Qp10 waiver – Downstream Analysis Guidance

From the opening paragraph:

*The Agency will waive the 10-year control requirement on a case by case basis where the developer demonstrates that there will be no increase in flood threat downstream to the point of the so called 10% rule (see section 1.2). This will **always** require that an applicant perform hydrologic/hydraulic analyses.*

The treatment standard for overbank flood protection shall be waived if:

2. *The site is smaller than (5) acres AND the channel has the downstream capacity to convey the post-development 10-year discharge downstream to the point of the so-called 10% rule; and downstream conveyance systems have adequate capacity to convey the 10-year storm.*

How this waiver can be obtained:

1. Calculate your pre and post development Q at the point of the 10% rule
    - Locate a study point downstream of your discharge point where your site (site = limits of disturbance) is 10% of the total contributing drainage area; i.e. where the drainage area is 10 times the area of your site.

    - Model the runoff from the entire contributing off-site drainage area to this 10% study point but model the pre-development conditions at your site separately (as a separate sub-watershed or set of sub-watersheds) to obtain the pre-development runoff rate at the 10% study point. Then replace your pre-development site model (leaving the off-site drainage area untouched) with your post-development site watershed model to determine Q at the study point. (Essentially your site should be modeled separately first and "linked" to the remainder of the contributing drainage area to calculate your pre and post flow rates at the 10% study point).

2. Compare pre and post development Q at the point of the 10% rule
    - If flows and velocities **increase by less than 5%** at the study point, then no detention facility may be required <u>if and only if</u> the following is confirmed via hydraulic analyses:

        - Verify that the stream channel (in addition to any off-site conveyances from the site to the discharge point) from the discharge point to the study point has adequate capacity (no downstream structures are impacted) to convey these increased flows (i.e. this would be loosely possible in hydrocad if you modeled the downstream channel as a reach and ensured that it did not reach "Manning's capacity"; it would be better to apply some sort of hydraulic water surface profile analysis such as HECRAS).

    - If flows and velocities **increase by 5% or greater** then the designer must <u>either</u>:

- Provide enough detention to decrease flows such that they do not cause a 5% or greater increase in flows at the 10% study point AND confirm the following via hydraulic analyses:

- Verify that the stream channel (in addition to any off-site conveyances from the site to the discharge point) from the discharge point to the study point has adequate capacity (no downstream structures are impacted) to convey these increased flows (i.e. this would be loosely possible in hydrocad if you modeled the downstream channel as a reach and ensured that it did not reach "Manning's capacity"; it would be better to apply some sort of hydraulic water surface profile analysis such as HECRAS).

OR

- Design a detention facility such that post development flow rates for the 10 year 24 hour storm are controlled to pre-development flow rates, i.e. provide Qp10 control as provided for in the 2002 VSWMM.

Special Situation: If the drainage area of the receiving water at your point of discharge is already 10 times (or greater than) your site area, then the location of your discharge point can be considered your 10% study point. Technically, in this situation you must evaluate the runoff from the drainage area to this point, including the entire drainage area of the receiving water as well as from your site (as in the above bullet). However, in situations in which the drainage area to the study point is much greater than 10% of the site area (but is not yet to the 10 sq. mi. which would allow the designer to apply the less than 10 sq. mi. Qp10 waiver), the following may apply:

- Provide evidence that flows and velocities will not increase by more than 5% at the point of the 10% rule. Such evidence may not require that you model the entire drainage area of the receiving water, but instead could include the following:
  - Stream gauge data for the receiving water demonstrating that the magnitude of average flows is such that the increase in discharge rate from your site could not increase the flows by more than 5%.

- As above, the designer must verify that the stream channel (in addition to any off-site conveyances from the site to the discharge point) from the discharge point to the study point has adequate capacity (no downstream structures are impacted) to convey these increased flows (i.e. this would be loosely possible in hydrocad if you modeled the downstream channel as a reach and ensured that it did not reach "Manning's capacity"; it would be better to apply some sort of hydraulic water surface profile analysis such as HECRAS).

Note: As indicated in the downstream analysis guidelines, "depending on the magnitude of the impact and the specific conditions of the analysis, additional information and data may be necessary…"

The above procedure is the same for qualifying for the Qp100 downstream analysis waiver (i.e. the Qp100 is waived if a downstream analysis is conducted that indicates extreme flood control is not necessary for the site.) However, more rigorous hydraulic analyses may be required given the larger flows in the 100 year, 24 hour design storm.

The following must also be provided in addition to information supporting the above analyses:

- Location map:
  - clearly labeled receiving waters
  - location of the discharge point (s)
  - location of the 10% study point
  - outline of the site area
  - outline of the drainage area to the discharge point (s)
  - outline of the drainage area to the 10% study point.
  - location of any structures in conveyances to the discharge point and from the discharge point to the 10% study point
- Area totals:
  - site area
  - drainage area to the discharge point
  - drainage area to the 10% study point
- Discharge rates from the site (summed if multiple discharge points) for the pre-development and post-development scenario, with a percent increase calculation.
- Flow rates and velocities at the 10% rule study point for the pre-development and post development scenario.
- Verification that all conveyances from the site and from the discharge point to the 10% study point have the capacity to convey any increase in flow rates and velocities.