Chapter 16.35 APPENDIX 5 STORM DRAINAGE AND EROSION CONTROL, SITE DEVELOPMENT,

Section 16.35.01. Drainage Design Criteria Summary (September 15, 2004)

Storm drainage and erosion control planning submittal requirements are outlined in Appendix 5 of Title 16. Criteria can also be found in the "Wasatch County - A Guide for Erosion and Sediment Control" (1996). Unless provided otherwise, the criteria and methods presented in the following references should be used in planning and design of the drainage system.
(a) "Urban Drainage Design Manual", Hydraulic Engineering Circular No. 22, November 1996, Federal Highway Administration, FHWA-SA-96-078, http://www.fhwa.dot.gov/bridge/hydpub.htm
(b) Urban Storm Drainage Criteria Manual", June 2001, Urban Drainage and Flood Control District, http://www.udfcd.org/
(c) "Design and Construction of Urban Stormwater Management Systems", ASCE Manuals and Reports of Engineering Practice No. 77, 1992, https://www.asce.org/bookstore/book.cfm?book=2800
The drainage plan should provide for control of erosion at the source, non-eroding conveyance facilities, and water quality/detention basins.
(1) Control of Erosion and Contaminants at the Source.
The ability to control erosion and other pollutants at the source is the most important single mitigation factor. Every practical effort should be made to prevent erosion from occurring at the source. The objective should be to prevent erosion during construction and to reestablish vegetation as soon as possible after construction on all areas with exposed topsoil.
Slope soil erosion, after revegetation, should be less than or equal to pre-development rates and should be less than the topsoil development rate (generally assumed as 0.01 inches per year or two (2) tons per acre per year).
(2) Conveyance Facilities.
The initial drainage system (i.e. curb & gutter, storm drains, culverts, ditches, realigned natural channels, etc.) should be designed to convey runoff from a minor storm event (ten (10) year event, the storm event having a ten (10) percent chance of being equaled or exceeded in any given year) without nuisance flooding and without erosion. If tributary runoff flows (either peak or volume) are increased to a natural drainage, the drainage should be shown to be non-eroding in a ten (10) year event.
The drainage system should be capable of passing the storm runoff from a major storm (one-hundred (100) year event, the storm event having a one (1) percent chance of being equaled or exceeded in any given year) without flooding buildings.
(3) Water Quality/Detention Basin.
The criteria for design of the water quality/detention basin should include both water quality mitigation and mitigation for downstream erosion and flooding effects. The effects of development (i.e. increased impervious area and decreased time of concentration) should be mitigated such as to prevent increased flooding of downstream properties (one-hundred (100) year design event) and to prevent increased erosion of downstream conveyance channels (ten (10) year design event). The level of mitigation required is dependent upon the capacity of the downstream drainage system. A common practice is to provide for onsite detention, reducing storm runoff peaks from the development to at or below historic (pre-development) levels. If downstream conveyance capacities are severely limited, it may be necessary to reduce storm runoff peak flowrates from the developed property to much less than historic runoff flowrates to offset the impacts of the increased runoff volume.
(a) The basins should be designed to adequately capture and treat runoff from the water quality design storm. Wasatch County criteria ("A Guide for Erosion and Sediment Control" pages 11 and 18) require capturing and containing the runoff volume from a two (2) year twenty-four (24) hour storm (minimum). The water quality capture volume should be discharged at a rate such as to allow a minimum residence time of twelve (12) hours (defined as the time from the

centroid of the inflowing hydrograph to the centroid of the outflowing hydrograph). The maximum allowable discharge rate for the water quality capture volume discharge orifice may be computed using the simplified equation:

Q_{wq} = (WQCV / 30) * C

Q_{wq} = maximum allowable water quality capture volume release rate (cfs)

WQCV = water quality capture volume (acre-feet)
= 2-year 24-hour runoff volume

C = conversion from acre-feet/hour to cubic feet per second = 12.1

(b) The water quality pond should have sufficient additional storage below the lowest outlet to accommodate sediment accumulation. The minimum volume of provided sediment storage should be either computed from a slope erosion analysis for the three year slope soil loss (Revised Universal Soil Loss Equation reference: "Design Hydrology and Sedimentology for Small Catchments", C.T. Haan, B.J. Farfield, and J.C. Hayes, 1994, Academic Press, Inc., San Diego, California) or may be taken as equal to twenty (20) percent of the water quality capture volume. If subsoils are such that water captured in the sediment storage area cannot infiltrate within a reasonable period of time (to avoid mosquitoes etc.), then a subdrain system should be considered.
(c) The analysis for designing the required detention volume to mitigate downstream flooding and erosion effects should be performed assuming that the pond is full to the water quality capture volume level prior to the start of the design storms (ten (10) year and one-hundred (100) year).
(d) An emergency spillway (preferably open channel type) is required with a one-hundred (100) year flood event minimum design capacity assuming that the primary outlets are plugged. The elevation of the top of the embankment should be a minimum of one (1) foot above the water surface elevation when the emergency spillway is conveying the maximum design or emergency flow. The design height of the embankment should be increased by roughly five (5) percent to account for settlement.
(4) Water Quality/Detention Basins Maintenance Requirements.
Key components include non-plugging outlets design, maintenance access design, and pond side slope erosion protection design.
(a) Detention basin outlets should be designed to be non-plugging as much as possible. A possible option for the water quality capture volume discharge orifice is to provide an orifice (set with the orifice invert at the bottom of the water quality capture volume level) with a connected pipe inlet placed a minimum of six (6) inches below the water level at which water begins to discharge. Outlet pipes should be protected by inlet grates which are sized, spaced, and oriented such as to minimize plugging of the outlets.
(b) Maintenance access to the ponds should be provided. Required access includes access with heavy equipment to the pond floor (generally fifteen (15) inches minimum width with fifteen (15) percent maximum slope) and all weather access should be provided to the pond outlet facilities.
(c) Interior pond side slopes should preferably be four (4) horizontal to one (1) vertical (4:1) or flatter and should not be steeper than three (3) horizontal to one (1) vertical (3:1). Pond side slopes (both interior and exterior) should meet the same criteria for slope erosion control stated above (two (2) tons per acre per year maximum mean annual slope soil erosion rate). Riprap protection (or the equivalent) may be necessary to protect pond side slopes from wave action, especially in ponds with a permanent pool.
(d) Provisions for low-maintenance landscaping and irrigation must be provided. Landscaping will be maintained by the Homeowners Association.