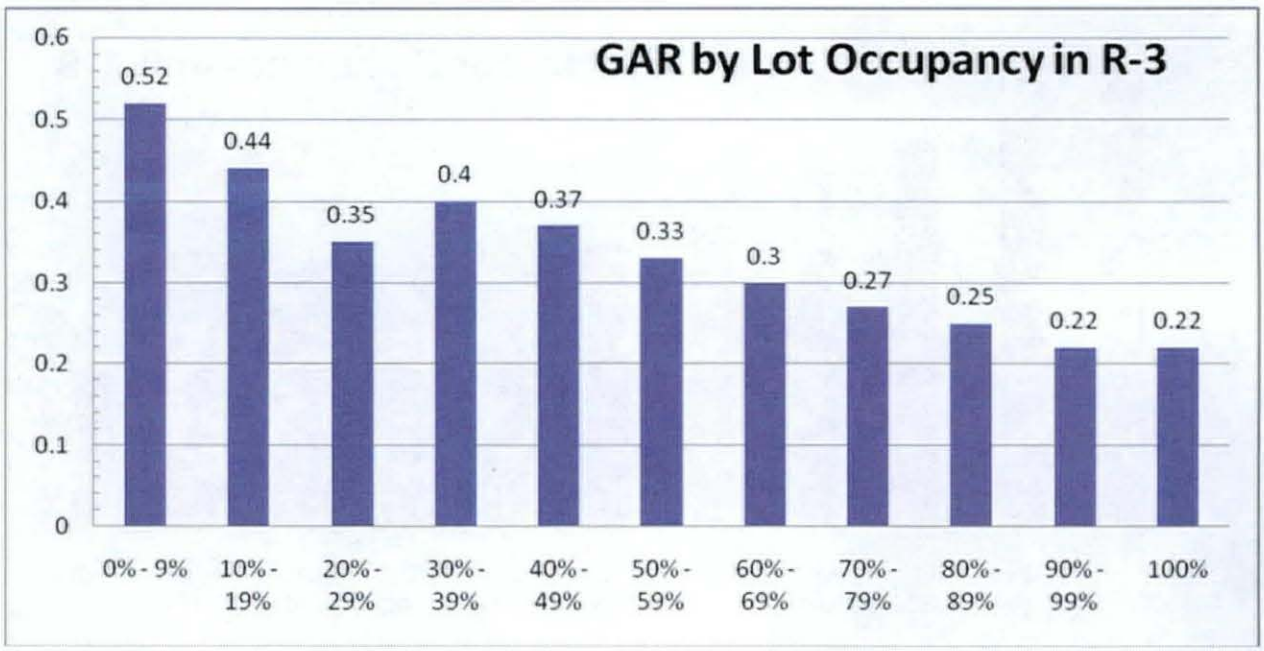

Figure 7: Relation of GAR to Lot Occupancy in the R-3 Zone

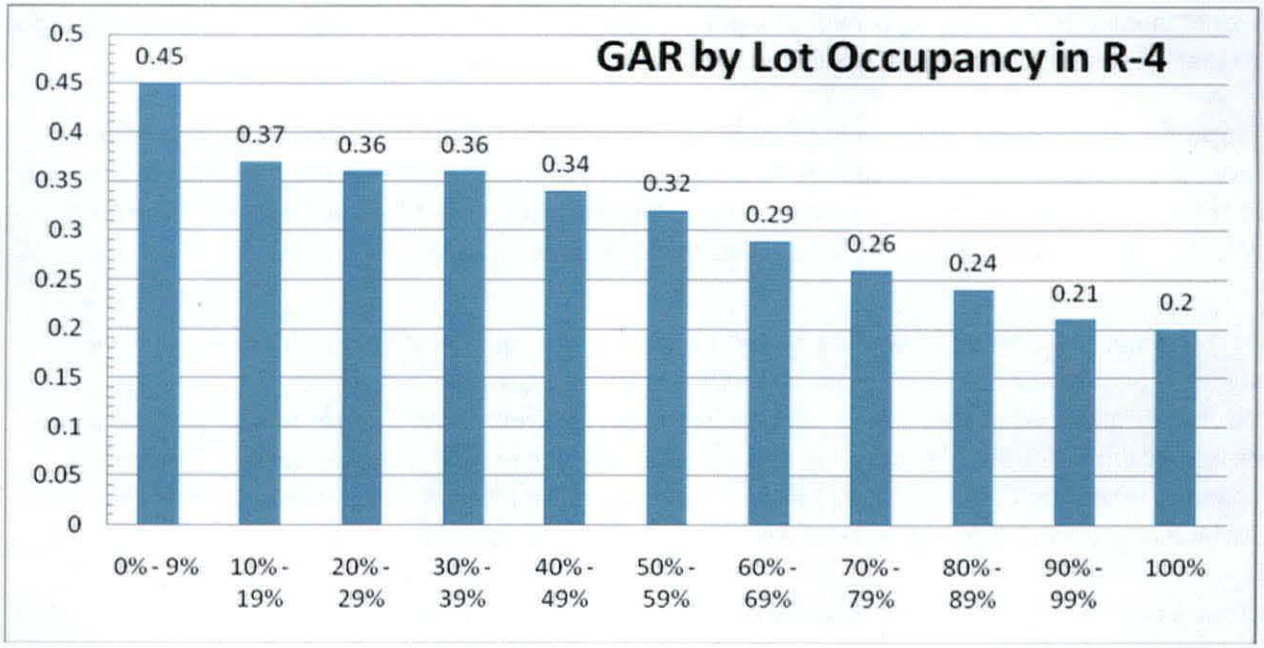

Figure 8: Relation of GAR to Lot Occupancy in the R-4 Zone

GAR by different lot occupancies was also studied to determine if there was a strong correlation between the amount of open space and the environmental performance of a parcel. In developing the GAR system, it is generally assumed that the environmental performance of a forested or meadow lot not impacted by human intervention would have the highest possible environmental performance, and an entirely asphalt paved lot would have the lowest. Generally the data shows that lower lot occupancy equates to higher existing GAR. This correlates with existing understanding of environmental performance of different building materials.

OP's Recommendation: Not Apply GAR in R-1 through R-4 Zones

OP continues to recommend that the GAR, initially at least, is not applied in zones R-1 through R-4. This recommendation is based on the following factors; administrative mechanism for requirement, cost and burden on government to review applications, education/outreach needed to distribute information to single family property owners, existing conditions, and other sustainability zoning tools being recommended in these areas.

The current GAR zoning tool system is being proposed using the mechanism of the Certificate of Occupancy as a trigger for compliance. Certificates of Occupancy are not required for single residential units, or single family homes. The Office of Planning is not aware of any other administrative mechanism which would be able to hold a similar place in administering the GAR. Administration of the GAR in the R-1 to R-3 zones (and to a lesser extent the R-4 zone)

would involve review and approval of a plan at the building permit stage, but there would be no trigger for inspection or regulatory step to ensure compliance.

Properties with one-family dwellings typically maintain higher standards of landscaping and retain more green area. The R-1 through R-4 zones currently have the highest average GAR of all zones in the city. They are currently at the level of GAR to which other zones will aspire. Even the highest lot occupancy areas of these zones average over 0.2 GAR

At this time, the Office of Planning recommends a less administratively burdensome pervious surface requirement as an alternative to GAR in the R-1 through R-4 zones. While not as flexible or nuanced as the GAR, a pervious surface requirement will result in many of the same environmental benefits. Moreover, the pervious surface standard would apply far more broadly; while the GAR would only impact new and completely rebuilt homes, a pervious surface requirement would be reviewed for any paving or building additions.

OP will continue to research this issue prior to setdown of Subtitle D, which contains the R-1 to R-4 zones and will propose percentages of pervious surface requirements for each zone in the subtitle along with further analysis of the environmental benefits of pervious surface requirements on these zones.

Construction Cost Estimates

The Zoning Commission also asked for background information on the cost estimates used by OP for analysis of GAR levels. In the report and at the hearing, OP expressed that the cost of compliance with GAR was anticipated to be less than half of one percent of construction costs, even when the existing property started with a GAR score of 0.0.

The primary source of data for these estimates was *RS Means Building Construction Cost Data*, a leading industry source for construction cost information. RS Means was not only used to estimate building construction costs, but also provided much of the input for estimating the cost of GAR elements. The data on cost of GAR elements was collected by the team working with Dr. Melissa Keeley in the preparation of data for the GAR. The cost data gathered and used has been attached to this memo.

BMP Cost Comparison for GAR

BMP Type	Cost (US$/ft^2)		Source(s)
Bioretention	**$3-4**		lid-stormwater.net
	$10-12		NC State SW Group
	(dependent on soil type)		Kansas City
	$13-15		Montalto et al (2007)
Green Roof (Extensive, ~3in.)	**$8**		EPA, 2007
	$14-25		Greenroofs.com
	$10-15		King County, 2007
	$25-30 (re-roofing <5K ft^2)		P. Johnson with CBF, 2007
	$9.00 – 25.50 (retrofit roof)		Montalto et al (2007)
	$20-25 (new roof <10K ft^2)		"
	$6.40 – 15.30 (new roof)		Montalto et al (2007)
	$10-15 (new roof >15K ft^2)		"
Permeable Pavement	Asphalt	**$0.50 - 1.00**	lid-stormwater.net
	Concrete	**$2 – 6.50**	lid-stormwater.net
		$2.50 – 8.30	Montalto et al (2007)
	Grass/ gravel pavers	**$1.50 – 5.75**	lid-stormwater.net
		$2.10 – 8.00	Montalto et al (2007)
	ICPC	**$5 – 10**	lid-stormwater.net
Green Façade	**$24-$39** [1]		GreenScreen

[1] Cost includes wall panel (edge trim, and mounting clips, installation, and delivery. Product = $8-10/ ft^2 for wall panel. Installation = $12 – 20/ ft^2 (factors affecting installation equals level of complexity of panel layout and site access). Delivery costs = 20-30% of cost of materials.

Tree Canopy	Red Maple	**$295** (2" caliper) **$177** (installation)[2]	Merrifield Garden Center
	Oak	**$150** (1 ½" caliper) **$90** (installation)	"
	Red Maple	**$275** (2" caliper) **$225** (installation) **$272** (install & concrete removal)	Boyd's Tree Services
	Ash	**$400** (2" caliper tree & installation)	RS Means Building Construction Cost Data (2007)
	Crabapple	**$285** (6-8" tree & installation)	"
	Dogwood	**$128** (4-5' tree & installation	"
	Ginkgo	**$273** (6-7' tree & installation)	"
	Magnolia	**$187** (4-5' tree & installation)	"
	Red Maple	**$395** (1 ½" caliper tree & installation)	"
	Poplar	**$273** (1 ¼' caliper tree & installation)	"
Shrubs	Azalea	**$42.50** (15-18" container & installation)	RS Means Building Construction Cost Data (2007)
	Mount Laurel	**$75.50** (15-18 B&B & installation)	"
	Rhododendron	**$57.50** (18-24" container & installation)	"
	Hibiscus	**$46.00** (3-4', B&B & installation)	"
	Hydrangea	**$46.50** (2-3', B&B & installation)	"
Infiltration without Evapotranspiration			
	Sod	**$0.08 - $0.30** [3]	Cost Helper
		$0.14 - $0.60 [4]	Cost Helper
		$0.43 (good lawn)	Sample et al. (2003)

[2] Installation is usually 60% of the cost of the tree
[3] Do it yourself installation
[4] Professional installation

Urban Lawn		**$0.34** (fair lawn)	"
		$0.26 (poor lawn)	"
		$0.95 [5]	Ron's Landscaping
		$1.50 - $2.00 [6]	Azalea Landscaping
		$0.35 (sod and installation on level ground)	RS Means Building Construction Cost Data (2007)
		$0.41 (sod and installation on level ground)	RS Means Building Construction Cost Data (2007)
		$0.47 (sod and installation on level ground)	RS Means Building Construction Cost Data (2007)
		$0.60 (sod and installation on sloped ground)	RS Means Building Construction Cost Data (2007)
		$0.69 (sod and installation on sloped ground)	RS Means Building Construction Cost Data (2007)
		$0.82 (sod and installation on sloped ground)	RS Means Building Construction Cost Data (2007)
	Top Soil (15cm)	**$0.50** (good lawn)	Sample et al. (2003)
		$0.40 (fair lawn)	"
		$0.30 (poor lawn)	"
		$0.20	Ron's Landscaping
		$0.40 (4" deep)	RS Means Building Construction Cost Data (2007)
		$0.54 (6" deep)	RS Means Building Construction Cost Data (2007)
	Soil conditioner	**$0.03** (good lawn)	Sample et al. (2003)
		$0.02 (fair lawn)	"
		$0.01 (poor lawn)	"

[5] Price of sod, laying it, and cleaning up debris
[6] Sod, tilling soil, laying sod, grading soil

Concrete/Asphalt Removal	Concrete Removal	**$2** (4" thick)	ContractorTalk.com
		$1.61 (up to 8" thick concrete + 4" gravel)	Donohoe Construction
		$3.13 (with tree planting)	Boyd's Tree Services
		$3.45 (4" thick removal for residentail)	RS Means Square Foot Costs (2007)
		$4.23 (5" thick)	"
		$1.23 (demolition up to 6" thick, mesh reinforced)	RS Means Building Construction Cost Data (2006)
		$1.58 (demolition up to 6" thick, rod reinforced)	RS Means Building Construction Cost Data (2006)
		$1.53 (saw cutting selective demolition, for 3" thick) **$0.82** (for each additional inch)	RS Means Building Construction Cost Data (2006)
	Asphalt Removal	**$0.81** (3" asphalt + 4" gravel)	Donohoe construction
		$0.44	South Carolina Emergency Management Division
		$1.35 (saw cutting selective demolition up to 3" depth) **$0.67** (for each additional inch)	RS Means Building Construction Cost Data (2006)
	Bituminous pavement	**$0.46** (bituminous road up to 3" thick)	RS Means Building Construction Cost Data (2006)
		$0.75 (4-6" bituminous road)	RS Means Building Construction Cost Data (2006)
		$0.49 (bituminous driveway)	RS Means Building Construction Cost Data (2006)

Citations:

Balboni B. (Ed.). (2007). *RS Means Square Foot Costs* (28th ed.). Kingston, MA: Reed Construction Data, Inc.

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