WHITE PAPER

SENATE FILE 455

EVALUATING THE IMPACTS OF STORMWATER MANAGEMENT LEVELS AND TOPSOIL RESTORATION

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

February 15, 2024

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Notice to Readers

The effort to prepare and review this report and its attachments has been completed on a voluntary basis to provide information related to stormwater management levels, based on the consideration of Iowa Senate File 455. No compensation, financial or otherwise has been provided to any person listed as preparers, reviewers, or endorsers of this report. Similarly, no compensation has been provided to any employer or other organization affiliated with the preparers, reviewers, or endorsers of this report.

For More Information

The complete report and appendices have more details and analyses that were completed related to this topic. The report also includes background information about stormwater management terms that may assist in understanding this topic.

Introduction

This executive summary and its attached report were prepared in response to the introduction of Iowa Senate File 455. Its purpose is to review different levels of stormwater management that are currently employed by some counties and cities within Iowa. **The results of those current local requirements are compared to standards based on language in Senate File 455 as introduced at the beginning of 2024.**

This study will evaluate four key aspects related to this issue:

1) Review changes in stormwater runoff rates and volumes expected to be created by land use changes.

2) Compare and contrast different levels of stormwater management.

3) Review the effects of topsoil related to runoff rates, volumes and required sizes of stormwater management practices.

4) Compare expected construction costs for these scenarios.

Key findings

- **Single-family residential developments generate significantly more stormwater runoff volume than agricultural land uses.** Stormwater basins used to slow the rate of flow leaving new developments will not prevent these increases in runoff volume. Runoff volume increases would be even higher for multi-family, commercial, industrial or other land uses with greater levels of impervious cover.

- Rolling back stormwater management standards to the level proposed by Senate File 455 would result in much larger flow rates being released from new development sites, compared to what is currently allowed in many Iowa counties and communities. **The increases in release rates from sites would be greatest during the smaller storm events that happen most frequently. This increases the risk of channel erosion downstream.**

- While allowing significant increases in peak release rates, **basins designed using the Senate File 455 standard would only be marginally smaller than those designed following the Iowa Stormwater Management Manual**, or other locally adopted standards.

- In all scenarios reviewed, **the projected typical construction cost difference for detention basins** designed to the Senate File 455 standard and the most aggressive stormwater management scenario was **less than $500 per lot**.

- **Preserving or restoring more topsoil** within new development sites **reduces the total volume of runoff** being created by new developments. Using more topsoil can be used to **decrease the required sizes of stormwater detention basins**. It can also **reduce ongoing homeowner costs** related to fertilization, irrigation and other lawn maintenance activities.

Project Examples

This study looks at two fictional, but representative, 40-acre single-family residential developments, each set in a location with slightly different soil characteristics. The condition of the site immediately prior to development is given to be a row-crop agricultural field. Within each example, different scenarios of stormwater management were evaluated, based on ordinances and policies currently in use in Iowa.

These were compared to the standards as described and included in Senate File 455. This proposed law would restrict the ability of cities and counties to enforce stormwater regulations and topsoil requirements. Refer to pages 14 and 21 of the full report for a greater description of the management scenarios that were studied.

Conclusions

1. Land Use Change Results in More Runoff Volume

Runoff volumes after development can be significantly higher than existing conditions. **In this example, the runoff volume is increasing by 49% during the 1-year storm event** (2.67" in 24 hours for Central Iowa). The 50,000 cubic foot (CF) increase in volume is equivalent to an additional 374,000 gallons of stormwater runoff being created from this one 40-acre site. **That volume would fill over half of an Olympic size swimming pool**. Stormwater detention practices that are designed to target larger storm events have limited ability to reduce runoff volumes. So even with such practices in place, most of these runoff volume increases are likely to be passed downstream.

Increases in runoff volume result in higher levels of flow being sustained longer. **If the rate of that flow isn't reduced sufficiently, the potential for downstream channel erosion is increased.** This is especially true for the smallest, most commonly occurring storm events. The Iowa Stormwater Management Manual (ISWMM), as owned by the Iowa Department of Natural Resources (DNR) and maintained by the Iowa Department of Agriculture and Land Stewardship (IDALS), promotes guidelines for these small events to protect against channel erosion and maintain water quality. Cities may not be able to enforce those provisions of ISWMM should Senate File 455 be passed in its current form.

Comparison in Runoff Volumes
Site Example with Hydrologic Soil Group (HSG) B Conditions

	Existing (Agriculture)	Developed (Single Family)	Increase in Volume
1-year storm (2.67")	103,000 cubic feet	153,000 cubic feet	49%
100-year storm (7.12")	607,000 cubic feet	706,000 cubic feet	16%

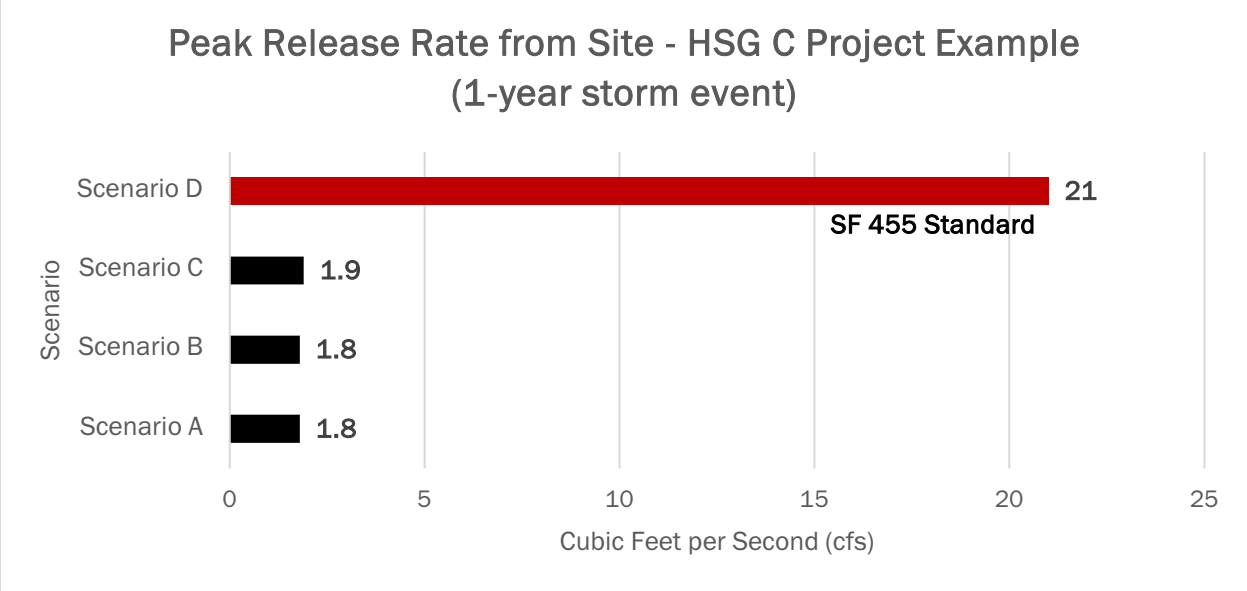
See Appendix B, Hydrograph 4 (Existing) and Hydrograph 7 (Developed).

For more information about Hydrologic Soil Groups, see page 2 of the complete report.

2. Comparing Stormwater Management Approaches

The limitations proposed under Senate File 455 could prohibit cities and counties from being able to enforce the small storm provisions that are advocated by ISWMM. **Ninety-eight percent (98%) of all rainfall events in Iowa are smaller than the 1-year storm event** (between 2.5" to 3" of rain in 24-hours across Iowa). Effectively managing these storm events is critical in reducing the risk of channel erosion and improving water quality in small urban streams or immediately downstream of cities and towns.

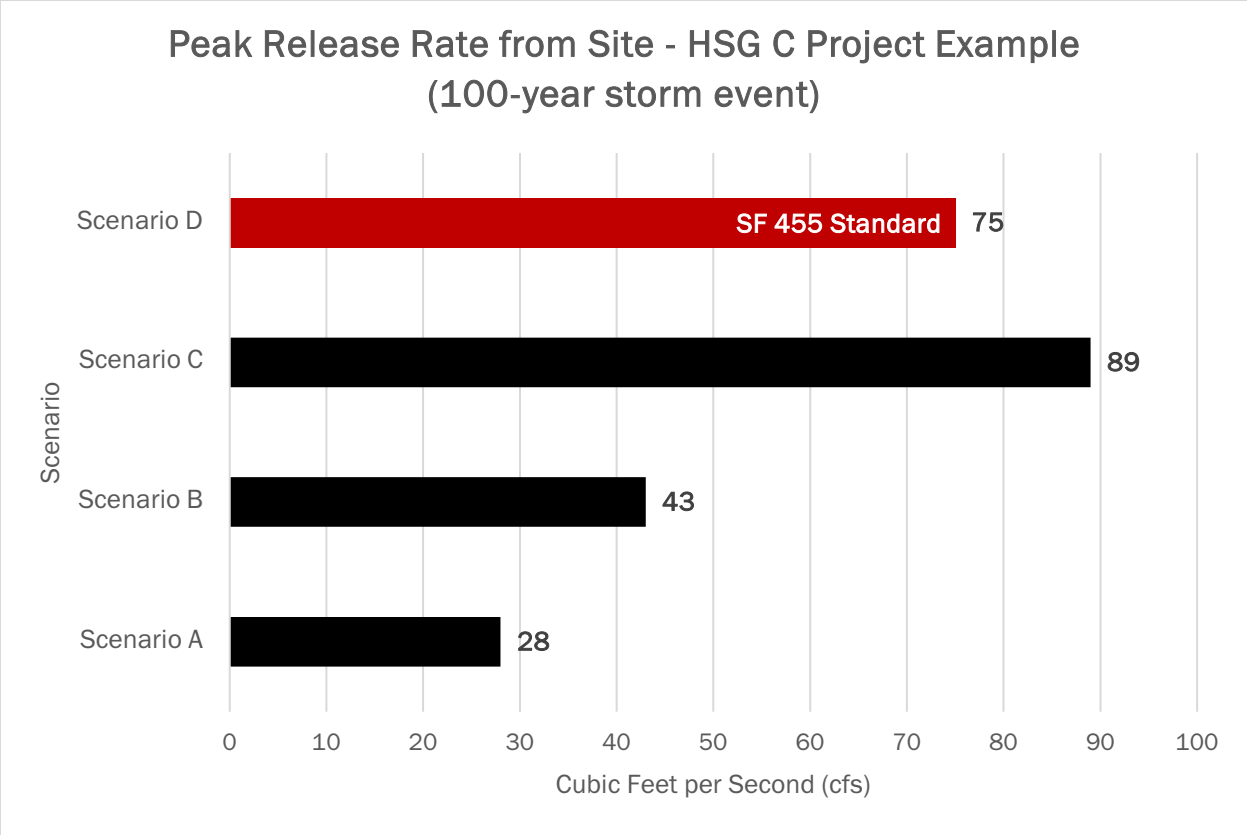
In this example, the peak rate of flow leaving the basin in Scenario D (designed to the Senate 455 standard) would be 11 times larger than basins designed using methods outlined in the Iowa Stormwater Management Manual (ISWMM). As mentioned previously, the increased runoff volume leaving the development will force these elevated rates to be sustained over a longer period of time, greatly increasing the potential for channel erosion downstream.



See Appendix B, Hydrograph 18 (Scenario A), Hydrograph 19 (Scenario B), Hydrograph 20 (Scenario C) and Hydrograph 21 (Scenario D).

Description of Scenarios Considered for this Example	
Scenario A	Requires small storm controls. Runoff from all events up to 5-year storm event controlled to the natural (meadow) condition for the same storm event. Runoff from the 5- to 100-year storm events controlled to the 5-year natural (meadow) condition. Natural conditions would be based on local site soil conditions, which were HSG C for this example.
Scenario B	Requires small storm controls. Runoff from all events up to 100-year storm event controlled to the natural (meadow) condition for the same storm event, based on Hydrologic Soil Group B soils. (Soil type for natural condition was adjusted to reduce allowable release rate.)
Scenario C	Requires small storm controls. Runoff from all events up to 100-year storm event controlled to the natural (meadow) condition for the same storm event, based on local site conditions (HSG C).
Scenario D	The Senate File 455 standard. No requirements for small storms. Runoff from 5- to 100-year storm event controlled to 5-year existing rate (agriculture for this example).
For information about Hydrologic Soil Groups, refer to page 2 of the complete report. For additional information about these scenarios, refer to page 21-22 of the complete report.	

For larger storm events, there is more variance in the allowable release rates. For example, Scenario C would have lower allowable release rates than the Senate File 455 standard for events that are smaller than the 50-year storm event, but it would allow a slightly higher release rate during the 100-year storm event. Other standards are significantly below the Senate File 455 standard for all storm events.



See Appendix B, Hydrograph 18 (Scenario A), Hydrograph 19 (Scenario B), Hydrograph 20 (Scenario C) and Hydrograph 21 (Scenario D). See Appendix B for release rate information for storms other than the 100-year event.

However, even with these wide variances in allowable release rates defined by the different management requirements, there is only a minimal change in the area expected to be occupied by stormwater management basins. **The total variance from the extremes of management approaches in this design example is only 1.7% of the total site area, or about 0.7 acres of the entire 40-acre development.**

Projected Basin Area Below High-Water Elevation
100-year Storm Event (HSG C example)

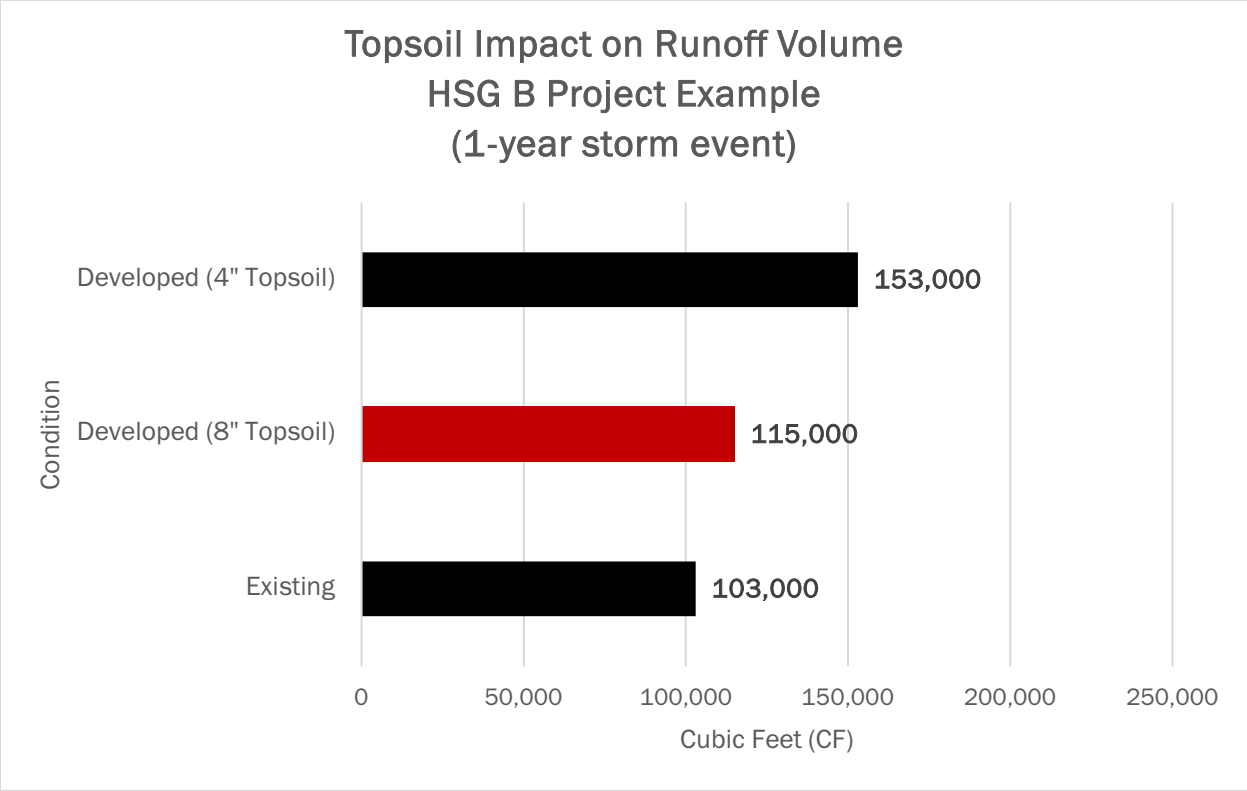
	Area (acres)	% of Total Site	
Scenario A	2.3	5.7%	
Scenario B	2.2	5.4%	
Scenario C	1.9	4.8%	
Scenario D	1.6	4.0%	**< SF 455 Standard**

3. Topsoil Can Reduce Runoff Volumes and Basin Sizes

Topsoil is usually stripped off the surface of the land prior to site construction, as it doesn't provide a stable foundation for buildings, streets, driveways and other structures. This topsoil is typically separated from other soils and stockpiled on site while other construction is done. **It is required by federal and state permit regulations to be preserved and spread back over open space areas within the construction site.**

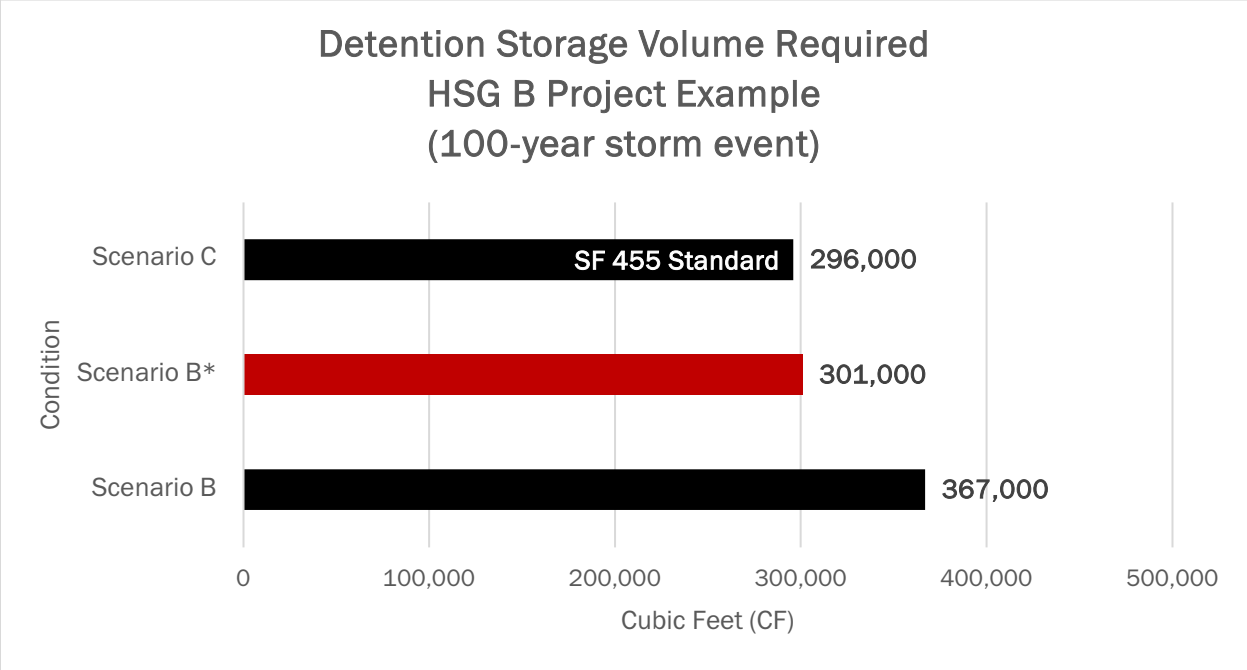
Based on those regulations, cities and counties have adopted standards to verify how these topsoil requirements are being satisfied. In some cases, cities or counties have set requirements for verification that these standards are met, or to confirm that a certain depth of topsoil, or equivalent level of restoration be provided. For more information about topsoil regulations, refer to page 28 of the complete report.

Different levels of topsoil respread were reviewed as part of this report. If topsoil respread is increased from 4 inches up to 8 inches across site open spaces after development, it would mitigate much of the increase in runoff volume caused by the single-family development example. **If an average of at least 4.8 inches of topsoil were available within an agricultural field before construction, that would be enough topsoil to cover 8 inches across the 60% of the site not covered by new homes, streets, and other impervious surfaces.** In this example, the deeper depth of topsoil respread is projected to reduce runoff volume by 25%, retaining about 284,000 gallons of runoff on-site (**over 40% of an Olympic sized pool**).



See Appendix B, Hydrograph 4 (Existing), Hydrograph 7 (Developed, 4" Topsoil) and Hydrograph 8 (Developed, 8" Topsoil).

The additional topsoil reduces both the rate and volume of runoff that proposed detention basins have to manage. **In this example, using 8 inches of topsoil on open spaces (Scenario B*) reduced the required basin storage by 18% (compared to Scenario B, where only 4 inches of topsoil was placed). This reduction in size made that basin nearly identical in size to the basin designed based on the Senate File 455 standard (Scenario C).**



See Appendix B, Hydrograph 14 (Scenario B), Hydrograph 15 (Scenario B*) and Hydrograph 16 (Scenario C).

Description of Scenarios Considered for this Example	
Scenario B	Requires small storm controls. Runoff from all events up to 100-year storm event controlled to the natural (meadow) condition for the same storm event, based on local site soil conditions, which were HSG B for this example. 4" topsoil respread is proposed.
Scenario B*	Same requirements as Scenario B, but 8" topsoil is proposed.
Scenario C	The Senate File 455 standard. No requirements for small storms. Runoff from 5- to 100-year storm event controlled to 5-year existing rate (agriculture for this example). 4" topsoil respread is proposed.
For information about Hydrologic Soil Groups, refer to page 2 of the complete report. For additional information about these scenarios, refer to pages 14 and 37 of the complete report.	

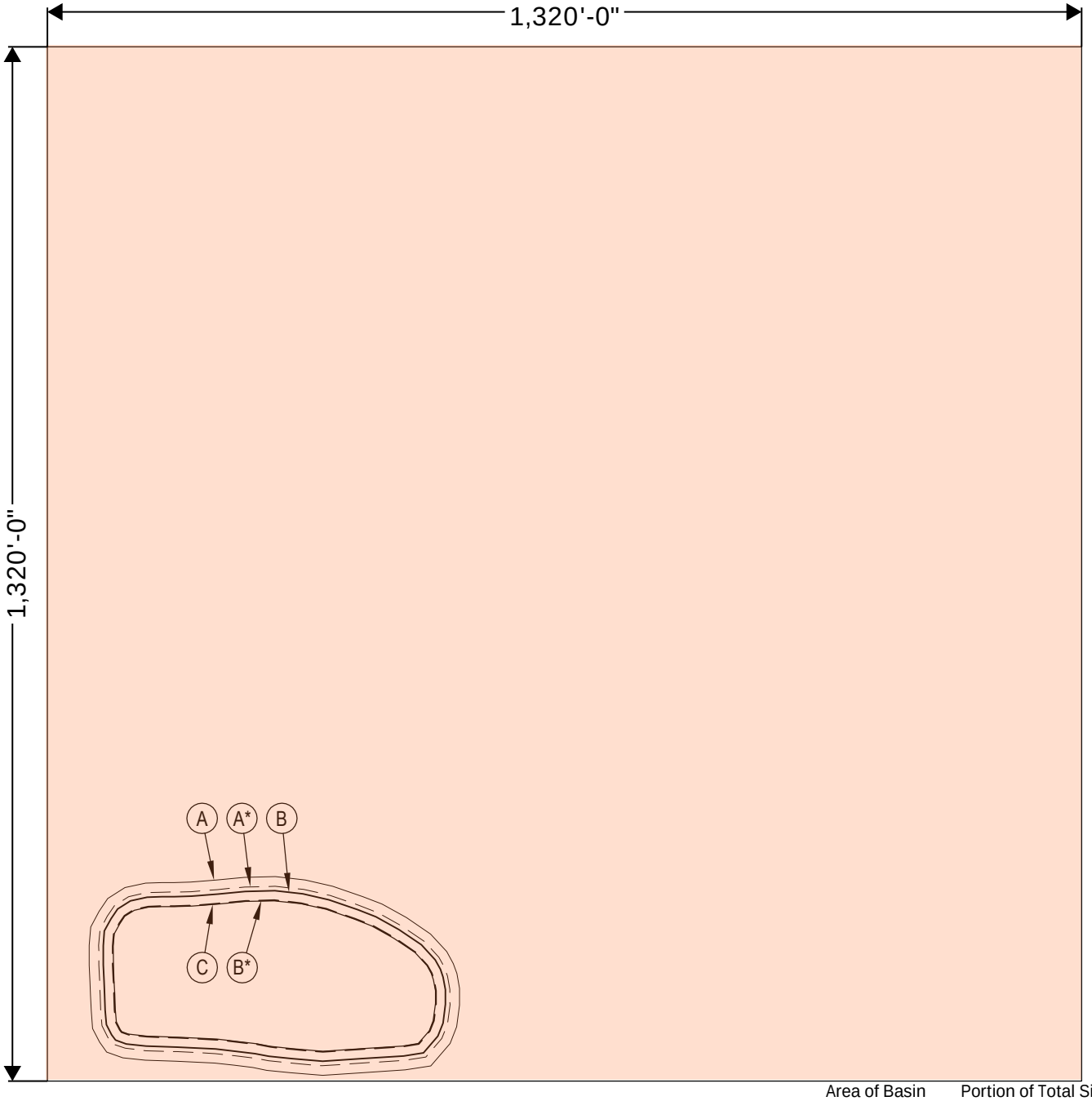
4. Construction Costs

This study compared even the most extreme scenarios and found that the difference in construction cost for the various levels of stormwater management practices is likely to be less than $500 per lot. In projects that need an import of earth materials to build up lot elevations, the cost savings from reduced earth import may offset any other construction cost increases, resulting in a net project savings when larger basins are built. Any potential savings in construction cost from the smaller basin sizes that may be allowable under the Senate 455 standard does not consider the cost of repairs for any additional erosion or flood damages that are incurred by downstream property owners or taxpayers.

SINGLE FAMILY DEVELOPMENT EXAMPLE

40-ACRE SITE, 40% IMPERVIOUS
HYDROLOGIC SOIL GROUP B

SCALE 1" = 200'

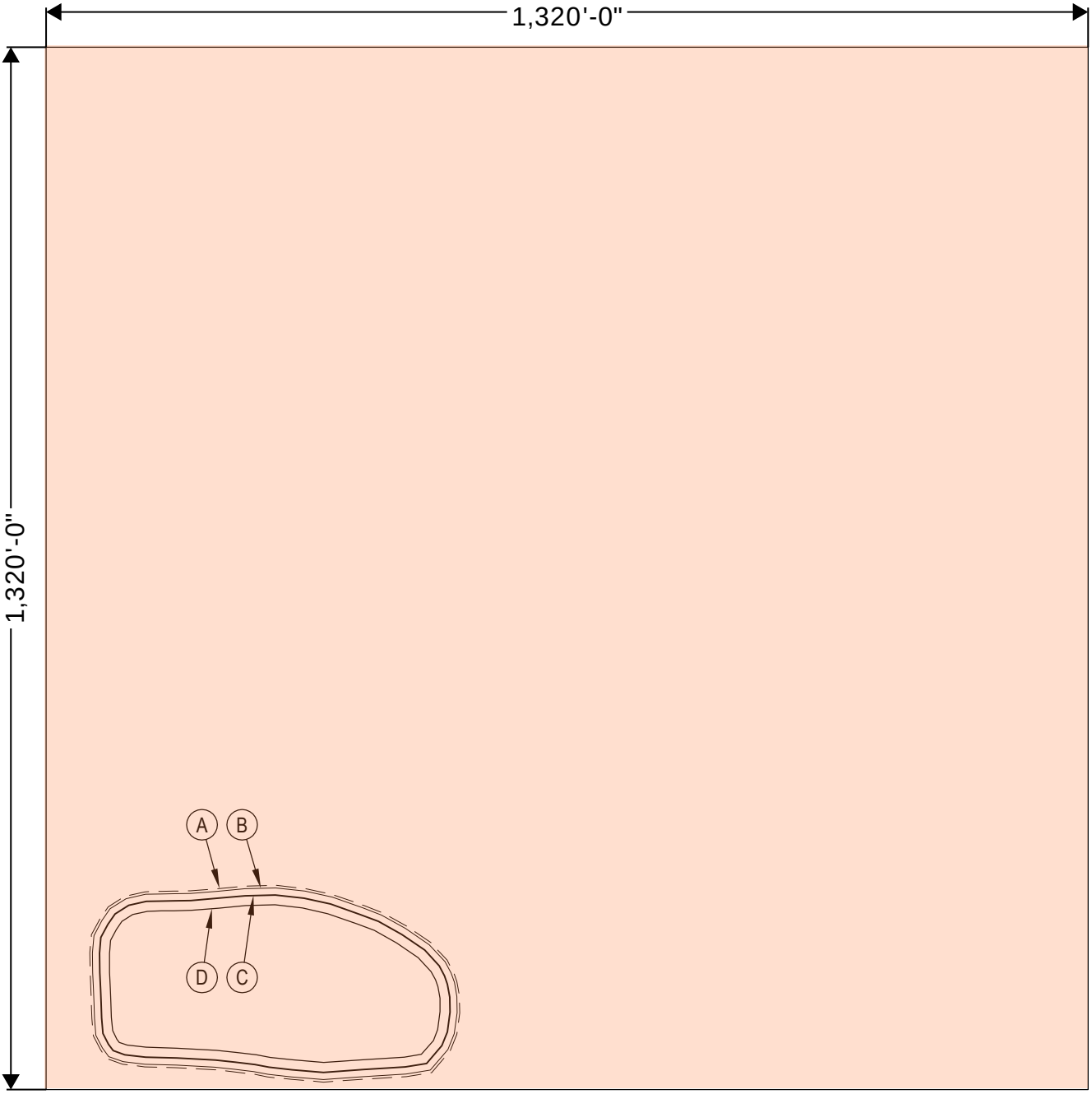


	Area of Basin Below 100-year High-water Line	Portion of Total Site Below 100-year High-water Line
Scenario A: Up to 100-year developed to 5-year natural (4" topsoil applied)	2.3 acres	5.8%
Scenario A*: Same as Scenario A, but with 8" topsoil applied	2.0 acres	5.0%
Scenario B: Up to 100-year developed to natural, same event (4" topsoil applied)	1.8 acres	4.6%
Scenario B*: Same as Scenario B, but with 8" topsoil applied	1.5 acres	3.8%
Scenario C: Senate 455 Standard (4" topsoil applied)	1.5 acres	3.8%

SINGLE FAMILY DEVELOPMENT EXAMPLE

40-ACRE SITE, 40% IMPERVIOUS
HYDROLOGIC SOIL GROUP C

SCALE 1" = 200'



	Area of Basin Below 100-year High-water Line	Portion of Total Site Below 100-year High-water Line
Scenario A: Up to 100-year developed to 5-year natural	2.3 acres	5.7%
Scenario B: Up to 100-year developed to natural, same storm, HSG B soil	2.2 acres	5.4%
Scenario C: Up to 100-year developed to natural, same storm, HSG C soil	2.0 acres	4.8%
Scenario D: Senate File 455 Standard	1.6 acres	4.0%

(4" topsoil applied to all scenarios)