



Downstream Assessment Summary of Review

INTRODUCTION

The Halff Team was tasked with reviewing the downstream assessment criteria (Section 2.0) of the current NCTCOG iSWM Technical Manual for Hydrology. The goals of this review included:

- Benchmarking of criteria used by other municipalities
- Providing other options in the application of the downstream assessment

Through this review, it was concluded that the current iSWM Technical Manual provides a process that continues to be applicable for site-specific evaluation of downstream impacts resulting from development. While many of the researched communities are utilizing a more watershed-based approach to downstream assessment techniques, a more effective site-specific evaluation was not found. These findings are presented in more detail in the following sections.

The concerns with the current iSWM downstream assessment are typically focused on the level of effort required during the development submittal and review process. However, the assessment is often credited as being one of the most impactful paradigm shifts in the iSWM manual compared to traditional and historic drainage criteria in the NCTCOG region.

BACKGROUND AND PURPOSE

The purpose of the downstream assessment is to protect downstream properties/structures from increased flooding and downstream channels from increased erosion potential due to upstream development. The importance of the downstream assessment is particularly evident for larger sites or developments that have the potential to dramatically impact downstream areas. The cumulative effect of smaller sites, however, can be just as dramatic. The assessment should extend from the outfall of a proposed development to a point downstream where the discharge from the proposed development no longer has a significant impact on the receiving stream or storm drainage system.

Many communities have implemented a detention requirement that focuses on limiting the peak flow at the outlet of a site to the pre-development peak discharge. This approach neglects to consider the negative timing impacts that could result from a detention requirement.

The downstream assessment was implemented with the original iSWM Technical Manual for the following purposes:

- Protect downstream properties from flood or velocity increases caused by upstream development
- Provide defensible evidence that a proposed development does not impact downstream properties
- Potentially eliminate the need for detaining increased runoff caused by development
- Make better informed decisions for the site-specific impacts of development



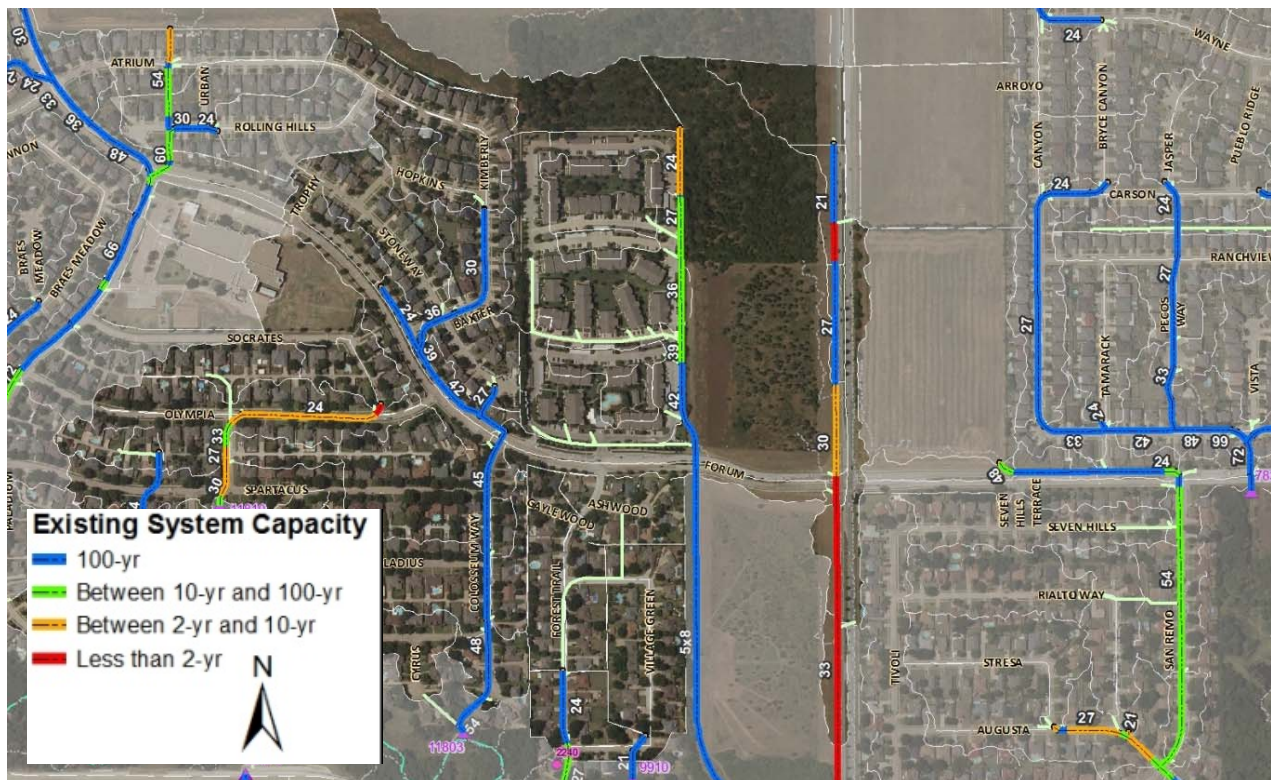
Downstream Assessment Summary of Review

BENCHMARKING

Grand Prairie, Texas

The City of Grand Prairie is an iSWM Silver Certified Community. The City has taken a proactive approach to evaluating their infrastructure and the flood conveyance capacity of their storm drain systems. Through a comprehensive storm drain study, the City has identified which storm drain outfalls in the City provide an adequate level of service. By incorporating storm drain design plans into an integrated and comprehensive storm drain model, the City determined the existing and future fully developed capacity and level of service for their storm drain trunk lines. Design discharges and corresponding land uses have been mapped for reference during the development process to compare proposed development with the original design assumptions. If the storm drain was designed for fully developed conditions and the proposed development does not exceed the zoning land use impervious percentage, then the downstream assessment is often considered complete. In the case of an undersized storm drain system or open channel, the proposed development is provided with models and a much better starting condition for the downstream assessment process.

This watershed-based approach has often expedited the development review process and helped to identify areas where stormwater mitigation may be necessary. Understanding these constraints and levels of service early in the development process is critical to planning and budgeting for stormwater related needs.



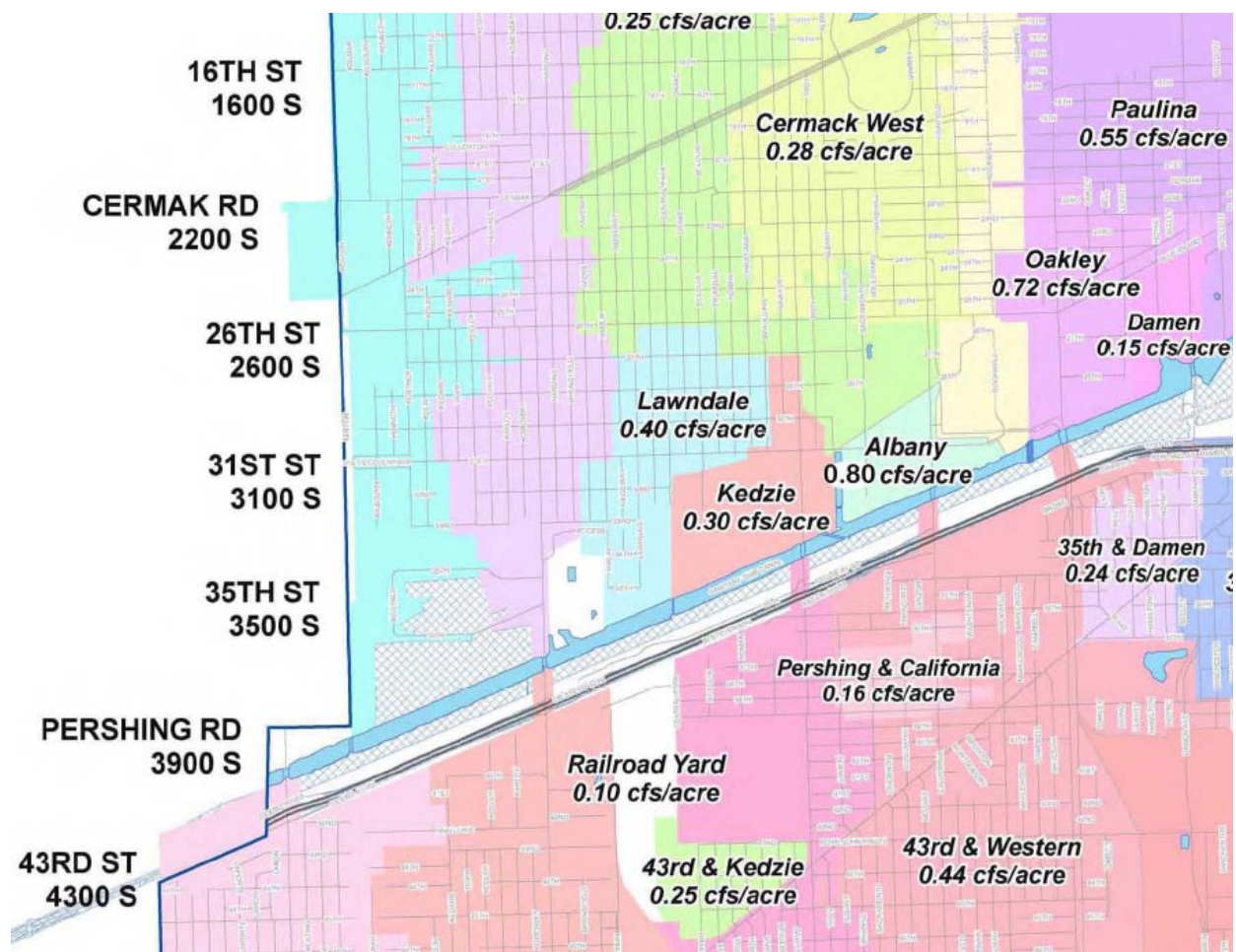


Downstream Assessment Summary of Review

Chicago, Illinois

The City of Chicago has implemented a watershed-based approach to downstream assessment. Most regional solutions in Chicago are not practical for infill situations that often occur in the areas of stormwater concern. As part of their planning efforts, the City analyzed the conveyance capacity of the infrastructure and developed capacity maps that establish release rate thresholds (discharge / acre) for each of the basins within the City. These established release rates are often lower than the release rates of the existing site conditions in areas where the current storm drain systems are undersized. If a redevelopment creates, reconstructs, or resurfaces greater than 7,500 square feet of development, then the release rate requirements are applied.

The sample exhibit below shows an example of the Chicago outlet capacity map that dictates the release rates across the City.



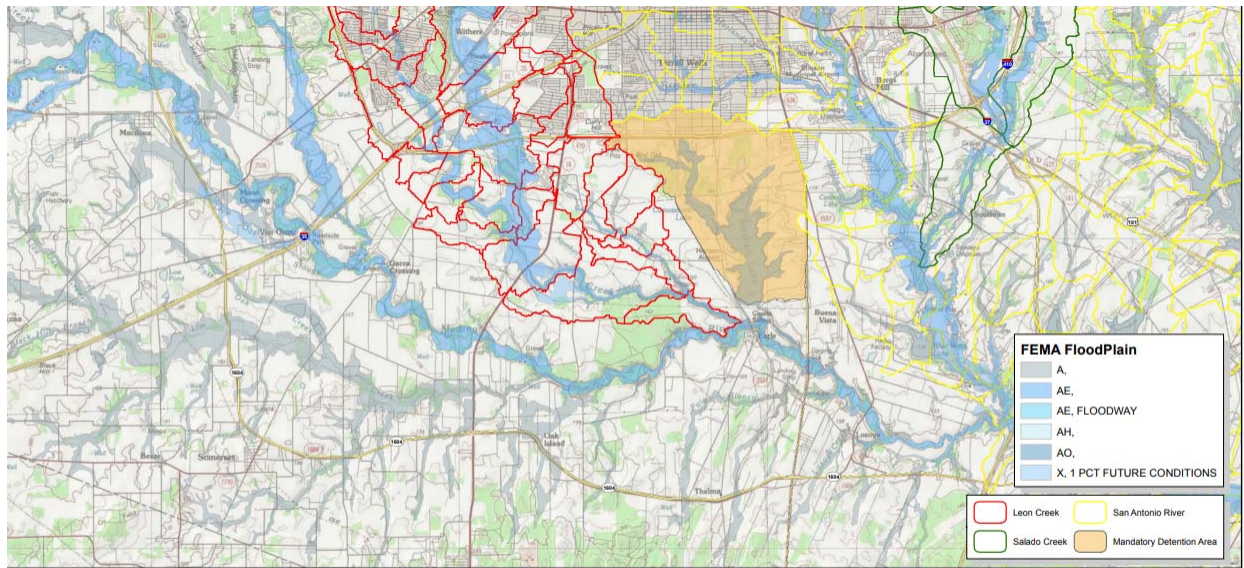


Downstream Assessment Summary of Review

San Antonio, Texas

The City of San Antonio has also taken a more watershed-based approach to help identify capacity concerns that dictate additional development requirements. The City has identified required detention areas throughout the City based on known flooding issues as shown for one area of the City in the map below. A full version of the City of San Antonio Mandatory Detention Areas can be found at the following link:

https://www.sanantonio.gov/Portals/0/Files/CIMS/StormWaterFees/1510ag05753_10.pdf



SAN ANTONIO MANDATORY DETENTION AREA

Main Watershed and Sub-Basin Map



For areas outside of the mandatory detention areas, the City development process allows for a fee-in-lieu-of to mitigate regional impacts if the adverse impact analysis is acceptable. The City's adverse impact analysis requires an engineering analysis to show no adverse impact within 2,000 linear feet downstream of the development, or to the nearest downstream regional facility, or to the nearest FEMA floodplain, whichever is less. This process is comparable with the current iSWM downstream assessment, but with more defined downstream limits of the analysis in some cases.

The document found at the following link provides additional information on the City of San Antonio fee-in-lieu-of program: <https://www.sanantonio.gov/Portals/0/Files/CIMS/Services/FILO-FAQ.pdf>



Downstream Assessment Summary of Review

CONCLUSIONS

The following conclusions are presented for consideration based on the review of benchmark communities, experience in the development of downstream assessment submittals, and review of development submittals by the Halff Team.

Site-Specific Assessment Process

This review did not reveal any critical changes that are needed to the current site-specific downstream assessment process. The process is very similar in other cities that allow site-specific analysis. While the process can often require additional effort, the benefit of eliminating unnecessary detention ponds is generally accepted as outweighing the costs of the additional engineering analysis. The more watershed-based approaches such as the Chicago release rates can reduce the engineering effort but often result in a prescriptive requirement that could be very challenging to implement in the NCTCOG region.

Watershed-Based Assessments

Many communities are assessing their infrastructure level of service in advance of development to determine adequate outfall locations and corresponding land uses or impervious percentages that can occur without downstream impacts. These regional assessments often remove some of the burden from the development process and can help to expedite the review process. The local municipalities taking on this effort have helped to reduce the redundancy of separate assessments in the same watershed and inconsistencies in the assumptions and watershed boundaries. They are also able to facilitate a more efficient transfer of as-built infrastructure data and models to assist in the development process.

Zone of Influence - Downstream Assessment Limits

Establishing the downstream limits of the assessment can be a point of contention and confusion. While there is not a purely objective criterion outside of hydrologic modeling, there are several options that can help in establishing the Zone of Influence, or downstream assessment limits.

- Greenfield Development – The 10% Rule outlined in the iSWM Technical Manual continues to be a good estimate of the downstream zone of influence for greenfield and large watershed assessments. Additional guidance could help identify other key considerations for downstream limits that could include:
 - Next significant hydraulic structure or bridge crossing downstream
 - FEMA mapped floodplain
 - Next downstream regional system or detention structure.
- Infill Development – The 10% rule is not as appropriate for infill and urban development systems. Often these systems are being analyzed based on peak flows. Without the hydrograph-based analysis, the timing, which is a key component of the downstream assessment, is typically not considered. For the infill developments, additional judgement can help determine appropriate downstream zone of influence. The following are considerations:
 - Use an objective condition, such as 2,000 linear feet downstream, like the City of San Antonio.
 - Consider the downstream system and critical locations in an urban system, such as a sag inlet location.



Downstream Assessment Summary of Review

- Document historical flood complaints and flood damages. These areas of known flood hazard can inform the existing flood constraints as well as the appropriate limits of the downstream assessment.

Established Release Rates

Established release rates are becoming more common in other parts of the country. The criteria establish an objective and relatively simple process to determine acceptable conditions. The calculations and review process are relatively simple. However, the anticipated result would be a significant increase in stormwater control structures and mitigation requirements.