Benefits of Implementing a Soil Management/LID Plan

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Soil Management Plan???

Avoid disturbance

Minimize compaction

Soil restoration

Part of overall LID Plan

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What the heck is a LID PLAN ???

- The low-impact development (LID) plan combines a hydrologically functional site design with pollution prevention measures to compensate for land development impacts on hydrology and water quality.
- In New Jersey: Meet specific stormwater requirements by implementing “non-structural strategies” to the maximum extent practicable

Non-structural Strategies

- Must meet erosion control, groundwater recharge runoff quantity and quality standards to the maximum extent practicable using non structural strategies

- **Strategies:**
  - Protect areas that provide water quality benefits
  - Minimize impervious surfaces and disconnect flow
  - Maximize the protection of natural drainage features and vegetation
  - **Minimize the decrease in the pre-construction time of concentration**
  - **Minimize land disturbance including clearing and grading**
  - **Minimize soil compaction**
  - Provide low maintenance landscaping
  - Provide vegetated open channel conveyance systems
  - Provide preventative source controls

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Soil Management Plan- NJ

- STANDARD FOR LAND GRADING
- STANDARD FOR TOPSOILING
- SOIL STABILIZATION AREAS
- SOIL RESTORATION AREAS
- PROCEDURES FOR COMPACTION REMEDIATION
- DEEP INFILTRATION AREAS

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Topsoil

- Target Organic Matter (TOM) content by soil texture

Soil textural class	**Minimum soil organic matter (% by mass)**
Sand and loamy sand	2.0
Sandy loam	2.5
Loam	4.0
Silt Loam, Clay Loams, Clay	5.0

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SOIL STABILIZATION AREAS

- Within 10 feet of building foundations
- Where soils will be required to support vehicle traffic loads such as roads, parking lots and driveways (including gravel surfaces) or pedestrian walkways (sidewalks etc)
- Areas requiring industry or government specified soil designs such as but not limited to: golf courses, landfills, wetland restoration, septic disposal fields, etc.
- Slopes determined to be inappropriate for safe operation of equipment
- Other general areas where increased infiltration through surface soils is not desirable (i.e, over septic fields)
- Areas where no heavy equipment travel or other disturbance has taken place (no compaction)
- Areas receiving temporary vegetative stabilization in accordance with that Standard.

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Soil Restoration

- Maximum Bulk Densities (gm/cc) by soil type

Soil type	**Target Bulk Density**
Sands	1.6
Very fine sand	1.6
Sandy Loam	1.6
Sandy Clay Loam	1.6
Silt Loam	1.5
Clay	1.4

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Procedures for Compaction Remediation

- Bring site to rough grade elevation (finish grade must accommodate a depth of 6.0” of topsoil placement).
- Spread topsoil uniformly. Topsoil shall conform to all quality criteria in accordance with the Standard for Topsoil.
- Rip the subsoil (with 6” lift of topsoil in place) to a depth of 6” (total depth of 12”) in one direction. Do not re-travel over ripped soils. Chisel plow-type implements shall not overturn or mix the sub and topsoil. The objective is to lift both layers in place and fracture the subsoil to a depth of 6.0”.

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Procedures for Compaction Remediation (continued)

- After ripping, finish grade topsoil to remove irregularities, ruts etc. Use of low ground pressure equipment or hand raking is preferred where practicable and feasible. Care must be taken to avoid re-compacting ripped soils.
- Apply permanent vegetative cover measures in accordance with applicable Standards (Permanent Vegetative Cover, Standard for Sod)

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Deep Infiltration Areas

- Infiltration Basin
- Rain Garden
- Bio-Retention Basin

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Soil Amendment

Some common design applications include:

- Reduce runoff from compacted lawns.
- Enhance rooftop disconnections on poor soils.
- Increase runoff reduction within a grass channel
- Increase runoff reduction within a vegetated filter strip.
- Increase the runoff reduction function of a tree cluster or reforested area of the site.

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SECTION 2: PERFORMANCE

Table 4.1: Stormwater Functions of Soil Compost Amendments [1]

Stormwater Function	HSG Soils A and B		HSG Soils C and D	
	No CA [2]	With CA	No CA	With CA
Annual Runoff Volume Reduction (RR)				
Simple Rooftop Disconnection	50%	NA [3]	25%	50%
Filter Strip	50%	NA [3]	NA [4]	50%
Grass Channel	20%	NA [3]	10%	30%
Total Phosphorus (TP) EMC Reduction [4] by BMP Treatment Practice	0		0	
Total Phosphorus (TP) Mass Load Removal	Same as for RR (above)		Same as for RR (above)	
Total Nitrogen (TN) EMC Reduction by BMP Treatment Practice	0		0	
Total Nitrogen (TN) Mass Load Removal	Same as for RR (above)		Same as for RR (above)	
Channel Protection & Flood Mitigation	**Partial.** Designers can use the RRM spreadsheet to adjust the curve number for each design storm for the contributing drainage area, based on annual runoff volume reduction achieved.			

[1] CWP and CSN (2008), CWP (2007)
[2] CA = Compost Amended Soils, see Stormwater Design Specification No. 4.
[3] Compost amendments are generally not applicable for A and B soils, although it may be advisable to incorporate them on mass-graded B soils to maintain runoff reduction rates.
[4] Filter strips in HSG C and D should use composted amended soils to enhance runoff reduction capabilities. See Stormwater Design Specification No. 2: Sheetflow to Vegetated Filter Strip or Conserved Open Space.

SECTION 3: DESIGN TABLE

Not applicable.

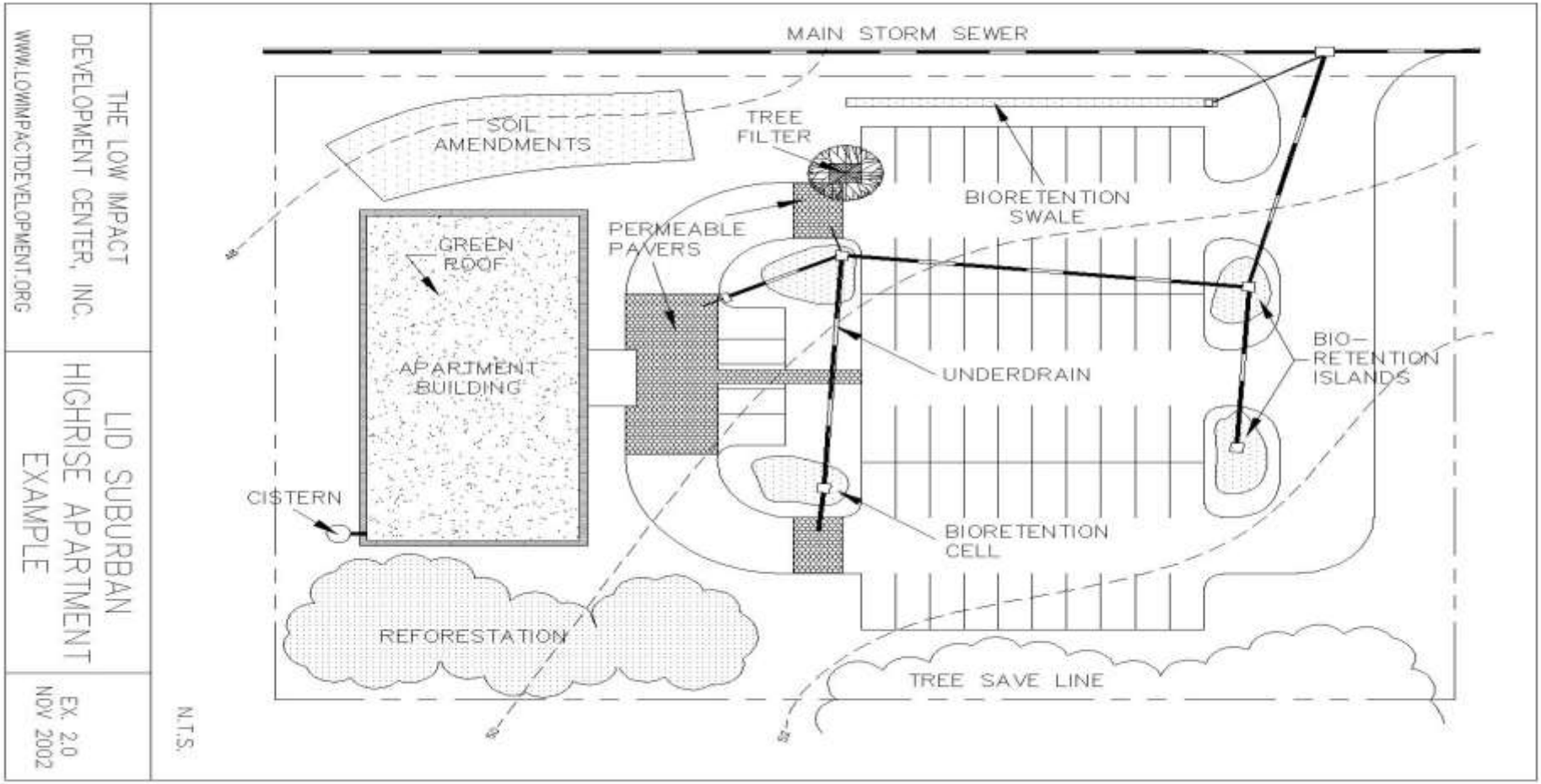
SECTION 4: TYPICAL DETAILS

Not applicable.

SECTION 5: PHYSICAL FEASIBILITY & DESIGN APPLICATIONS

Compost amended soils are suitable for any pervious area where soils have been or will be compacted by the grading and construction process. They are particularly well suited when existing soils have low infiltration rates (HSG C and D) and when the pervious area will be used to filter runoff (downspout disconnections and grass channels). The area or strip of amended soils should be hydraulically connected to the stormwater conveyance system. Soil restoration is recommended for sites that will experience mass grading of more than a foot of cut and fill across the site.

LID PLANS



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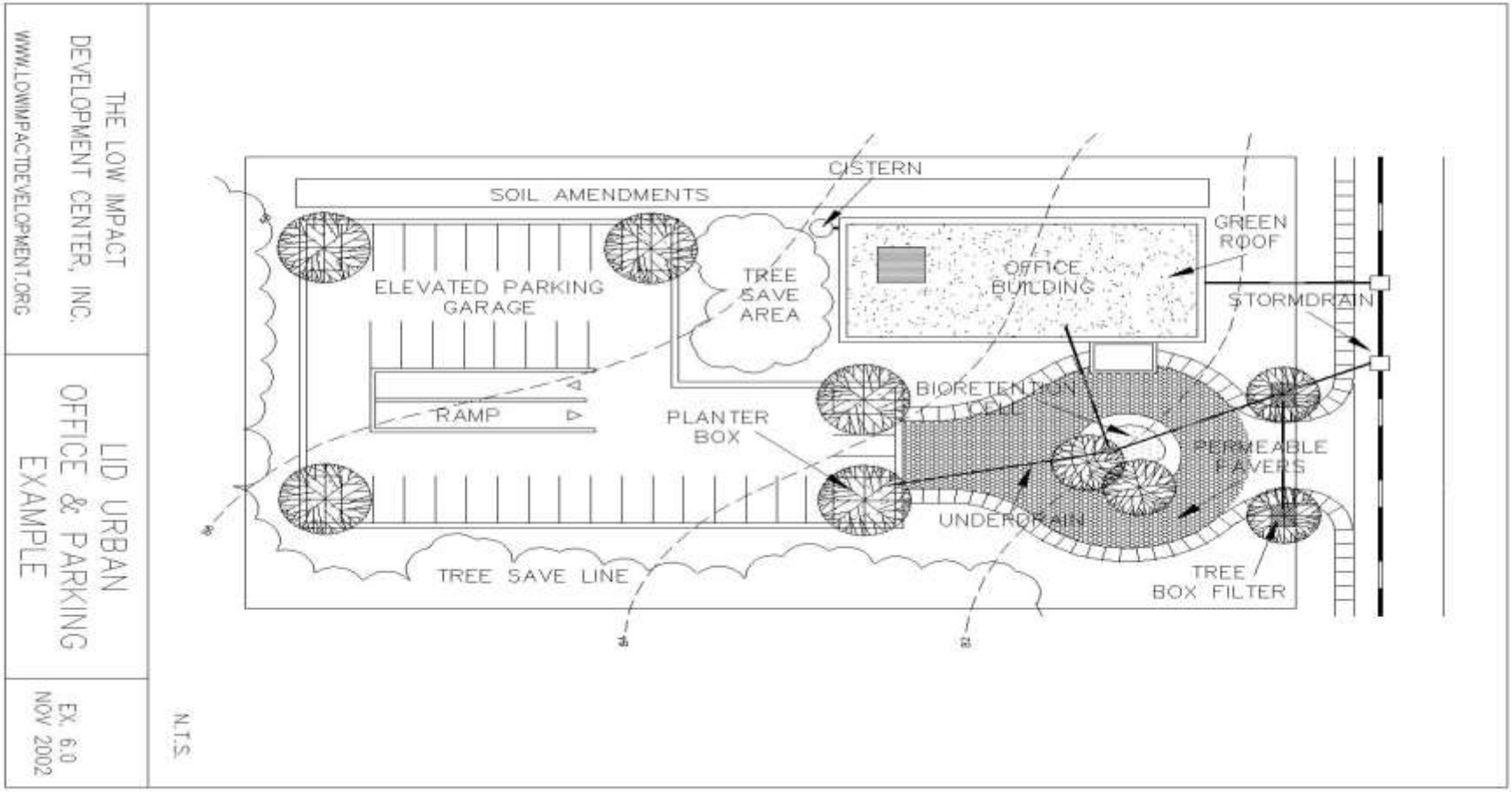

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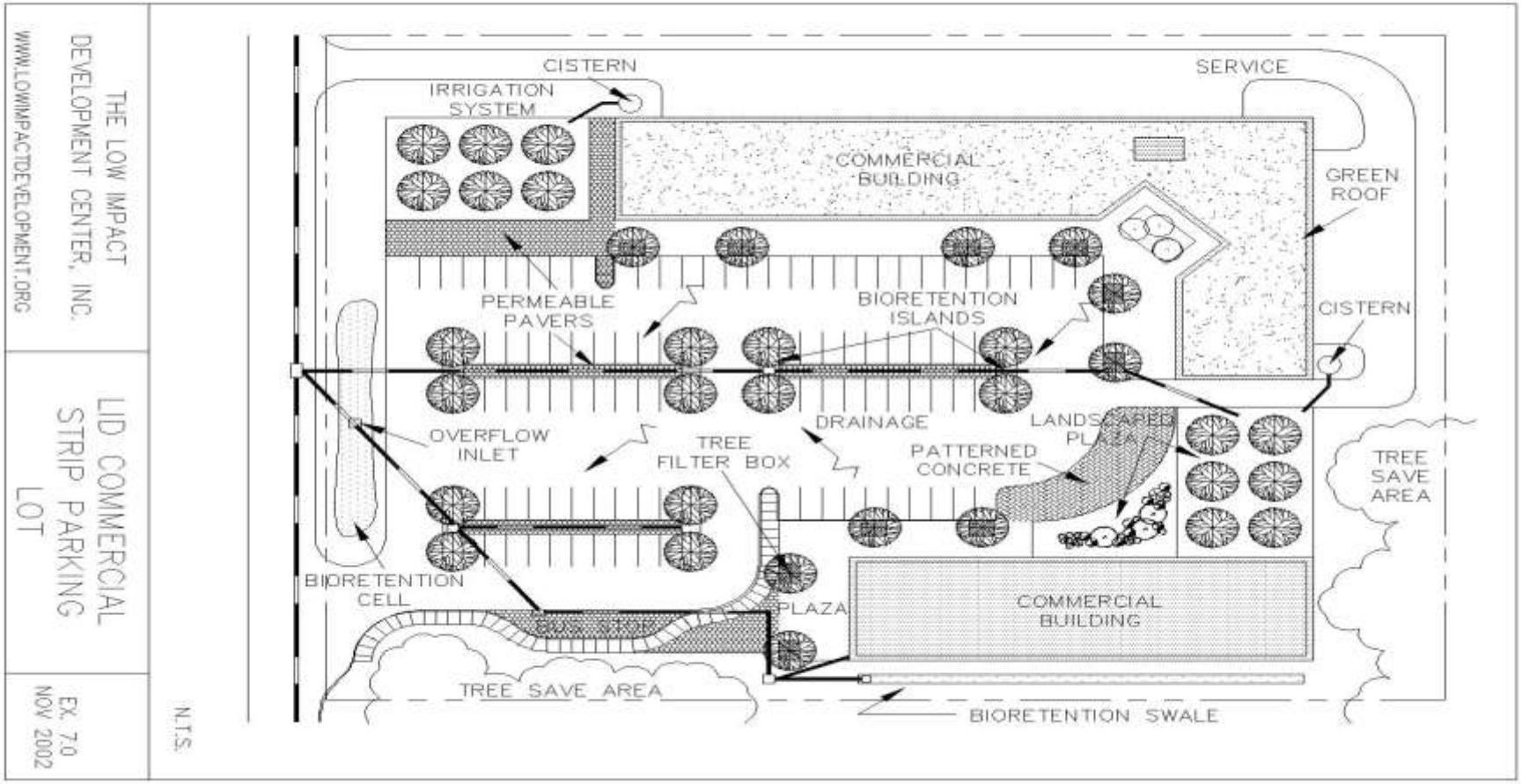

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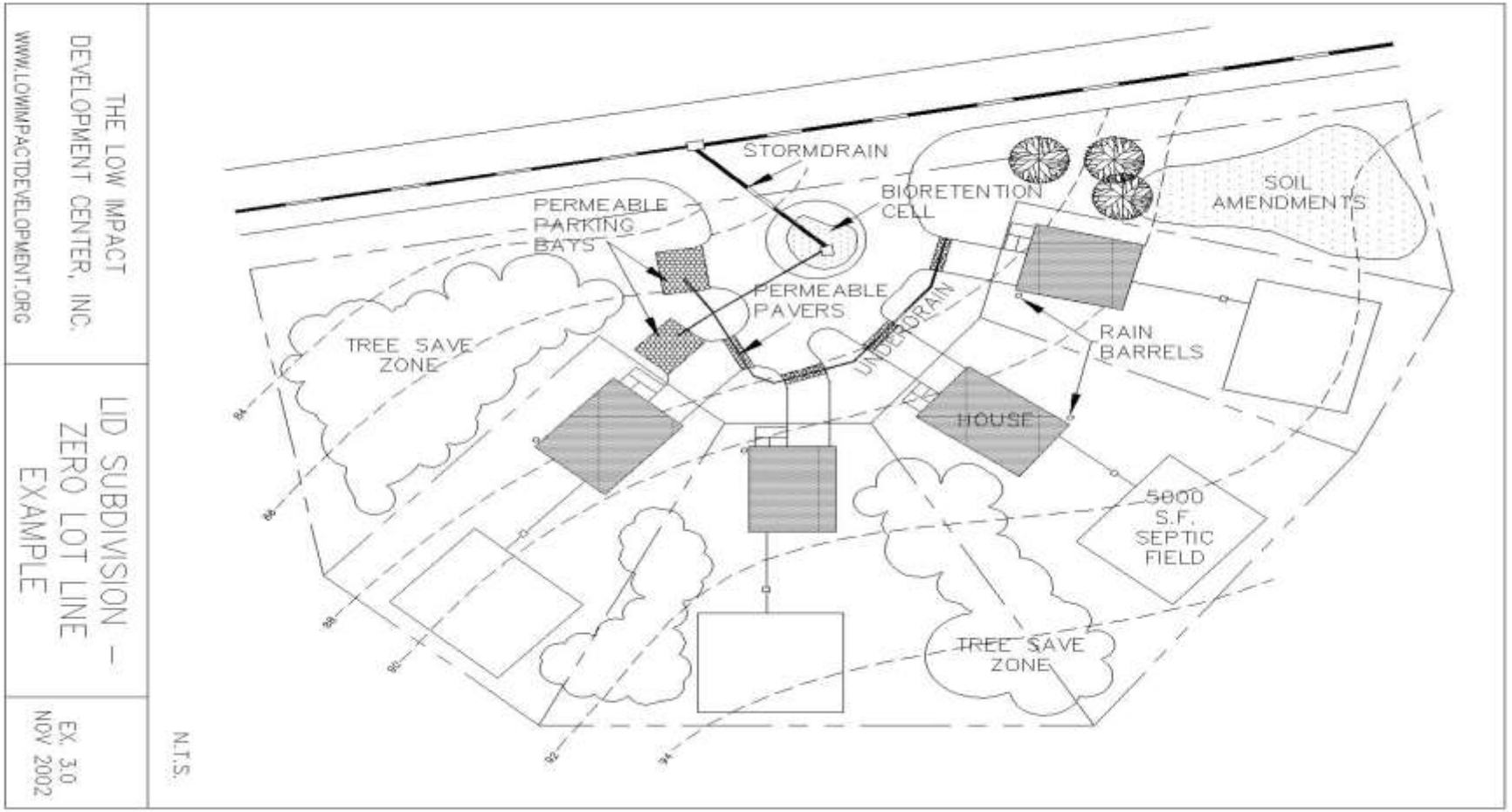

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LID BMPs

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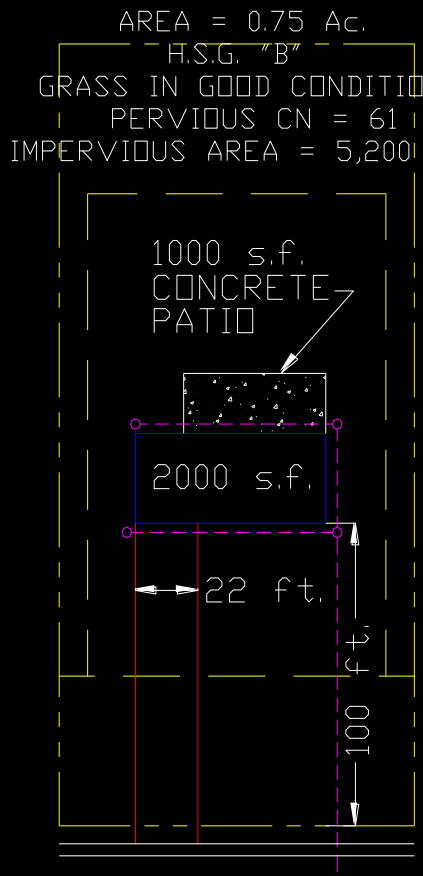
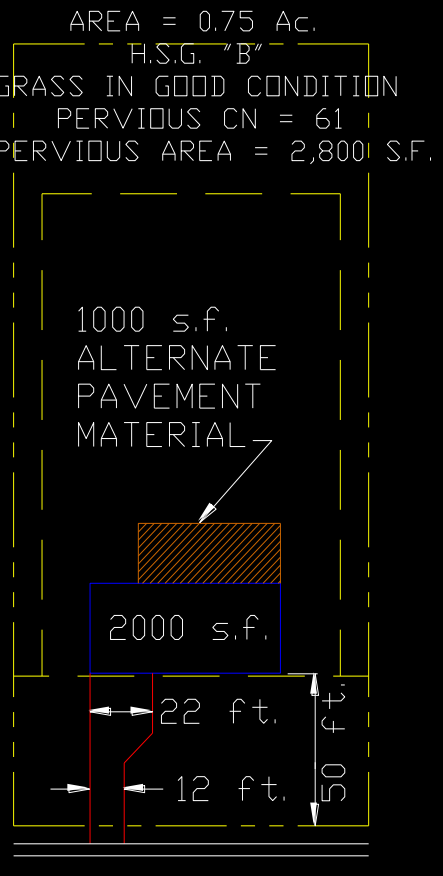
Development Lot Comparison: Standard vs. LID of Reduced Impervious Surface



Standard Development Techniques



Low Impact Development Techniques

COMPARISON

Standard Method

2 Year = 2,001 c.f. 10 Year = 5,268 c.f.

100 Year = 10,073 c.f.

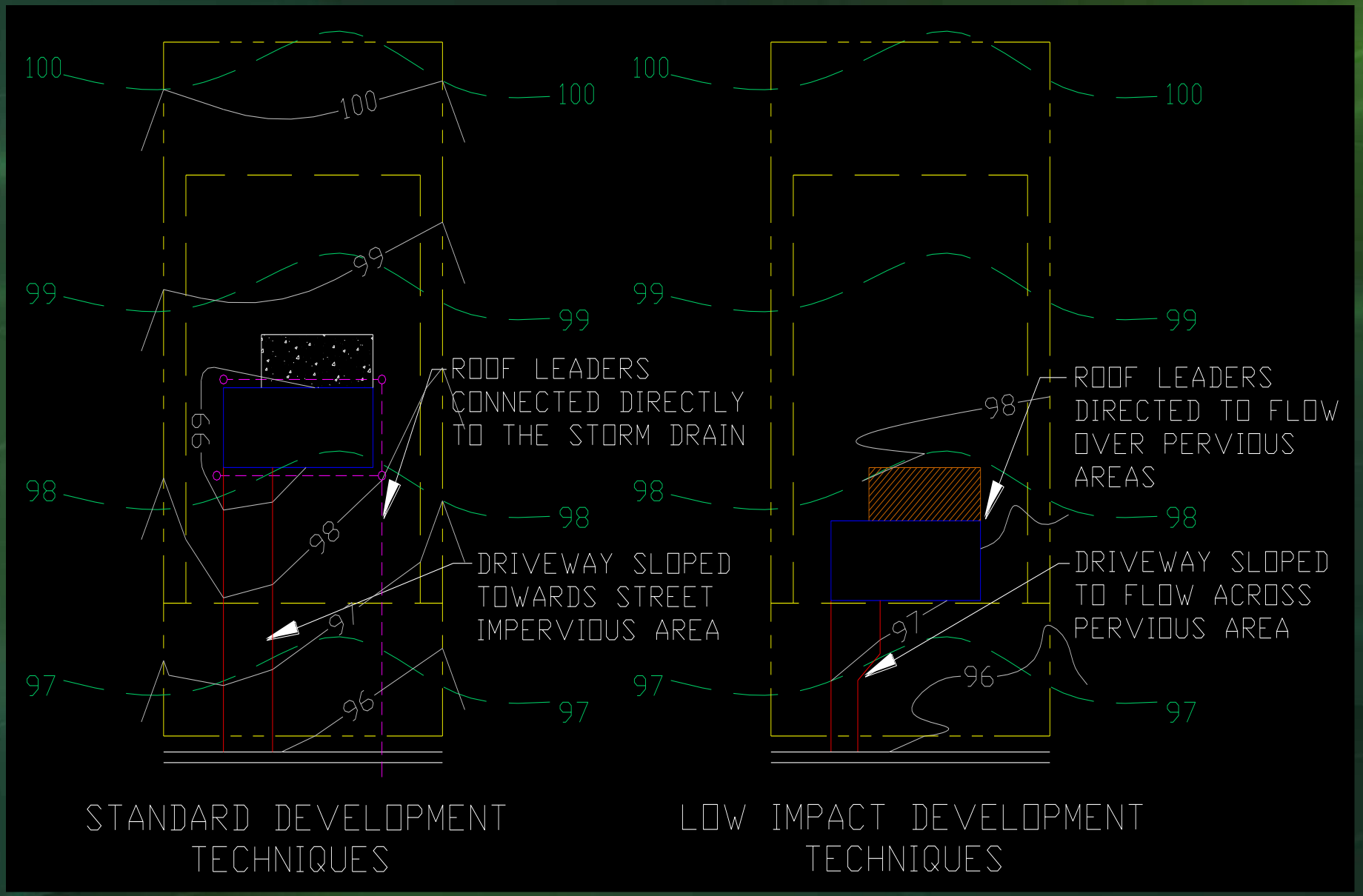
Low Impact Development

2 Year = 1,661 c.f. 10 Year = 4,683 c.f.

100 Year = 9,257 c.f.

- Difference In Volumes
  - 2 Year = 340 c.f. or 17.0% Less
  - 10 Year = 585 c.f. or 11.1 % Less
  - 100 Year = 816 c.f. or 8.1% Less

Disconnection of Impervious Surface



COMPARISON

Standard Method

2 Year = 2,001 c.f.

10 Year = 5,268 c.f.

100 Year = 10,073 c.f.

Low Impact Development

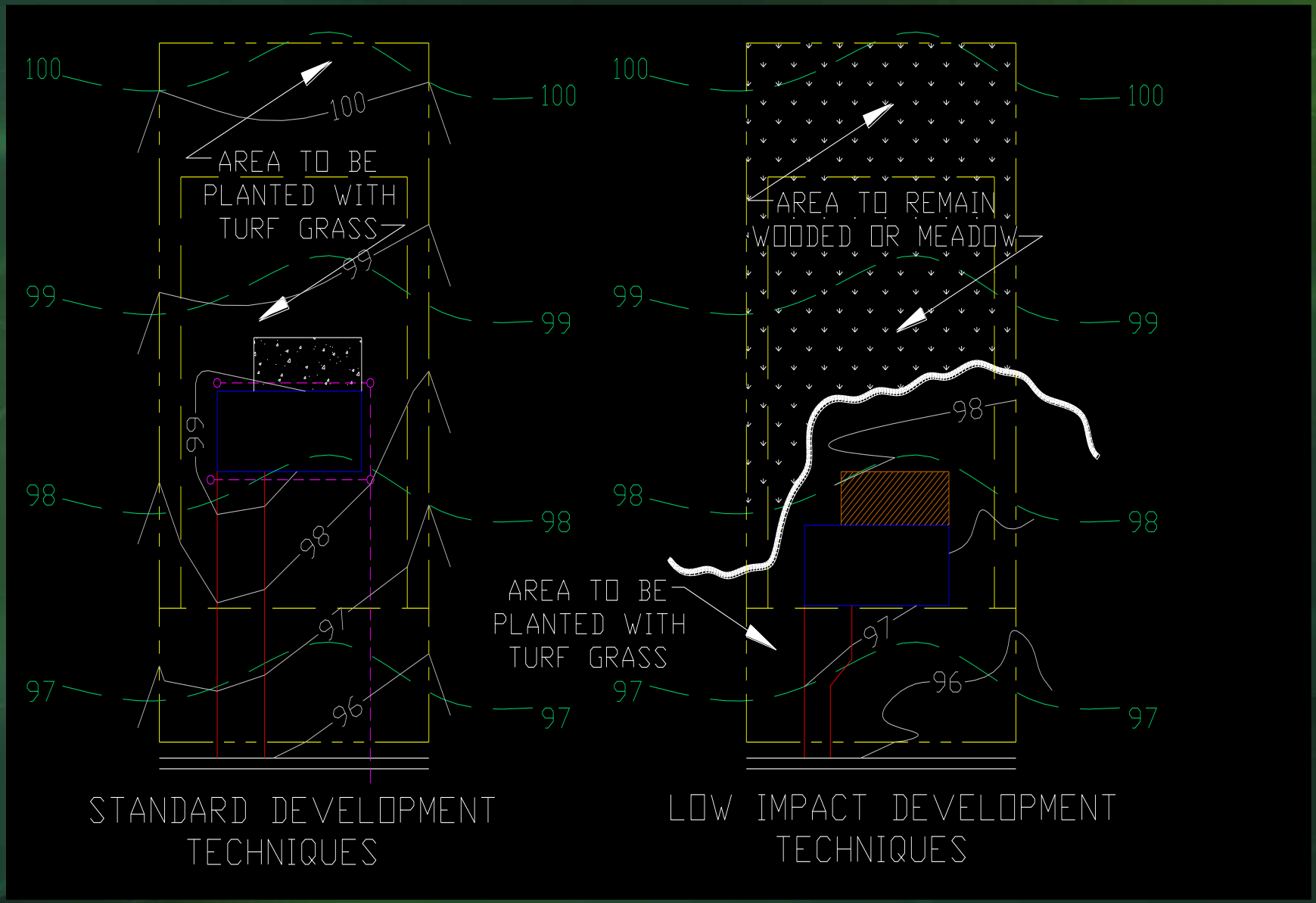
2 Year = 1,470 c.f.

10 Year = 4,383 c.f.

100 Year = 8,821 c.f.

- Difference In Volumes
- 2 Year = 531 c.f. or 26.5% Less
- 10 Year = 885 c.f. or 16.8 % Less
- 100 Year = 1,252 c.f. or 12.4% Les

Maintaining Natural Buffer Areas



COMPARISON

Standard Method

2 Year = 2,001 c.f.

10 Year = 5,268 c.f.

100 Year = 10,073 c.f.

Low Impact Development

2 Year = 1,141 c.f.

10 Year = 3,713 c.f.

100 Year = 7,841 c.f.

- Difference In Volumes
- 2 Year = 860 c.f. or 43.0% Less
- 10 Year = 1,555 c.f. or 29.5 % Less
- 100 Year = 2,232 c.f. or 22.2% Less

BENEFITS

- Reduced increase in the peak rate runoff
- Reduced increase in the peak runoff volume
- Reduced size of stormwater management infrastructure such as storm drain and detention basins
- Possible elimination of detention basin
- Reduced amount of runoff volume to be treated for water quality, yielding less TSS
- Reduced size of water quality treatment structures
- Reduced amount of runoff volume to be recharged back into the water table, resulting in smaller infiltration structures
- Minimized nutrient introduction levels, by maintaining the natural buffer areas

Current Regulatory Roadblocks

- Disbursing runoff vs. collecting runoff
- Stability conflicts
- Must collect to prove TSS Removal
- Must collect to prove recharge
- Must collect to prove volume control
- Maintenance requirements
- RSIS conflicts

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Solutions

- Eliminate Conflicts
- Watershed (RSMP) Plan (especially Barnegat Bay)
- Use Specific Peak Rate Factors
- Accept Water Quality, Recharge and Volume Reduction Benefits (especially for re-development)
- Coordinate with NJDEP Municipal SW Program

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Thank You!

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