TABLE OF CONTENTS

SECTION 700 – STORM DRAINAGE STANDARDS

701 GENERAL

Unless otherwise approved by the City Engineer, storm drainage revisions, additions, modification, or changes shall be made in compliance with City standards, ordinances, and Best Management Practices as identified in the stormwater management manual currently adopted by the City. Adequate provisions shall be made for storm drainage, storm sewers, and associated appurtenances sufficient to transmit maximum seasonal flows and 100-year flood waters characterized by the area.

If warranted based on the condition and capacity of the existing storm drainage infrastructure (or lack thereof) and, impacts caused by the proposed development, off-site improvements may be required (at the cost of the Developer), at the City Engineer's discretion, to mitigate impacts caused by the proposed development.

Erosion and Sedimentation Control (ESC) measures shall be in conformance with the stormwater management manual currently adopted by the City. Best Management Practices (BMPs) for ESC shall be installed and maintained in strict conformance with the approved ESC plan.

702 GENERAL REQUIREMENTS

1. Prior to construction, the temporary erosion and sediment control (TESC) plans and storm drainage plans shall be reviewed and approved by the City's Public Services Department.

2. Storm drainage and TESC plans shall be consistent with the requirements specified in Section 200. Additional plan requirements are as follows:

    a. Ground surface, catch basin or manhole stationing, invert and surface elevation at each catch basin or manhole, and grade of storm sewer pipe between adjacent catch basins or manholes. All catch basins or manholes shall be numbered on the plans and correspondingly numbered on the profile.

    b. Details (to scale drawings) which clearly show special joints, connections, and cross-sections, and storm drainage appurtenances such as flow control manholes and related items and all other items as required by the City to clearly identify construction items, materials, and/or methods.

3. Storm drainage conveyance systems shall be installed within public rights of way, tract areas that will be dedicated to the City or easements that will be granted to the City and are consistent with the requirements in Section 300. The City shall reserve the right to determine where easements will be provided in lieu of tract areas.

703 GENERAL DESIGN STANDARDS

The design elements of storm drainage systems shall conform to the stormwater management manual that is currently adopted by the City. A stormwater conveyance system plan and profile and stormwater facilities plans shall be prepared in conformance with Section 200 of these standards and be reviewed and approved by the City. The following design considerations shall apply:

1. The use of commercial parking lots for detention of stormwater will be reviewed by the City Engineer and approved or denied based on the design, location and general parameters of the project. The detention area shall be situated away from areas of pedestrian movement unless means for rapid closing of the areas is incorporated in the design. The maximum depth of water in parking lot storage shall be limited to 6 inches. Curbs cannot be used for retaining storage.

2. Maximum catch basin spacing shall be 200 feet on road grades up to 3 percent, 300 feet when the road grade is 3 percent or greater, and 500 feet maximum on main storm drains between access structures, whether catch basins or manholes. No surface water (unless otherwise approved in writing by the Public Services Director) shall cross any roadway. In addition, catch basins shall be placed whenever the length of surface drainage exceeds 300 feet on road grade, extending either direction from crest or sag on vertical curves. Unless otherwise approved by the City, a catch basin spacing analysis is required for tributary roadway widths that exceed 20 feet. Vaned grates shall be employed on street grades equivalent to or exceeding a 3 percent slope.

3. Where storm drains run outside an existing public right-of-way, permanent easements will be required for public or private maintenance as may be required and warranted. Easement widths shall be 15 feet or equivalent to twice the maximum design depth of the storm sewer utility, whichever is greater. A construction (temporary) easement of suitable width shall also be provided if needed.

4. The City Engineer shall approve the selection of BMPs for the mitigation of stormwater runoff.

704 POND DESIGN STANDARDS

It is the intent of the City of Bonney Lake, that when provided, stormwater ponds will conform to the following standards that would allow joint use of the facilities for stormwater mitigation and open space. Credit towards open space requirements shall be provided in strict conformance with the City of Bonney Lake's Municipal Code and any credit given shall solely be determined by the Public Services Director. Unless otherwise approved, the following shall apply to the design and construction of open ponds within the City of Bonney Lake:

1. Detention or retention pond side slopes shall not be steeper than 4H:1V. Interior pond slopes may be walls, provided that 50 percent of the perimeter of the pond is constructed with slopes that do not exceed 4H:1V and the depth of the pond does not exceed 4 feet.

2. Exterior pond berm embankments shall be a minimum of 6 feet in width at the top of the berm, shall not exceed 4 feet in height as measured from the top of the berm to the bottom of the exterior slope, and exterior slopes shall not exceed 2H:1V.

3. Pond depths typically shall not exceed 4 feet. The City may on a case by case basis approve depths up to 6 feet.

4. Seeding, fertilizing, and mulching of ponds shall be in conformance with the minimum requirements for landscaping in the City of Bonney Lake.

5. The design of irrigation systems for pond landscaping shall be approved by the City.

6. All ponds shall be graded with a minimum 0.50 percent slope from the inlet to the outlet to completely drain in between rainfall events.

7. Wet ponds (ponds with permanent pools of water) will not be allowed.

8. An approved water quality BMP shall precede all open pond facilities (whether used for retention or detention).

9. Typically fences will not be required around open ponds. The installation of a fence may reduce or eliminate any credit given towards open space requirements (if applicable). If directed by the City to construct a fence around a facility, the fencing shall be in conformance with the standard details and PVC privacy slats (screening) shall be installed in the same color as the vinyl coating of the fence.

10. A pond access road is required when **any** pond side slope exceeds 5H:1V. Pond access roads shall be constructed with a minimum width of 15 feet, at a maximum grade of 12 percent, and with the use of a reinforced grass surface that is capable of withstanding a minimum of an H20 load. Access is required to the pond inlet and control structures constructed as a part of the facility.

11. Design infiltration rates for retention facilities shall be determined as directed in the currently adopted stormwater management manual. Upon the completion of a stormwater infiltration or bio-filtration (rain garden) facility a minimum of two tests (more as directed by the City) shall be conducted in the presence of the City Engineer or his/her representative to confirm that the facility will perform as intended.

12. MSdiversion structure shall be installed upstream of all ponds that is designed to convey all flows up to the 6-month event directly to the flow control manhole. Flows that exceed the 6-month event shall be conveyed to the pond inlet.

705 EROSION AND SEDIMENTATION CONTROL

Erosion and Sedimentation Control (ESC) shall be implemented in accordance with the currently adopted stormwater management manual and the following requirements:

1. It is the Developer's responsibility to obtain all necessary permits and to ensure that all approved ESC best management practices are properly installed and maintained such that silt-laden runoff is not discharged from the site.

2. Failure to fully implement the provisions of an approved ESC plan may result in the stoppage of work or fines as allowed by the City of Bonney Lake Municipal Code.

3. BMPs shall be installed in accordance with the currently adopted stormwater management manual or as indicated in the standard details.

4. An ESC supervisor must be designated by the Contractor/Developer. The ESC supervisor must be available 24 hours a day and seven days a week including holidays. It is the Developer's responsibility to provide the City with the appropriate contact information and to provide the City with 24 hours notice in the event that a temporary or permanent change will be made with respect to the assignment of the ESC supervisor for a project.

5. In the event that the Developer fails to adequately protect adjacent areas from silt or debris, the City may make the corrections as is necessary to bring the project site into compliance with the ESC plan. All costs associated with such corrective measures shall be the sole responsibility of the Developer. Fines may be assessed as allowed under the current City of Bonney Lake Municipal Code.

6. Silt, mud, and/or debris shall not be carried by vehicles or by any other means onto existing rights of way. In the event that on-site BMPs are insufficient to contain silt, mud, and/or debris to the project site, a vacuum sweeper shall be employed by the Developer until such a time that the roadway is cleaned to the satisfaction of the City and no further material is transported onto the right of way. Should conditions warrant, the City Engineer may order the Contractor to restrict all access to and from the construction site until such a time that the roadway can be cleaned and the on-site BMPs can be restored.

7. ESC plans must include a construction sequence indicating the progression by which ESC best management practices shall be installed prior to commencing other work on the site.

8. Temporary sedimentation ponds or traps shall not be installed in locations where permanent infiltration (retention) facilities will be located in the future.

706 CONVEYANCE

Conveyance systems shall be closed pipe systems unless otherwise approved by the City. Closed pipe systems shall be designed and sized by a professional engineer licensed in the State of Washington and shall be constructed in conformance with City Standards, the most current edition of the State of Washington *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT Standard Specifications) except as amended herein.

The analysis of conveyance systems shall be in conformance with the most recent edition of the Washington State Department of Transportation Hydraulics Manual as supplemented by the stormwater management manual that is currently adopted by the City and as amended herein.

All stormwater conveyance systems shall be designed to safely convey runoff from the 25-year, 24-hour storm event as determined by the Santa Barbara Urban Hydrograph Method (other methods may be used if approved by the City Engineer). The tributary area to a conveyance system shall include all upstream drainage areas that will or may contribute runoff to the system. The City Engineer may require the downstream conveyance system to be designed to convey the 100-year, 24-hour storm event if such capacity is deemed necessary to protect the public.

1. The minimum main size shall be 12 inches in diameter. Lateral lines, if approved by the City Engineer, may be 8 inches in diameter. Runoff shall be computed, and if the flow requires it, a larger pipe shall be used. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to serve adjacent areas or for future service.

2. Storm drain gradients shall be such as to assure minimum flow velocity of 3 feet per second when flowing full.

3. Structure lids (frames and covers) shall be labeled on the approved plans. Vaned grates shall be installed as directed by the City and on all structures located on profile grades that exceed 3 percent. Square solid lids shall be ductile iron, lockable, and installed on all Type 1 structures not intended to catch surface water drainage. Round lids shall be as shown in the standard details (solid locking round lids shall be provided for all flow control structures and structures located in un-improved areas that are not intended to catch surface water drainage).

4. The stormwater conveyance system shall be extended to the "far" property line(s) as required by the City for future connections.

5. The City may require a backwater analysis to be performed as conditions warrant. The City, based on the specific conditions of each project, will determine the methods and return period used in a backwater analysis.

6. The runoff from impervious surfaces, such as roof and/or driveway areas that will be constructed on lots within residential plats must be included in the design of the stormwater mitigation facilities if runoff from these areas either will be conveyed to the facility or may be conveyed to the facility in the future (i.e., overflow due to the failure of on-site mitigation).

7. All pipe for storm mains shall be "preapproved" by the City's Engineer based on localized conditions and comply with one of the following types:

    a. Polyvinyl Chloride: PVC pipe shall conform to ASTM 3034, SDR 5, or ASTM 789 with joints and rubber gaskets conforming to ASTM D3212 and ASTM F477.

    b. Plain Concrete: Plain concrete pipe per WSDOT Standard Specifications.

    c. Reinforced Concrete: Reinforced concrete pipe per WSDOT Standard Specifications.

    d. Ductile Iron: Ductile iron sewer pipe shall be Class 50 and conform to the WSDOT Standard Specifications.

    e. Polyethylene: PE smooth wall pipe per ADS N 12 (bell and spigot), or City approved equal, constructed per WSDOT Standard Specifications 7-04.

    f. Corrugated Metal: Zinc-coated (galvanized) corrugated iron or steel pipe shall be coated uniformly with asphalt.

707 CONVEYANCE SYSTEM TESTING REQUIREMENTS

Unless otherwise approved by the City, the following testing shall be conducted prior to the acceptance of any storm sewer conveyance system that will be either owned and/or maintained by the City or will discharge to a system either owned and/or maintained by the City. All testing must be completed in the presence of the City's Inspector. The Contractor/Developer shall contact the City two (2) working days prior to the requested date for testing. The actual date for testing shall be determined by the City.

1. Television Video Inspection: Upon completion, the storm sewer lines and any roof downspout services shall be internally televised by a qualified firm providing said services. The recording shall be the final product and must be edited by the Contractor/Developer such that the recording progresses in a consistent manner from start to finish throughout the improvements. All equipment and materials shall be compatible with existing City equipment. It shall be the Contractor's/Developer's responsibility to confirm equipment compatibility with the City prior to inspection. A DVD, together with a written log of the television inspection, shall be submitted to the City for their review and approval, and if accepted, shall be retained in the City's files. This work can be performed prior to paving. The City's inspector shall be notified of the date of the television inspection to ensure his availability and on-site witnessing of the event during this time.

   The City requires the use of a test ball or test slug (1 inch in diameter, graduated with 1/4-inch markings) to identify the depth of any ponding encountered during the television inspection. A maximum of 1 inch of ponding is acceptable.

   After a period of no less than 18 months, but prior to 2 years, the Developer is required to perform an additional internally televised inspection of the sewer lines and services. The recording shall be delivered to the City's satisfaction as provided above. The City will not release the maintenance bond issued for the sanitary sewer improvements until a second television inspection has been successfully performed and any defects found are corrected by the Developer and accepted by the City.

2. Deflection Testing: Upon completion, storm sewer lines constructed of thermoplastic pipe materials shall be deflection tested by using a properly sized "go-nogo" mandrel in conformance with Section 7-17.3(2)G of the WSDOT Standard Specifications. Deflection testing may be completed concurrently with the television video inspection.

3. Low-Pressure Air Test: A low-pressure air test shall be conducted in conformance with the Standard Specifications. All testing must be completed in the presence of the City's Inspector. Testing shall not be conducted until after a successful television inspection has been conducted and the first lift of final pavement (or asphalt treated base) has been completed.

708 CONNECTIONS

Connections of storm drain pipe leading from an existing street inlet location may be made into an existing main storm drain only with a new structure, subject to case-by-case review and approval of the City Engineer and subject to the following additional requirements:

1. The inletting structure shall be a catch basin with a sump.

2. Length of inlet connection shall be as approved by the City Engineer.

709 SURVEY STAKING

All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and capable of performing such work. The engineer or surveyor directing and/or performing such work shall be currently licensed by the State of Washington to perform said tasks.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of storm sewer systems shall be as follows:

1. Stake centerline alignment every 25 feet with cuts and/or fills to bottom of trench.

   Stake location of all catch basins/manholes and other fixtures for grade and alignment.

   Stake location, size, and depth of retention/detention facility.

   Stake finished grade of catch basin/manhole rim elevation and invert elevations of all pipes in catch basins, manholes, and those that daylight.

710 TRENCH EXCAVATION

1. Clearing and grubbing (where required) shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

   Trenches shall be excavated to the line and depth designated by the City to provide a City approved minimum of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency and in compliance with all safety requirements of the prevailing agencies. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench, and under no circumstances is water (either groundwater or surface water) to be allowed to enter the pipe. The owner shall maintain sufficient pumping equipment on the job to ensure that these provisions are carried out.

   The contractor shall perform all excavation of every description and whatever substance encountered; and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a sufficient depth below the storm sewer line grade. Where materials are removed from below pipe grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.

   Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval of the City, and shall be in conformance with all state and federal regulations.

   When after excavating to the foundation level, the material remaining in the trench bottom is determined to be unsuitable by the City, excavation shall be continued to such additional depth and width as required by the Design Engineer. Unsuitable foundation materials shall be disposed of at a suitable site. The trench foundation shall be backfilled to the bottom of the pipe zone with gravel backfill for foundations, gravel backfill for pipe zone bedding, or other suitable material and compacted to form a uniformly dense, unyielding foundation.

711 BEDDING

Gravel backfill for pipe bedding shall be installed in conformance with Section 2-09 of the Standard Specifications (WSDOT).

1. Bedding for Storm Sewer Pipe: Gravel backfill for pipe bedding shall be per the standard details.

712 TRENCH BACKFILL AND TESTING

The City will conduct or employ a qualified firm to perform compaction testing of all trench and structure backfill at the Developer's expense. Backfill and compaction shall conform to the WSDOT Standard Specifications and the standard details. In instances where the excavation for a structure(s) is insufficient to adequately compact the backfill around the structure, the City may require that controlled density fill be used as backfill to ensure that compaction standards are met.

713 STREET PATCHING AND RESTORATION

See Section 600 for requirements regarding street patching and trench restoration.

714 DITCHES

Existing stormwater ditch systems are maintained by the City where located in public right-of-way or in dedicated public drainage easements. Existing ditches shall not be filled for any reason unless otherwise approved by the City Engineer.

715 ROOF DRAIN COLLECTION SYSTEMS

In areas where the soil conditions are not conducive to infiltrating runoff from roofs (and driveways where applicable), a private roof drain collection system shall be installed. Roof drain collection systems shall be connected to the public stormwater conveyance system at approved locations. The following requirements shall also apply:

1. Roof drain collection system connections shall be as shown in the standard details.

2. Collection systems shall be located entirely within a private storm drainage easement.

3. A cleanout is required every 200 feet and at all bends, tees, wyes, terminals and at the right-of-way line where collection systems are connected to the public storm sewer system. A cleanout is also required on all service laterals between the trunk line and the residential unit.

4. Roof drain collection systems shall be constructed with PVC SDR 35 pipe, white in color, and a minimum of 6 inches in diameter. Collection systems shall be designed by a professional engineer licensed in the State of Washington.

5. No more than 12 residential units may be served by a single roof drain system.

6. The minimum pipe slope for a roof drain collection system shall be 1 percent for a 6-inch-diameter pipe and 0.5 percent for larger pipe diameters.

716 GENERAL NOTES (STORM DRAIN CONSTRUCTION)

1. All workmanship and materials shall be in accordance with City Standards and the most current copy of the State of Washington *Standard Specifications for Road, Bridge and Municipal Construction* (WSDOT).

2. Erosion and sedimentation control measures shall be required in accordance with the approved plans and all local, state and federal regulations.

3. Comply with all other permits and other requirements by the City or other governing authority or agency as may be applicable.

4. A pre-construction meeting shall be scheduled with the City prior to the start of construction.

5. All storm mains and retention/detention areas shall be staked for grade and alignment by an engineering or surveying firm capable of performing such work, and currently licensed in the State of Washington to do so.

6. Storm drain pipe shall meet the following requirements:

    a. Plain concrete pipe conforming to the requirements of C-143.

    b. Reinforced concrete pipe conforming to the requirements of C-76-IV.

    c. PVC pipe shall conform to ASTM D3034, SDR 35 for 4-inch- through 15-inch-diameter PVC pipe, and shall conform to ASTM F679 for 18-inch- through 27-inch-diameter PVC pipe, with joints and gaskets conforming to ASTM D3212 and ASTM F477.

    d. Ductile iron pipe conforming to the requirements of the WSDOT Standard Specifications, thickness class as shown on the plans.

    e. Polyethylene smooth wall pipe per Advanced Drainage Systems (ADS) N-12, “sure-lok” bell and spigot, constructed per WSDOT Standard Specifications 7-04. Note: This type of pipe will only be approved with the City's specific approval. Approval shall be based on site-specific conditions and if additional on-site inspection time for witnessing proper pipe installation can be scheduled by the City.

7. Special structures, oil/water separators, and outlet controls shall be installed per the approved plans and manufacturers’ recommendations.

8. Provide traffic control plan(s) as required in accordance with MUTCD.

9. Call underground locate line at 811 or 1-800-424-5555 a minimum of 48 hours prior to any excavations.