

Clearfield City Corporation

Development, Design, & Construction Standards



April 2024

DEVELOPMENT, DESIGN, AND
CONSTRUCTION STANDARDS
for
CLEARFIELD CITY



SUBMITTED & RECOMMENDED:

DocuSigned by:
Brandon K. Jones

Brandon K. Jones, P.E.

4/23/24

APPROVED:

DocuSigned by:
Mark Shepherd

Mark Shepherd
Mayor

4/23/24

Date

DocuSigned by:
JJ Allen

JJ Allen
City Manager

4/23/24

Date

DocuSigned by:
Adam Favero

Adam Favero
Public Works Director

4/23/24

Date

DocuSigned by:
Braden Felix

Braden Felix, P.E.
City Engineer

4/23/24

Date

DocuSigned by:
Nancy Dean

Nancy Dean
Attest, City Recorder

4/23/24

Date

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SECTION 1 GENERAL

1.01 Applicability

These Development, Design, and Construction Standards are applicable to any land use application, all work within the public-right-of-way, and all city capital improvement projects.

1.02 Clearfield City Code Governs

Nothing in this document shall be construed to be contrary to Clearfield City Code. Should a conflict exist between this document and the Ordinances, the Code shall govern.

1.03 Conformance with Federal, State, and Local Laws

Nothing in this document shall relieve the Developer, Engineer, or Contractor from abiding by any and all Federal, State, and local laws.

1.04 Definitions

- A. Title or Chapter – When “Title” or “Chapter” is written, it shall be as if “Clearfield City Ordinance, Title (or Chapter)” is written.
- B. Contractor – The individual, firm, co-partnership, or corporation, and his, their, or its heirs, executors, administrators, successors, and assigns, or the lawful agent of any such individual firm, partnership, covenantor, or corporation, or his, their, or its surety under the contract bond, constituting one of the principals to the contract and undertaking to perform the Work.
- C. Drawings – The City-approved construction drawings, the Clearfield City Public Works Standard Drawings, and/or the Manual of Standard Drawings, as applicable.
- D. Developer – The person sponsoring construction of the improvements.
- E. Development – The subject subdivision, minor subdivision, or building.
- F. Improvements – See “Work.”
- G. Improvement Plans – See “Drawings.”
- H. Inspector – The authorized representative of the City assigned to make all necessary inspections of the Work performed or being performed, or of materials furnished or being furnished by the Contractor.
- I. Work – All types of work necessary to provide safe access and utility service to and within proposed subdivision, project, or site, including, but not limited to, site grading, utility installation, and street construction. Work includes all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning.¹

¹ From EJCDC® C-700, Standard General Conditions of the Construction Contract.

- J. See also the Clearfield City Code, Title 12 Subdivision Regulations. Where definition conflicts arise between City Ordinance and this document, the definitions in this document shall take precedence when in reference to this document.

1.05 Acronyms

- A. ALUA – Administrative Land Use Authority
- B. APWA – American Public Works Association
- C. AWWA – American Water Works Association
- D. BMP – Best Management Practice
- E. CFP – Capital Facilities Plan
- F. CLFD – Clearfield City
- G. DDW – Division of Drinking Water
- H. DWQ – Division of Water Quality
- I. DWRi – Division of Water Rights
- J. FEMA – Federal Emergency Management Agency
- K. HOA – Homeowners’ Association
- L. IFC- International Fire Code
- M. LID – Low Impact Development
- N. RCP – Reinforced Concrete Pipe
- O. UAC – Utah Administrative Code
- P. UDEQ – Utah Department of Environmental Quality
- Q. UDOT – Utah Department of Transportation
- R. UPDES – Utah Pollutant Discharge Elimination System
- S. USACE – United States Army Corps of Engineers

1.06 Modification Process

- A. Formal Written Request for Modification: A request for a modification to the Public Work Standards and Technical Specifications shall be made as follows:
 - 1. In writing and submitted to the Public Works Director;
 - 2. Prior to Work being performed in a manner not consistent with the Public Work Standards and Technical Specifications;
 - 3. Include each specific Public Work Standards and Technical Specifications being sought to be modified; and

4. Include a detailed explanation, supported by evidence of the undue hardship that will result by having to complete the Work in accordance with the Public Work Standards and Technical Specifications, or in the alternative, include a detailed explanation, supported by evidence how performing the Work in accordance with the Public Work Standards and Technical Specifications is unnecessary to meet the goals and standards of the City.
- B. Consideration of a Formal Written Request for Modification: The Public Works Director, or designee, shall consider each request and consult with those necessary to review all Formal Written Requests for Modification of the Public Work Standards and Technical Specifications and respond, as follows:
1. Respond in writing, with a finding of fact that details the basis for the granting or denial of each requested modification to the Public Work Standards and Technical Specifications.
- C. Record Maintenance: The granting or denial in whole or in part of any Formal Written Request or Modification to the Public Works Standards and Technical Specifications shall be maintained by the City in accordance with all federal, state, and local laws.

SECTION 2 DEVELOPMENT STANDARDS

2.01 Approval Procedure

See Title 12 (Subdivision Regulations) and Title 11 (Land Use) of the Clearfield City Code

2.02 Developer Responsibilities

- A. Required Improvements and Guarantees – see Title 12 of Clearfield City Code.
- B. Permits and Approvals
 - 1. Developer is responsible for obtaining all necessary permits and approvals for the construction of the Improvements. Copies of all applications and approved permits shall be submitted to the City. Agencies/permits that may be required include, but are not limited to:
 - a. DDW Plan Approval (pre-construction)
 - b. Operating Permit (post-construction)
 - c. UPDES NOI and NOT
 - d. DWRi Stream Alteration
 - e. DWRi Dam Safety
 - f. EPA 404 Wetlands
 - g. FEMA CLOMA and/or CLOMR
 - h. UDOT
 - i. UTA
 - j. Union Pacific
 - k. Others as applicable
- C. Improvements
 - 1. The required improvements shall include street improvements in front of each lot abutting dedicated streets to a connection with existing improvements of the same kind or to the boundary of the subdivision nearest existing improvements. Design must provide for future extension to adjacent development and be compatible with the contour of the ground for proper drainage. Required underground improvements such as water lines, sewer lines, storm drain, and any other buried conduit shall be installed to the boundary lines of the subdivision.
 - 2. Upsizing based on CFPs – The Developer is required to construct/install infrastructure sized in accordance with the City’s currently adopted CFPs. The City may be responsible for paying the difference in cost between the master planned infrastructure size and the minimum infrastructure size required for the development.

3. Materials and Construction Testing – Developer shall be responsible for materials and construction testing in accordance with the applicable specification(s). Testing must be performed by a properly licensed and qualified testing agency. The results shall be provided to the City’s inspector.
4. Mapping of New Improvements – Developer shall reimburse City for time spent completing field surveying and the mapping of new improvement locations into the City’s GIS database.

2.03 Subdivision Standards

- A. The general standards for subdivision layout and development are found in Title 12 – Subdivision Regulations.
- B. See also Section 3 – Design Standards and Section 4 – Construction Standards of this document.

2.04 Geotechnical Investigation

- A. A geotechnical investigation shall be conducted for the following:
 1. All new subdivisions;
 2. All commercial subdivisions and sites;
 3. Any subdivision that includes public infrastructure improvements; and
 4. Upon request of the City.
- B. The geotechnical investigation shall be complete in nature, and its findings shall be summarized in a Geotechnical Report. The Geotechnical Report shall be signed and sealed by a licensed Professional Engineer with expertise in the field of geotechnical engineering.
- C. See Appendix B for requirements regarding the Geotechnical Report, including minimum testing requirements and design parameters.

2.05 Traffic Impact Study

- A. A traffic impact study shall be conducted for the following:
 1. See Appendix C, Traffic Impact Study Minimum Requirements, Section C3, Level of Study.
- B. The study shall be complete in nature, and its findings shall be summarized in a Traffic Impact Study Report. The Traffic Impact Study Report shall be signed and sealed by a licensed Professional Engineer with expertise in the field of traffic engineering.
- C. See Appendix C for requirements regarding the Traffic Impact Study Report.

SECTION 3 DESIGN STANDARDS

3.01 Required Improvements

- A. See Title 12 Chapter 6 for information on the required improvements.
- B. See also Section 5 – Technical Specifications and Section 6 – Standard Drawings, Plans, and Details of this document for additional information.

3.02 Improvement Plans

- A. Complete and detailed, and signed and sealed (in accordance with UAC 58-22-602, as amended) construction plans and drawings of improvements shall be submitted to the City for the review by the ALUA prior to receiving final plat approval and prior to commencing construction.
- B. No construction shall begin until plans have been checked, received final land use approval, and a preconstruction meeting has been held.
- C. The Engineer of Record must provide a written certification (signed and dated), to be included on the final improvement plans, that states the following:
 - 1. As the Engineer-of-Record, I hereby certify that to the best of my knowledge these construction plans and supporting documentation (Plans) comply with the applicable City Code, Public Works Standards, local, State, and Federal regulations, and general engineering practices (Standards). I understand and agree that:
 - a. The City's acceptance of these Plans shall not be construed to be a permit for, or an approval of, any variance from any provisions of the Standards.
 - b. Any communication from the City giving feedback on the Plans shall be construed as feedback only and shall not be interpreted as authorization to vary from or cancel the provisions of the Standards.
 - c. The City's acceptance of these Plans, or feedback from the City on whether the Plans meet the Standards, shall not prevent the City from requiring the correction of errors in the Plans at any time, including during the construction of improvements.
 - d. Any exceptions to the Standards granted by the appropriate governing agency have been provided in writing to the City.
- D. The following instructions are for the purpose of standardizing the preparation of drawings to obtain uniformity in appearance, clarity, size, and style. The plans and designs shall meet the standards defined in the specifications and drawings hereinafter outlined. The minimum information required on the drawings for improvements are as follows:
 - 1. All drawings and/or prints shall be clear and legible and conform to industry standard engineering and drafting practices.

2. Drawings shall be legible and to a common scale when printed on 11" x 17" paper.
3. Both plan view and centerline profile must be shown. On subdivisions along steep cross slopes, profiles for each side of the street may be required to be shown.
4. Plan and profiles shall indicate design and/or existing grades a minimum of 200-ft beyond the limits of the proposed project.
5. All wet utilities (water, sewer, storm drain, land drain) shall be shown in plan and profiles views.
6. Each set of plans shall be accompanied by a separate sheet of details for special structures which are to be constructed and are not covered by the City Standards. All structures shall be designed in accordance with the minimum Clearfield City Standards and approved by the ALUA.
7. Separate drawings of elements of the City Standards shall not be required to be redrawn and submitted with the construction drawings unless specific deviations from the standards are requested for approval; however, the construction drawings shall refer to the specific items of the Standards that are to be incorporated into the Work.
8. The plan and profile construction plans shall be submitted in portable document format ("pdf"). Upon approval, the developer's engineer shall provide the City with electronic files of the final plat and improvement plans in AutoCAD or other City approved format. A hard copy of the approved construction plans bearing the final land use acceptance shall be kept available at the construction site. Prior to final acceptance by the City, the developer, developer's representative, contractor, or project engineer shall submit to the City a set of "as built" drawings for permanent City file record.
 - a. All changes shall be clouded and documented.

3.03 Design / Layout

A. Blocks

1. Length: Shall not exceed 1,200-lf.
2. Width: Shall be wide enough to adequately accommodate 2 tiers of lots. Double Frontage Lots must comply with City Code Title 12.

B. Walkways: In blocks greater than 800-ft in length, a dedicated walkway may be required. Such walkways shall include:

1. Concrete, minimum of 5-ft wide;
2. 4-foot Chain-link (or approved equal) fence on both sides of walkway where chain-link is permitted, or 4-foot fence that meets the material requirements of the zone in which it is located; and
3. Entrance barriers to prevent motorized vehicles from accessing the walkway.

- C. Non-Residential Uses: Shall be designed specifically for such purposes with adequate space for off-street parking and delivery facilities.
- D. Lots
 - 1. Arrangement / Design: Shall provide satisfactory and desirable sites for buildings and properly relate to the topography and character of the surrounding area.
 - 2. Minimum Lot Requirements: Per the zone in which the subdivision is located, See City Code Title 11. The square footage of any street (public or private) shall not be included in the lot size.
 - 3. Side lines of lots shall be approximately at right angles or radial to the center of the street.
 - 4. Corner lots shall be platted wider than interior lots to permit conformance with required setbacks.
- E. Flag lots shall comply with City Code 11-3-9. with an access strip no less than 20-feet wide (access strip not included in the lot area).
- F. Developable Area Limitation: Any area within a subdivision that is not developable (e.g. protection of natural slopes or vegetation, special natural topographic features, or visual factors) shall be shaded and noted on the Plat.
- G. Adjoin Street: Each lot shall abut on an existing or proposed public street.

3.04 Sanitary Sewer Design

- A. All design shall be in accordance with UAC R317, as amended.
- B. Changes in pipe size shall occur in a manhole. Match 0.8 depth point of sewer lines.
(UAC, R317-3-2-H)
- C. All terminating sewer mains shall end with a city standard manhole. No cleanout shall be permitted on a main line.
- D. Service lateral connection shall not be allowed in sewer manholes.
- E. All sewer shall be gravity unless otherwise approved by the City.
- F. Collection lines shall be in public rights-of-way or private road rights-of-way. Collection lines shall not be located on private property (easements) without the express written permission from the City. If such case is granted, the easement shall be a minimum width of 20-ft and shall be dedicated to the City of Clearfield.
- G. All sanitary sewer systems shall be public and shall connect to a public sewer line. Private sanitary sewer systems may be permitted on singularly owned property provided they discharge directly to a public sewer system and obtain the express written permission from the City.

3.05 Water Design

- A. All design shall be in accordance with UAC R309, as amended, and AWWA Standards.
- B. All mains and individual lot services shall be of sufficient size to meet fire flow requirements.
- C. Valves are required on all branches of tees and crosses. On unbroken lengths of water line, the maximum valve spacing is 1000-ft.
- D. At dead end lines, including temporary dead ends, provide fire hydrant at termination point.
- E. Where a water line crosses surface water, designer/engineer shall contact the DDW and the City prior to final design.
- F. All fire lines shall meet the IFC and Public Works Standards and Technical Specifications but shall remain privately owned and maintained.
- G. Fire hydrants
 - 1. Fire hydrants are to be installed in locations as required by the IFC and approved by the North Davis Fire District and the City, with a minimum spacing of 500-ft.
 - 2. Fire hydrants shall not be located within 10-ft of any sanitary sewer line or manhole.
 - 3. Fire hydrants must maintain a 5-ft minimum clearance from an adjacent proposed or existing improvement (e.g., mailbox, streetlight, fencing, etc.).

3.06 Street/Road Design

- A. Streets shall be designed in accordance with these Standards, standard engineering practices, and the AASHTO and MUTCD guidelines.
- B. Local (residential) streets shall have not less than 333-ft radius curves²
- C. No changes of grade in excess of 1.5% shall be permitted without a vertical curve.
- D. Sight triangles, in accordance with AASHTO requirements, shall be shown as required in the Drawings.
- E. Horizontal points of curvature shall not be located closer than 150-ft from the center of an intersection.
- F. Intersections
 - 1. Roadway centerlines shall intersect at 90-degrees. Where a 90-degree angle is not feasible, the intersection angle may be reduced to as low as 80-degrees with the City Engineer's concurrence. In no case shall the angle be less than 80-degrees.
 - 2. Intersections shall be no closer than 500-ft to one another, as measured from centerline to centerline.

² AASHTO A Policy on Geometric Design of Highways and Streets (2018): Table 3-13, 30mph, $e = -2.0\%$.

G. Cul-de-Sacs

1. Length of cul-de-sac shall not exceed 500-ft as shown in the Standard Drawings.

H. Pavement / Pavement Section

1. Developments
 - a. Pavement section shall comply with the Standard Drawings.
2. City Projects
 - a. Pavement section shall be included in the Project Plans.
3. See Standard Drawings for minimum pavement section and notes.
4. Both Development and City Projects must meet the minimum pavement section thicknesses. Where geotechnical pavement design thicknesses exceed the standard minimums, the geotechnical pavement design thicknesses shall govern.

I. Temporary Turnarounds

1. When a turnaround cannot be constructed outside of subdivision, it may be located on a portion of the subdivision lots as required in the Drawings.
2. The lot(s) on which the turnaround is constructed shall be restricted as follows:
 - a. Platted as "R" (restricted lot).
 - b. This lot cannot be sold or building permits issued until the road is extended beyond the subdivision boundary, complete with curb, gutter, and sidewalk.
3. Drainage onto adjacent property must be by written approval (easement) of adjacent property owner.

J. Landscaping

1. When landscaping is required to be designed/installed, refer to City Code (Title 12 and Title 11, Chapter 21 "Landscaping Standards and Requirements") and these Standards.

K. UDOT

1. Intersections with UDOT controlled streets shall be in accordance with UDOT Standards. A copy of the approved UDOT Access Permit shall be submitted to the City.

L. Union Pacific

1. Railroad crossing shall be in accordance with Union Pacific's Standards and requirements. A copy of the approved railroad crossing permit shall be submitted to the City.

M. Street Amenities

1. Streetlights (see Drawings) shall be installed at intersections, curves, overpasses, or as deemed necessary by the City.

2. Street trees (see City Code Title 12 and Form Based Code for projects in Downtown) shall be:
 - a. Planted on both sides of all streets, outside of the rights-of-way, on private property in approved locations.
3. Signs and traffic safety devices shall be placed as required by the City.

3.07 Storm Drain and Drainage Design

- A. See Appendix A for Storm Drain and Drainage Design Standards.
- B. Low Impact Development (See Appendix A)
- C. 80th Percentile Storm Retention (See Appendix A)

SECTION 4 CONSTRUCTION STANDARDS

4.01 General Policies

A. General Conditions

1. Permit/License: When the work is in progress, Contractor shall have at the work site a copy of the required permit(s) and their contractor's license number.
2. Private access: Temporary all-weather roadways, driveways, walks, and rights-of-way for vehicles and pedestrians shall be constructed and continuously maintained where required.
3. Street excavation in winter: Excavation of City streets during the winter months (herein defined as November 15 to April 1) will be allowed only if the work is a new service connection, required maintenance, or emergency, or otherwise approved by the Public Works Director. Permanent patching of City streets excavated in the winter may be delayed until April 1 with the following provisions: Within five working days from the completion of the excavation, the permittee provides/maintains a 1-1/2-in thick temporary winter asphalt surface until such time as the permanent asphalt surface is installed; the permittee shall provide/maintain a temporary untreated base course surface until such time as the temporary winter asphalt surface is installed. These provisions apply regardless of whether the permittee or City crews are performing the permanent resurfacing.
4. Existing utilities: All projects shall be "Blue Staked" prior to construction. The contractor shall use extreme caution to avoid a conflict, contact, or damage to existing utilities, such as power lines, sewer lines, storm drains, streetlights, telephone lines, cable television lines, water lines, gas lines, poles, or other appurtenances during the course of construction of the project. Any such conflict, contact, or damage shall be immediately communicated to said utility company and the Public Works Department. All damages must be repaired as soon as possible in accordance with the requirements of the utility company.
5. Preconstruction pictures of existing public way improvements: The permittee may secure pictures of the conditions of the existing public way improvements such as curbing, sidewalk, landscaping, asphalt surfaces, etc. In the event that public way improvements are damaged and no pictures are taken, the Public Works Department will assume the correction of the damage is the responsibility of the permittee.

B. Licensing

1. Contractor (including all sub-contractors) must be licensed with the State of Utah: It is the policy of Clearfield City that contractors desiring to perform work in the City's public way shall be properly licensed in the State of Utah. The acceptable licenses shall be in accordance with UAC R156-55a-301, as amended.

Exceptions: A license shall not be required by the City when the permittee is a public utility company. However, subcontractors for utility companies shall have a valid contractor's license.

C. Construction Permits

Developer/Contractor is responsible for obtaining all necessary permits for the construction of the Improvements prior to commencement of said Improvements. Permits required may include, but are not limited to:

1. Excavation (City)

- a. The City issues permits to control any excavation and construction operations in the public right-of-way. All contractors, sub-contractors, and utility companies proposing to construct, repair, or replace any facility within the public right-of-way shall contact the City and complete all permit requirements prior to commencing proposed work.
- b. Work by utility companies and their contractors in constructing facilities in new subdivision streets shall be required to post a bond with the City and will be subject to City inspection and compliance with all requirements.
- c. Emergency Work
 - i. Maintenance of pipelines or facilities in the public way may proceed without a permit when emergency circumstances demand the work be done immediately provided a permit could not reasonably and practicably have been obtained beforehand.
 - ii. If emergency work is commenced on or within any public way of the City, the Public Works Department shall be notified within one-half hour when the work commences or as soon as possible from the time the work is commenced. Contact shall be made to the City's "on call" personnel. The Public Works Department shall also be notified within 1 hour of the start of work on the first regular business day of which City offices are open after such work commences, and a permit shall be requested by the Contractor and subsequently issued by the City which shall be retroactive to the date when the work was begun. Before commencing the emergency work, all necessary safety precautions for the protection of the public and the direction and control of traffic shall be taken. None of the provisions of these regulations are waived for emergency situations except for the prior permit requirement.
- d. Enforcement: Any violation of the above regulations regarding working within the Public Way shall be subject to the provisions of the applicable Clearfield City Code.

2. USACE/DWRi – Stream Alteration
3. UPDES
4. Dam Safety (DWRi)
5. UDOT – Encroachment
6. Davis County Surveyor's Monument

D. Excavation Operations

1. Blue Stakes: Before commencing excavation operations, the permittee shall call "Blue Stakes" at 1-800-662-4111 or 811.
2. Traffic control devices: Traffic control devices such as construction signs, barricades, and cones must be in place before excavation begins.
3. Protection of paved surfaces outside of excavation area: To avoid unnecessary damage to paved surfaces, backhoes, outriggers, tracked equipment, or any other construction equipment that may prove damaging to asphalt shall use rubber cleats or paving pads when operating on or crossing said surfaces.
4. Open trench limits: Open trenches will be limited to one block at a time or 660-ft, whichever is less.
5. In the event of an approved planned road closure, Contractor shall notify the City, Fire Department, emergency services dispatch, UTA, US Postal Service, and Davis School District a minimum of 24 hours prior to the closure. In the case of an emergency, the above listed agencies will be notified as soon as possible.

E. Environmental Controls

1. Dust and debris: The permittee or contractor shall keep dust and debris always controlled at the work site. If necessary, a container shall be provided for debris and dusty areas shall be wet down. The permittee or contractor shall be responsible for the cleanup of mud or debris from public roads deposited by vehicles or construction equipment exiting the work site. The City reserves the right to shut down the work or issue a citation if dust is not controlled.
2. Noise: The permittee or contractor shall keep neighborhood free of noise nuisance in accordance with City Code.

F. Cleanup: The permittee or contractor shall remove all equipment, material, barricades, and similar items from the right-of-way. Areas used for storage of excavated material will be smoothed and returned to their original contour. Vacuum sweeping or hand sweeping shall be required when the City determines cleaning equipment is ineffective.

G. Storm Water: All Contractors working within the boundaries of the City shall conform to all requirements and regulations as outlined by the Clearfield City Storm Water Management Plan. Copies of the plan are available on the City's website.

4.02 Pre-Construction Meeting

- A. The pre-construction meeting shall not be held until the ALUA has approved and signed the construction plans.
- B. A preconstruction meeting shall be held before any excavation or other work is begun in the subdivision or Project. The meeting may include, but is not limited to the following:
 - 1. Public Works Director
 - 2. City Engineer or Project Manager
 - 3. Subdivision or Project Engineer
 - 4. All contractors and subcontractors involved with installing the subdivision or project improvements.
 - 5. Representatives of affected Clearfield City Departments.
 - 6. Representatives of local utility companies (as may be required by the City).
- C. Items pertaining to the construction and inspection of the subdivision or Project improvements will be discussed.

4.03 Construction

- A. Specifications
 - 1. Contractor shall be responsible for constructing all improvements in accordance with the Technical Specifications, per Section 5 of this document.
 - 2. No deviations will be allowed unless reviewed and authorized by the City on a case-by-case basis.
- B. Plans and Details
 - 1. Contractor shall be responsible for constructing all improvements in accordance with the Drawings, Plans, and Details, per Section 6 of this document.
 - 2. No deviations will be allowed unless reviewed and authorized by the City on a case-by-case basis.
 - 3. In the event that as-built conditions of the improvements are found to be out of compliance with the approved improvement plans and tolerances contained in these Standards, it shall be the contractor's responsibility to remove those improvements and replace them with improvements that comply with the approved improvement plans and are within the given tolerances. Adjacent improvements may also require replacement to bring all improvements into compliance.

C. Sequence/Timing

1. All underground utility work shall be completed prior to placement and compaction of the roadway base course. Utilities, including service lines, not installed prior to roadway construction shall be bored as approved by the City.
2. All concrete collars shall be installed within 14 days of asphalt placement.

D. Inspection

1. All construction work involving the installation of improvements in the subdivision or project shall be subject to inspection by the City. It shall be the responsibility of the person responsible for construction to ensure that inspections take place where and when required. Certain types of construction shall have continuous inspection, while others may have only periodic inspections.

E. Requests for Inspections

1. Requests for inspections shall be made to the Public Works Department by the person responsible for the construction.
2. Requests for inspection on work requiring continuous inspection shall be made 3 working days prior to the commencing of the work.
3. Notice shall also be given 1 day in advance of the starting of work requiring periodic inspection, unless specific approval is given otherwise by the City.

F. Continuous Inspection

1. be required on (but not limited to) the following types of work:
 - a. Laying of street surfacing.
 - b. Placing of concrete for curb and gutter, sidewalks, and other structures.
 - c. Laying of sewer pipe, drainage pipe, water mains, water service laterals and testing.
2. On construction requiring continuous inspection, no work shall be done except in the presence or by permission of the Public Works Department or authorized City representative.

G. Periodic inspections

1. Shall be required on (but not limited to) the following types of work:
 - a. Street grading and gravel base
 - b. Excavations for curb and gutter and sidewalks
 - c. Excavations for structures
 - d. Trenches for laying pipe
 - e. Forms for curb and gutter, sidewalks and structures

H. Substantial and Final Completion Inspections

1. A substantial completion inspection shall be requested by the Contractor and made by the Public Works Department or authorized representative after all construction work is completed. Any faulty or defective work shall be corrected by the persons responsible for the work within a period of 30 days of the date of the City's official punchlist defining the faulty or defective work.
2. A final completion inspection shall be requested by the Contractor and made by the Public Works Department or authorized representative after all faulty and defective work has been corrected.

I. Testing

1. Development Projects

- a. Developer/Contractor shall select a properly licensed and qualified testing agency.
- b. Developer/Contractor shall be responsible for coordinating all testing in accordance with the Technical Specifications per Section 5 of this document.
- c. Testing reports shall be submitted to City weekly for review. Areas with failed tests shall be corrected and retested.
- d. Failure to have improvements tested as they are constructed may be cause for work stoppage or rejection by City.

2. Projects

- a. Contractor shall select a properly licensed and qualified testing agency.
- b. Contractor shall be responsible for coordinating all testing in accordance with the Technical Specifications per Section 5 of this document and the Project Manual.
- c. Testing reports shall be submitted to City weekly for review. Areas with failed tests shall be corrected and retested. Contractor may be required to pay for retesting.
- d. Failure to have improvements tested as they are constructed may be cause for work stoppage or rejection by City.

J. Safety

1. Contractor is solely responsible for jobsite safety.
2. Contractor shall comply with all local, state, and federal rules and regulations regarding jobsite safety.
3. City and/or its authorized representatives shall have the authority to shut down a job when unsafe working conditions are found.

SECTION 5 TECHNICAL SPECIFICATIONS

5.01 Technical Specifications for Clearfield City

- A. Adoption of Divisions 01 through 34 of the Manual of Standard Specifications, as published by Utah LTAP Center, Utah State University, Logan, Utah, current edition, with all published amendments. (Commonly referred to as APWA Specs.)
- B. Modifications and Additions to Manual of Standard Specifications (see Appendix E)

5.02 Order of Precedence

- A. Approved project-specific specifications (when applicable)
- B. Modifications and Additions to Manual of Standard Specifications
- C. Manual of Standard Specifications, current edition, with all published amendments

SECTION 6 STANDARD DRAWINGS, PLANS, AND DETAILS

6.01 Standard Drawings, Plans, and Details for Clearfield City

- A. Clearfield City Public Works Standard Drawings, current edition (See Appendix F)
- B. Adoption of Manual of Standard Plans, published by Utah LTAP Center, Utah State University, Logan, Utah, current edition, with all published amendments. (Commonly referred to as APWA Drawings.)

6.02 Order of Precedence – City Projects

- A. Approved project-specific drawings and details (when applicable)
- B. Clearfield City Public Works Standard Drawings, current edition
- C. Manual of Standard Plans, current edition, with all published amendments, when not covered by one of the aforementioned items.

6.03 Order of Precedence – Development Projects

- A. Clearfield City Public Works Standard Drawings, current edition
- B. Manual of Standard Plans, current edition, with all published amendments, when not covered by one of the aforementioned items.
- C. Final Land Use Approval Specific Drawings and Details

APPENDIX A – STORM DRAIN AND DRAINAGE DESIGN STANDARDS

APPENDIX A

STORM DRAIN AND DRAINAGE DESIGN STANDARDS

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EXHIBITS

1. NOAA Point Precipitation Frequency Estimates – Intensity
2. NOAA Point Precipitation Frequency Estimates – Depth
3. Summary of Allowable LID BMPs

A1. General Provisions

- A. This document represents the reporting, design and construction standards for private and public design and construction as it relates to storm drainage within the City.
- B. A Storm Water Report is required for all new development and redevelopment projects.
- C. Implementation of LID measures and 80th percentile storm retention does not reduce or eliminate the requirement for detention/retention as contained in this document but may be included within the designed detention/retention volumes calculated.

A2. Definitions and Acronyms

The following terms shall be defined as follows in this document related to storm water:

- A. 80th Percentile Storm – The rainfall event whose precipitation total is greater than or equal to 80 percent of all storm events over a given period of record.
- B. Best Management Practices (BMPs) – Construction practices and control measures necessary to protect against pollution generated by construction sites.
- C. Common Plan of Development – "Common plan of development or sale" means one plan for development or sale, separate parts of which are related by any announcement, piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, plat, blueprint, contract, permit application, zoning request, computer design, etc.), physical demarcation (including contracts) that identify the scope of the project. A plan may still be a common plan of development or sale even if it is taking place in separate stages or phases, is planned in combination with other construction activities, or is implemented by different owners or operators.¹ Common plans of development may be residential, commercial, or industrial in nature.
- D. Detention Basin – A water storage pond designed to store a volume of water that reduces the post-development peak runoff of a storm to the pre-development runoff rate or other rate as defined by the governing body. This is accomplished by the use of an outlet which controls the rate of flow out of the pond into the receiving storm drain or water body. Detention ponds contain an inlet, outlet, and spillway; the inlet and outlet may be one and the same. The detention basin is intended to drain the storm water within a period of time to make the volume available for the next storm event.
- E. Development – Any man-made change to unimproved land, including but not limited to site preparation, excavation, filling, grading, paving, and construction of buildings or other structures.

¹ General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s); State of Utah Department of Environmental Quality, Division of Water Quality; August 16, 2023.

- F. Disturb – To alter the physical condition, natural terrain or vegetation of land by clearing, grubbing, grading, excavating, filling, building or other construction activity.
- G. Drain Inlet – A point of entry into a sump, storm water basin, or storm drain system.
- H. Drinking Water Source Protection Zone – Zones determined by geo-hydrology designed to protect groundwater aquifers of a well in a culinary water system.
- I. DWQ – Acronym for Division of Water Quality, a division of the UDEQ.
- J. Freeboard – The vertical distance between the emergency spillway and the top of the basin embankment.
- K. General Permit for discharges from MS4 (Permit) – Authorization for a municipal separate storm sewer system to discharge storm water into waters of the United States.
- L. Hardscape – Generally impervious areas, typically streets, sidewalks, driveways, parking areas, and roofs.
- M. Infiltration – The movement of water through the soil surface and into the soil;² the movement of water downward from the ground surface through the upper soil.³
- N. Infiltration Rate – The rate at which water enters the soils during a storm.²
- O. Infiltration System (storm water) – A system which is designed to return storm water runoff into an underground aquifer.
 - 1. Bioretention facilities, rain gardens, and tree boxes that are designed to slow down and hold storm water runoff for biological treatment and use by vegetative uptake are not considered to be infiltration systems if they are not isolated from groundwater. Groundwater isolation may be achieved with impermeable liners or an underdrain that does not discharge into a dug, bored, drilled or driven well, improved sinkhole or other subsurface fluid distribution system.
 - 2. The discharge of storm water piping below grade for the purpose of infiltration is considered a Class V injection well facility.
- P. Injection Well, Class V – As defined in UAC R317-7-2, as amended:
 - 1. A bored, drilled, or driven shaft whose depth is greater than its largest surface dimension, OR
 - 2. A dug hole whose depth is greater than its largest surface dimension, OR
 - 3. An improved sinkhole, OR
 - 4. A subsurface fluid distribution system.

² Linsley/Franzini/Freyberg/Tchobanglous. (1992). *Water Resources Engineering and Environmental Engineering*. New York: McGraw-Hill Inc.

³ Lindeburg. (2003). *Civil Engineering Reference Manual*. Belmont, CA: Professional Publications, Inc.

- Q. Low Impact Development (LID) – An approach to land development (or re-development) that works with nature to more closely mimic pre-development hydrologic functions, reduces or minimizes the quantity of storm water runoff, and protects or improves water quality in receiving water bodies.
- R. LID Analysis and Report – A written analysis of a development or redevelopment site that (1) identifies appropriate methods to reduce storm water runoff, (2) identifies the pollutants to target for each drainage area, and (3) selects appropriate structural controls to implement on the site.
- S. Municipal Separate Storm Sewer System (MS4) – The storm water conveyance system owned by the City which includes streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains. For a full definition, see UAC 317-8.
- T. Outlet – The discharge mechanism of a detention basin, typically a pipe containing a head gate or orifice to control the release of water out of the basin.
- U. Percolation – The movement of water through the subsurface soil layers, usually continuing downward to the groundwater table,³ measured by a Standard Percolation Test in units of minutes per inch.
- V. Pollutant – Chemicals, sediment, trash, disease-carrying organisms, and other contaminants picked up by storm water which is conveyed into rivers, streams, and other water bodies.
- W. Redevelopment – Alteration of a property that change the footprint of a site or building.
- X. Retention Basin – A water storage pond designed to store the runoff volume of a storm and dispose of water through percolation, infiltration, and evaporation within a period of time to make the volume available for the next storm event. A retention basin contains an inlet and spillway, but no structural outlet.
- Y. Softscape – Generally pervious areas, such as native vegetation and landscaped areas.
- Z. Spillway, Emergency – A storm drain basin feature that controls and guides storm water as it spills over the basin's embankment.
- AA. Spillway, Internal – A storm drain basin feature that allows excess water to leave the basin through discharge piping which is set at an elevation below the emergency spillway.
- BB. Storm Drain System – The system of conveyances (including but not limited to catch basins, detention basins, retention basins, infiltration galleries, curbs, gutters, ditches, cross drains, roads, man-made channels, sumps, pipes, etc.) owned and operated by the City, which is designed and used for collecting and/or conveying storm water.
- CC. Storm Water Pollution Prevention Plan (SWPPP) – A written plan that evaluates and minimizes the impact of pollutants on storm water through the use of control measures and activities that target pollution sources. A SWPPP template can be found on the UDEQ Water Quality website.
- DD. Storm Water Report – A written analysis of a development or redevelopment site that

estimates the volume and rate of storm water runoff generated by the proposed improvements. The report details rationale and calculations for establishing the sizes of storm water piping and storage facilities in compliance with this document. This Report shall also contain the calculations for determining the 80th Percentile Storm volume and methods evaluated and selected to manage the rainfall on-site.

1. This Report may be combined with the LID Analysis and Report.

EE. Storm Water Runoff – Precipitation that is not intercepted or otherwise captured at a site which eventually enters into natural water bodies such as rivers, streams, and lakes.

FF. Subsurface Fluid Distribution System – An assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground. (i.e. infiltration galleries, underground retention)

GG. UAC – Acronym for Utah Administrative Code.

HH. UDEQ – Acronym for Utah Department of Environmental Quality.

A3. Rainfall Hydrology

A. All storm drain systems shall be designed to carry the 100-year storm, unless otherwise stated.

B. Storm Specifications

1. Local storm drain piping shall be designed for the 10-year storm, where the road or other above ground conveyance will carry the difference to the 100-year storm.
2. Storm drain piping connecting two (2) streets through private property shall be designed for the 100-yr storm.
3. Local detention basins, including all piping into the basin from the nearest point of entry shall be designed to accommodate a 10-year storm event with a maximum discharge of 0.2 cubic feet per second (cfs) per acre.
4. Local retention basins, including piping into the basin from the nearest point of entry, shall be designed to accommodate the 100-year 2-hour storm.
5. Regional detention basins, including all piping into the basin from the nearest point of entry, shall be designed to accommodate the 100-year storm event.
6. The storm duration used for the sizing of basins shall be based upon the worst-case scenario. The time of concentration shall be calculated and shown.
7. See Exhibits 1 and 2 for rainfall data.

C. Hydrologic Methodology

1. Parameters

- a. Hardscape – Proposed streets and sidewalk areas plus the estimated hardscape areas (roofs, driveways, patios, walkways etc.) determined by using a recent subdivision with similarly sized lots, or calculated area as measured from approved site plan.
 - b. Softscape – The remaining area of the subdivision not hardscape.
2. Developments less than 20 acres
 - a. The Rational Method may be used. A computer model may also be used. See paragraph 3 for more information.
 - b. Rainfall Intensity – When using the Rational Method, use the rainfall intensity table provided in Exhibit 1 of this document.
 - c. Runoff Coefficients – The following C-values shall be used when using the Rational Method:
 - i. Hardscape – 0.90
 - ii. Softscape (open space, landscaping) – 0.25
 - iii. Values from published sources may be used when pre-approved by the City Engineer.
3. Developments larger than 20 acres
 - a. A City Engineer-approved computer model shall be used.
 - b. Rainfall Pattern and Depth – The following rainfall pattern shall be used. This pattern is based on the Farmer-Fletcher Distribution. This pattern is for a 1-inch unit storm and must be multiplied by rainfall depth for storms of other magnitudes, as provided in Exhibit 2.

Farmer-Fletcher Distribution

Unit Storm

Time (Min.)	Depth (inches)	Time (Min.)	Depth (inches)	Time (Min.)	Depth (inches)	Time (Min.)	Depth (inches)	Time (Min.)	Depth (inches)	Time (Min.)	Depth (inches)
1	0	11	0.004	21	0.033	31	0.052	41	0.012	51	0.005
2	0	12	0.005	22	0.034	32	0.045	42	0.011	52	0.005
3	0.002	13	0.008	23	0.035	33	0.04	43	0.01	53	0.004
4	0.002	14	0.009	24	0.038	34	0.035	44	0.009	54	0.004
5	0.002	15	0.009	25	0.039	35	0.03	45	0.009	55	0.004
6	0.002	16	0.013	26	0.045	36	0.022	46	0.008	56	0.003
7	0.002	17	0.017	27	0.052	37	0.02	47	0.006	57	0.003
8	0.002	18	0.02	28	0.054	38	0.018	48	0.006	58	0.002
9	0.003	19	0.024	29	0.054	39	0.016	49	0.005	59	0.002
10	0.003	20	0.029	30	0.054	40	0.014	50	0.005	60	0.001

A4. Storm Drain System**A. Independent System**

1. Storm waters shall not be conveyed in irrigation ditches.
2. Irrigation waters shall not be conveyed in storm drain systems.

B. Groundwater

1. Where adverse groundwater conditions exist, the City may allow the installation of a subsurface land drain system. Laterals may be installed to each lot for clear groundwater only (surface water may be permitted only upon approval from the City Engineer). Subsurface lines shall be installed with a slope adequate for proper drainage. A backflow control device may be required at the confluence of the land drain system and storm drain system, as determined by the City Engineer.

C. Piping**1. Storm Drain Lines**

- a. All storm drain lines that are considered to be part of the City's storm drain system shall be reinforced concrete pipe (RCP), of appropriate class when installed in the public right-of-way.
- b. Minimum size for storm drain mains shall be 15-inch diameter.
- c. Public storm drain pipes shall not be curved.
- d. See Section A3 for sizing requirements.

2. Land Drain Lines

- a. All land drains shall be PVC or RCP.
- b. Minimum size for land drain mains shall be 8-inch diameter.
- c. Minimum size for land drain laterals shall be 4-inch diameter.

3. Pipe specifications are included in Section 5 of the Public Works Standards.

4. Reimbursement / Pioneering Agreements – Where determined by the City Engineer and/or the Storm Drain Capital Facilities Plan, larger drain lines shall be installed to accommodate future development. The cost to provide adequate storm drainage for a development shall be paid for by the Developer. Upsizing will be coordinated at the time of development. The cost of upsizing will be the responsibility of the City or as defined in the agreement.

- D. Access – Storm drain lines shall have cleanout boxes, inlets, or manholes installed at all changes in grade or alignment, with a maximum distance of 400 feet between accesses. Structures shall be installed in accordance with the standard specifications and Standard Drawings.

E. Sumps

1. Sumps are not allowed in the City's storm drain system, except as approved by the City Engineer on a case-by-case basis.
2. Sumps shall not be permitted within zones 1 or 2 of any Drinking Water Source Protection Zone of any drinking water source.
3. Class V Injection Well permitting is required.

F. Grates

1. Grates shall be provided at all entrances/exits of the storm drain system, and on the upstream end of all culverts greater than 50-ft in length.
2. Grates shall be provided on catch basins, junction boxes, control structures, etc.
3. Bar spacing shall be designed for location, function, and safety. (Generally, bar spacing should not exceed three (3) inches.)

A5. Detention and Retention Basins**A. When Required**

1. Storm drainage basins are required for all development; however, residential developments less than one (1) acre are not required to have detention or retention, except when determined by the City Engineer.
2. In an effort to increase the City's ability to more easily manage storm events, Regional Detention Basins shall be constructed wherever possible, as shown in the City's Storm Water Capital Facilities Plan.
3. As shown in the City's Storm Water Capital Facilities Plan, Developer may be required to participate in the construction of a new regional detention basin or the upgrading of an existing detention basin that is designated as a regional detention basin in lieu of onsite detention within the proposed development, if the development is located within a regional detention basin's drainage subbasin.

B. Basin Property, Easement, and Access

1. Public Basins – Public basins shall be located on a separate parcel dedicated to the City with frontage along a public roadway. The developer shall provide the City permanent access to any portion of a public basin requiring operation and/or maintenance.
2. Private Basin – Private basins serving multiple lots shall be located on a separate parcel, owned by the home-or land-owners association. Private basins serving a single lot shall be located within the lot. The City shall be provided an easement to, around, and across the basin for emergency access, operation, and/or repair for a private basin.

3. Access – Each basin shall be constructed with sufficient, all-weather, drivable access to all structures from a public street. A turnaround area shall be provided at the termination of the access road.

C. Maintenance and Ownership

Actual ownership and maintenance responsibility shall be specifically defined in the Owner's Dedication, Certificates, Development Agreements, or by Deed.

1. Local Basins – Local basins shall be constructed by the developer. Following conditional acceptance of the construction, the operation and maintenance shall be conveyed to the City when applicable.
2. Regional Basins – Regional basins shall be owned and maintained by the City, constructed according to the criteria herein, and approved of the City Engineer.
3. Private Basins
 - a. Single Lots (Non-residential only) – When approved, private basins shall be owned and maintained by the property owner.
 - b. Multiple Lots – When approved, private basins shall be owned and maintained by the Homeowners' Association.
 - c. Access may be provided from a private street provided an access easement is granted to the City providing access to/from the basin from a public street.
 - d. For all private basins, Developer is required to enter into a Long-Term Storm Water Maintenance Agreement with the City.

D. Basin Volume

1. All basin designs and calculations shall be included in the Storm Water Report and submitted to and reviewed by the City Engineer for approval.
2. Volume shall be measured to the internal spillway (overflow) elevation.
3. Volume in pipes, ditches, or roadside swales shall not be considered in the volume calculation for detention and retention basins.
4. Above-grade storage of water shall not be allowed in parking lots.

E. Allowable Discharge Design

1. See Section A3.B for storm specifications.
2. Discharge shall not exceed the lesser of:
 - a. Pre-development runoff with pre-development, meaning the condition of the land prior to settlement, or
 - b. The discharge rate is determined by using the standard rate of 0.20 cubic feet per second per total acre.

Show all calculations or provide spreadsheet or program file.

3. Calculations shall be based on the total acreage of the development draining to the basin.
4. Pass-through of offsite drainage through the development must be considered and will be allowed.

F. Detention and Retention Basin Elements

1. Depth – Basins should not exceed three (3) feet in depth as determined from its lowest point to the overflow or spillway, unless otherwise approved by the City.
2. Side slopes – Side slopes shall not be steeper than 4:1 (horizontal to vertical).
3. Bottom Slope – The basin floor shall be designed so as to prevent the permanent ponding of water. The slope of the floor of the basin shall not be less than 1% to provide drainage of water to the outlet grate and prevent prolonged wet, soggy, or unstable soil conditions.
4. Freeboard – At least one (1) foot of freeboard is required (berm above the high-water mark).
5. Spillways
 - a. The purpose of a spillway is to protect life and property by providing an emergency route for floodwaters in excess of the design storm event. Spillways are required for all detention basins.
 - b. The spillway shall be designed to carry the 200-year storm flow minus the 100-year storm flow which is handled by the outlet control structure.
 - c. Spillways shall introduce flows back into the pipe or stream downstream of the outlet control.
 - d. Spillways shall include a maintained swale and drainage easement to a safe location.
 - e. The spillway shall be designed to prevent erosion.
 - f. All spillways shall be designed to protect adjacent embankments, nearby structures, and surrounding properties.
6. Ground Covers – The surface area of a multi-use basin shall be sodded with a drought resistant grass. A minimum of four (4) inches of top soil must be installed prior to sod placement. A sprinkler irrigation system is also required for all grassed basins. Developer/contractor is responsible for establishing vegetation. Basins used solely for detention/retention shall be rock-lined and incorporate decorative, drought tolerant landscaping as required by city code.

7. Embankment (Fill) Construction – If a raised embankment is constructed for a basin (constructed with granular materials), it shall be provided with a minimum of 6-inches of clay cover on the inside of the berm to prevent water passage through the soil.
 8. Excavation (Cut) Construction – If the basin is constructed primarily by excavation, then it may be necessary to provide an impermeable liner and land drain system when constructed in the proximity of basements or other below grade structures as determined by a geotechnical evaluation.
 9. Multi-Use Basins – Basins may be designed as multi-use facilities when appropriate precautions are incorporated into the design. If amenities such as pavilions, playground equipment, volleyball courts, etc. are to be constructed within the water detention area of a basin, they shall be designed appropriately. Structures shall be designed for saturated soil conditions and bearing capacities are to be reduced accordingly. Restrooms shall not be located in areas of inundation. Inlet and outlet structures should be located as far as possible from all facilities. No wood chips or floatable objects may be used in the area that will be inundated.
 10. Fencing – A conveniently-located access gate, appropriately sized for entrance by maintenance vehicles and equipment, shall be provided for fenced basins. Fencing should not be located at the top of the basin embankment where maintenance equipment, vehicles, and personnel need access. Fencing shall be a minimum of 6-ft tall, with material in accordance with these Public Works Standards and City Zoning Requirements.
- G. Detention Basins (LID BMPs may be incorporated when approved, See Sections A6 and A7)
1. Percolation – No reduction due to percolation for detention basins volumes shall be permitted.
 2. Outlet Control
 - a. Private detention basins may have a calculated fixed orifice plate mounted on the outlet of the basin.
 - b. Public detention basins shall have movable, screw-type head gates set at the calculated opening height with a stop block required to carry the maximum allowable discharge.
 3. Low Flow Piping – The inlet and outlet structures may be located in different areas of the basin, requiring a buried pipe to convey any base flows that enter and exit the basin. (Cross gutters and surface flows are prohibited.) The minimum pipe size and material for the low flow pipe shall be 15-inch RCP or as otherwise specified by the City Engineer.
 4. Oil/Sediment Separators
 - a. Sizing and design of oil/sediment separators shall be reviewed by the City Engineer and City Personnel prior to installation.

- i. Manufacturer's recommendations for sizing must be followed with calculations submitted to the City.
 - ii. Consideration must be given to frequency and ease of maintenance of the structure.
 - iii. Separator should be installed upstream of detention basin and appropriately sized for such location.
 - b. Any site dealing with large parking lots or particularly dirty parking lots such as auto repair and maintenance will be required to have an oil separator.
 - c. An approved oil/sediment separator shall be installed upstream of any basin utilizing rock lining.
 - d. On an annual basis, Private basins with Separators shall be required to be cleaned and provide documentation to the City per the Long-Term Storm Water Maintenance Agreement.
- H. Retention Basins (excludes 80th Percentile Storm Retention, See Sections A6 and A7)
- 1. Retention basins must be specifically approved by the City Engineer.
 - 2. Retention basins shall not be permitted within zones 1 or 2 of any Drinking Water Source Protection Zone of any drinking water source.
 - 3. An approved oil/sediment separator shall be installed upstream of retention basin.
 - 4. Retention Basin Criteria – Retention basins may be permitted if the following conditions apply:
 - a. The distance between the nearest City storm drain and the boundary of the development is greater than:
 - i. For residential development: 500 feet or 50 feet times the number of lots in the entire development (whichever is greater);
 - ii. For commercial development: 20 feet times the number of parking stalls on site.
 - b. The basin is not located within a Hazardous Area (such as a steep slope) or some other sensitive area (such as a Drinking Water Source Protection Zone).
 - c. Site is topographically incapable of draining to the City system.
 - d. Recommendation by the City Engineer.
 - 5. Percolation Rate for Retention Basins
 - a. A percolation test shall be performed by a licensed tester. The percolation test shall be performed at the elevation of the proposed grade of the bottom of the retention basin.

- b. Due to degradation of soils ability to percolate over time, only 70% of the percolation rate shall be used in the calculations for the retention basins.
- 6. Retention basins shall be designed to completely drain within 48 hours of the primary storm event.
- I. Subsurface Fluid Distribution Systems
 - 1. Subsurface Fluid Distribution Systems are allowed for private basins only.
 - 2. See Paragraph H for requirements related to Percolation Rate for Retention Basins.
 - 3. A Class V injection well permit is required.
 - 4. An approved oil/sediment separator shall be installed upstream of subsurface fluid distribution system.
 - 5. Subsurface Fluid Distribution Systems are not allowed for storm water disposal if located in Zone 1 or 2 of a drinking water source. They may be allowed in Zone 3 or 4 of a drinking water source if they are equipped with appropriate pretreatment and approved by the City Engineer.
 - 6. Examples of Subsurface Fluid Distribution Systems include but are not limited to: ADS StormTech® systems, ACF Environmental R-Tanks® and similar; perforated pipe infiltration galleries, etc.

A6. Water Quality

- A. Long-term Best Management Practices (BMPs) shall be used to maintain, to the maximum extent practical, the quality of the water to the pre-developed condition.
- B. Construction BMPs shall be implemented per the City's Storm Water Management Plan.

A7. Low Impact Development

All new development and redevelopment projects equal to or greater than one (1) acre, or projects that are less than one (1) acre that are part of a larger common plan of development or sale, shall be required to evaluate Low Impact Development (LID) approaches to infiltrate, evapotranspiration, and/or harvest and use storm water from the site to protect water quality.⁴

A. 80th Percentile Storm Retention

- 1. All new development and redevelopment projects equal to or greater than one (1) acre, or projects that are less than one (1) acre that are part of a larger common plan of development or sale, shall be required to manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80th percentile rainfall event [storm]. This objective must be accomplished by the use of practices that are designed, constructed, and maintained to infiltrate,

⁴ Adapted from General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s); State of Utah Department of Environmental Quality, Division of Water Quality; May 12, 2021.

evapotranspiration, and/or harvest and reuse rainwater. If meeting this retention standard is technically infeasible, a rationale shall be provided on a case-by-case basis for the use of alternative design criteria. The project must document and quantify that infiltration and evapotranspiration have been used to the maximum extent technically feasible and that full employment of these controls are infeasible due to site constraints.³

2. In the City, the 80th percentile storm has been determined to be 0.50 inches of depth.
 3. The intent is to manage water as close as possible to the point at which it falls.
 4. Calculations and implementation rationale must be contained in the Storm Water Report.
 5. LID measures should be implemented to meet the 80th Percentile Storm requirements.
- B. Implementation of this retention standard does eliminate the requirement for detention/retention basins as described in Section A5 but may be included within the designed detention/retention volumes calculated.
- C. Structural controls may include green infrastructure practices such as:
1. Rainwater harvesting (e.g. rain barrels)
 2. Rain gardens
 3. Permeable pavement or pavers (not permitted on public streets)
 4. Vegetated swales
 5. Preservation of vegetation (non-disturbance)
 6. Xeriscaping
 7. Others as approved by the City Engineer
- D. LID approaches must be evaluated and detailed in a LID Analysis and Report, which shall be submitted to and approved by the City Engineer.
- E. If an LID approach cannot be utilized, the Applicant must document an explanation of the reasons preventing this approach and the rationale for the *chosen alternative controls* on a case-by-case basis for each project.³
- F. Implementation of LID measures does not eliminate the requirement for detention/retention basins as described in Section A5 but may be included within the designed detention/retention volumes calculated.

EXHIBIT 1 – NOAA POINT PRECIPITATION FREQUENCY ESTIMATES - INTENSITY



NOAA Atlas 14, Volume 1, Version 5
Location name: Clearfield, Utah, USA*
Latitude: 41.1059°, Longitude: -112.0254°
Elevation: 4446 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

--- Intensity ---

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.64 (1.42-1.93)	2.06 (1.80-2.44)	2.82 (2.45-3.31)	3.52 (3.01-4.13)	4.64 (3.89-5.50)	5.69 (4.62-6.82)	6.94 (5.45-8.39)	8.42 (6.37-10.4)	10.8 (7.74-13.8)	13.1 (8.90-17.0)
10-min	1.25 (1.08-1.46)	1.57 (1.37-1.85)	2.14 (1.85-2.52)	2.67 (2.29-3.14)	3.53 (2.96-4.18)	4.33 (3.52-5.18)	5.28 (4.15-6.38)	6.41 (4.85-7.90)	8.24 (5.89-10.5)	9.95 (6.77-12.9)
15-min	1.03 (0.892-1.21)	1.30 (1.13-1.53)	1.77 (1.54-2.08)	2.21 (1.90-2.60)	2.92 (2.44-3.46)	3.58 (2.91-4.28)	4.36 (3.43-5.27)	5.30 (4.00-6.53)	6.81 (4.87-8.65)	8.23 (5.60-10.7)
30-min	0.696 (0.602-0.814)	0.874 (0.762-1.03)	1.19 (1.03-1.40)	1.49 (1.28-1.75)	1.96 (1.65-2.33)	2.41 (1.96-2.88)	2.94 (2.31-3.55)	3.57 (2.70-4.40)	4.59 (3.28-5.82)	5.54 (3.77-7.20)
60-min	0.430 (0.372-0.504)	0.541 (0.471-0.637)	0.738 (0.639-0.867)	0.919 (0.789-1.08)	1.22 (1.02-1.44)	1.49 (1.21-1.78)	1.82 (1.43-2.20)	2.21 (1.67-2.72)	2.84 (2.03-3.60)	3.43 (2.33-4.46)
2-hr	0.277 (0.244-0.318)	0.346 (0.306-0.399)	0.447 (0.393-0.515)	0.543 (0.472-0.628)	0.703 (0.596-0.819)	0.849 (0.703-0.999)	1.02 (0.821-1.22)	1.23 (0.950-1.50)	1.57 (1.14-1.96)	1.88 (1.30-2.41)
3-hr	0.213 (0.191-0.241)	0.263 (0.235-0.299)	0.329 (0.292-0.373)	0.391 (0.345-0.444)	0.492 (0.425-0.564)	0.585 (0.495-0.678)	0.700 (0.577-0.823)	0.836 (0.667-1.00)	1.06 (0.804-1.32)	1.26 (0.921-1.62)
6-hr	0.142 (0.129-0.156)	0.173 (0.158-0.192)	0.209 (0.190-0.231)	0.242 (0.218-0.269)	0.292 (0.260-0.326)	0.334 (0.293-0.376)	0.384 (0.331-0.438)	0.442 (0.371-0.511)	0.553 (0.449-0.669)	0.654 (0.516-0.821)
12-hr	0.089 (0.082-0.098)	0.109 (0.100-0.121)	0.132 (0.120-0.146)	0.152 (0.137-0.167)	0.182 (0.162-0.202)	0.206 (0.182-0.231)	0.232 (0.202-0.264)	0.261 (0.222-0.300)	0.308 (0.253-0.363)	0.347 (0.278-0.417)
24-hr	0.054 (0.050-0.059)	0.067 (0.062-0.073)	0.080 (0.074-0.087)	0.091 (0.084-0.099)	0.106 (0.097-0.115)	0.117 (0.107-0.128)	0.129 (0.118-0.141)	0.141 (0.128-0.154)	0.157 (0.141-0.184)	0.176 (0.151-0.211)
2-day	0.032 (0.029-0.034)	0.039 (0.036-0.042)	0.046 (0.043-0.050)	0.053 (0.049-0.057)	0.061 (0.056-0.066)	0.068 (0.062-0.073)	0.074 (0.068-0.081)	0.081 (0.073-0.088)	0.089 (0.080-0.098)	0.096 (0.086-0.106)
3-day	0.023 (0.021-0.025)	0.028 (0.026-0.031)	0.034 (0.031-0.037)	0.038 (0.036-0.042)	0.045 (0.041-0.048)	0.050 (0.046-0.054)	0.055 (0.050-0.059)	0.060 (0.054-0.065)	0.066 (0.060-0.073)	0.072 (0.064-0.079)
4-day	0.019 (0.017-0.020)	0.023 (0.021-0.025)	0.027 (0.026-0.030)	0.031 (0.029-0.034)	0.037 (0.034-0.040)	0.041 (0.037-0.044)	0.045 (0.041-0.049)	0.049 (0.045-0.054)	0.055 (0.049-0.060)	0.059 (0.053-0.065)
7-day	0.013 (0.012-0.014)	0.015 (0.014-0.017)	0.019 (0.017-0.020)	0.021 (0.020-0.023)	0.025 (0.023-0.027)	0.027 (0.025-0.030)	0.030 (0.028-0.033)	0.033 (0.030-0.036)	0.036 (0.033-0.040)	0.039 (0.035-0.043)
10-day	0.010 (0.009-0.011)	0.012 (0.011-0.013)	0.015 (0.014-0.016)	0.017 (0.015-0.018)	0.019 (0.018-0.021)	0.021 (0.019-0.023)	0.023 (0.021-0.025)	0.025 (0.023-0.027)	0.027 (0.025-0.029)	0.029 (0.026-0.031)
20-day	0.006 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.009-0.010)	0.011 (0.010-0.011)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.018)	0.017 (0.016-0.019)
30-day	0.005 (0.005-0.005)	0.006 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.009-0.010)	0.010 (0.010-0.011)	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.013 (0.012-0.015)
45-day	0.004 (0.004-0.004)	0.005 (0.005-0.005)	0.006 (0.006-0.006)	0.007 (0.006-0.007)	0.008 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.010)	0.010 (0.010-0.011)	0.011 (0.010-0.012)
60-day	0.004 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.006)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.009)	0.008 (0.008-0.009)	0.009 (0.008-0.010)	0.009 (0.009-0.010)

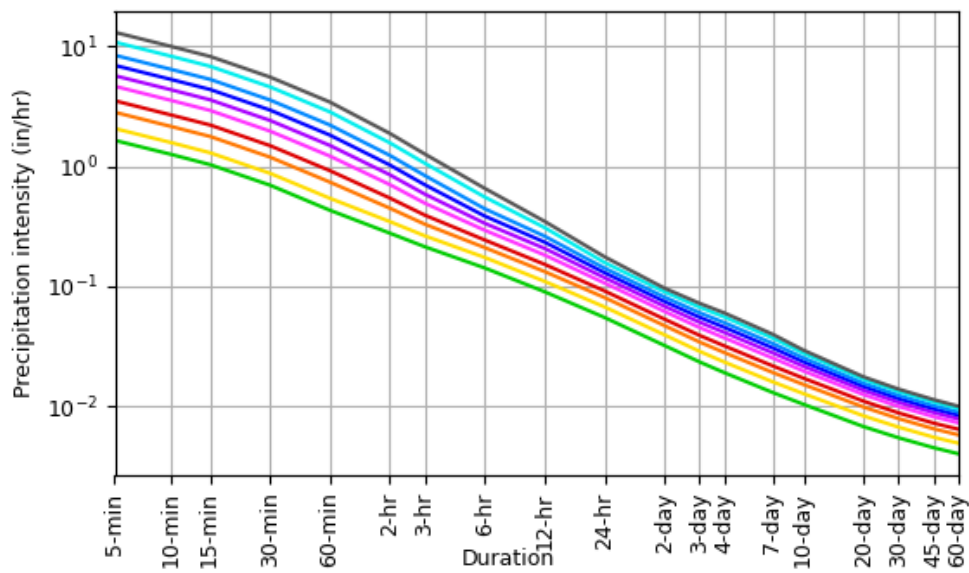
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

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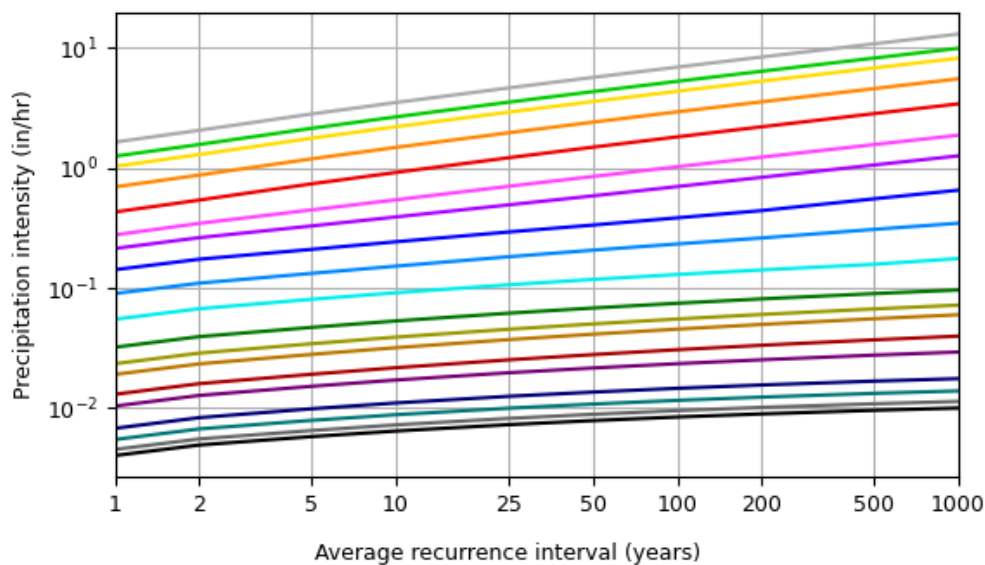
PF graphical

PDS-based intensity-duration-frequency (IDF) curves

Latitude: 41.1059°, Longitude: -112.0254°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

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Maps & aerials

Small scale terrain

EXHIBIT 2 – NOAA POINT PRECIPITATION FREQUENCY ESTIMATES - DEPTH



NOAA Atlas 14, Volume 1, Version 5
Location name: Clearfield, Utah, USA*
Latitude: 41.1059°, Longitude: -112.0254°
Elevation: 4446 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

--- Depth ---

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

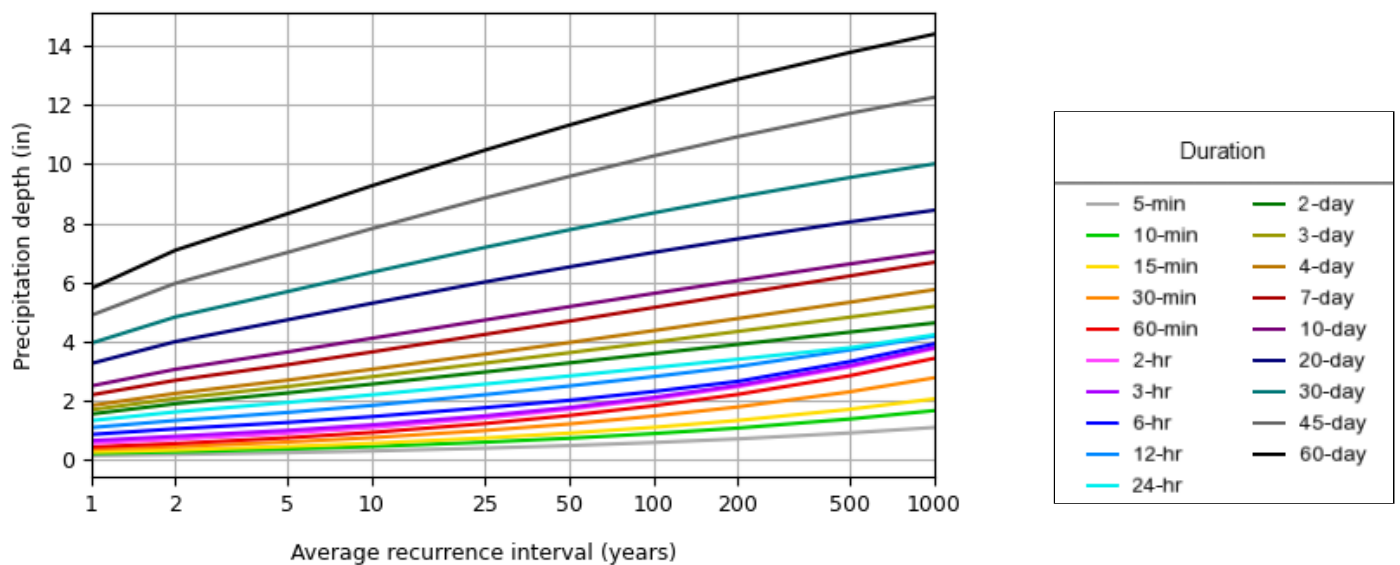
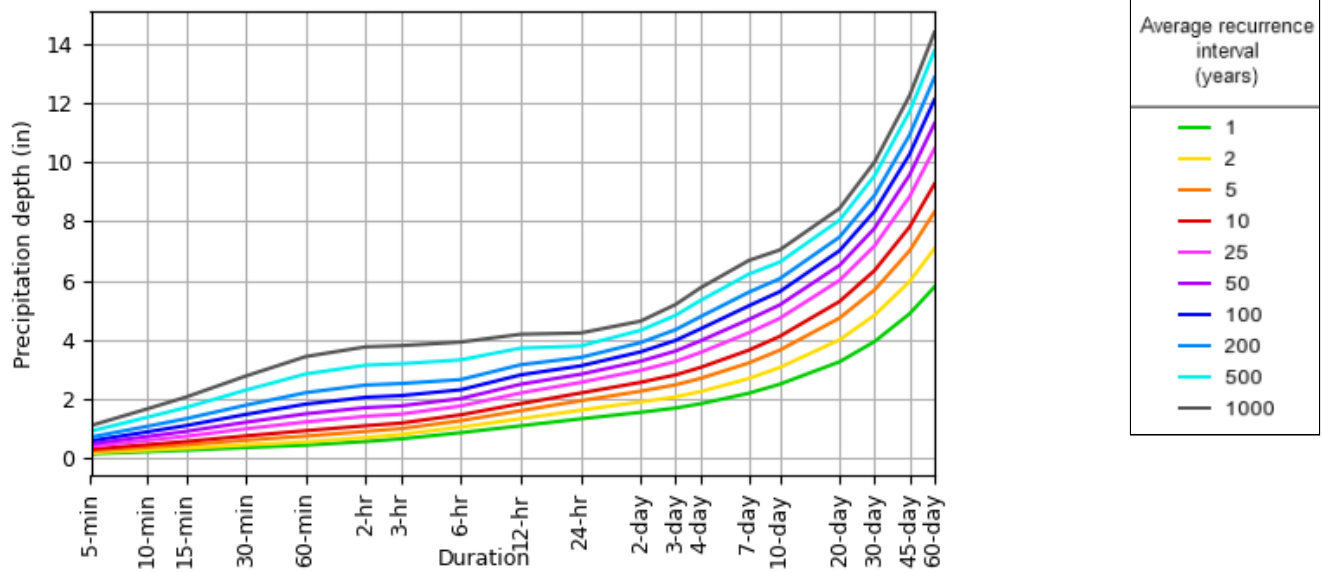
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.137 (0.118-0.161)	0.172 (0.150-0.203)	0.235 (0.204-0.276)	0.293 (0.251-0.344)	0.387 (0.324-0.458)	0.474 (0.385-0.568)	0.578 (0.454-0.699)	0.702 (0.531-0.866)	0.903 (0.645-1.15)	1.09 (0.742-1.42)
10-min	0.209 (0.180-0.244)	0.262 (0.228-0.308)	0.357 (0.309-0.420)	0.445 (0.382-0.524)	0.589 (0.493-0.697)	0.722 (0.586-0.864)	0.880 (0.692-1.06)	1.07 (0.808-1.32)	1.37 (0.982-1.74)	1.66 (1.13-2.16)
15-min	0.258 (0.223-0.303)	0.324 (0.283-0.382)	0.443 (0.384-0.520)	0.552 (0.474-0.649)	0.730 (0.611-0.864)	0.895 (0.727-1.07)	1.09 (0.857-1.32)	1.32 (1.00-1.63)	1.70 (1.22-2.16)	2.06 (1.40-2.67)
30-min	0.348 (0.301-0.407)	0.437 (0.381-0.515)	0.596 (0.517-0.700)	0.743 (0.638-0.874)	0.982 (0.823-1.16)	1.20 (0.978-1.44)	1.47 (1.15-1.78)	1.78 (1.35-2.20)	2.29 (1.64-2.91)	2.77 (1.88-3.60)
60-min	0.430 (0.372-0.504)	0.541 (0.471-0.637)	0.738 (0.639-0.867)	0.919 (0.789-1.08)	1.22 (1.02-1.44)	1.49 (1.21-1.78)	1.82 (1.43-2.20)	2.21 (1.67-2.72)	2.84 (2.03-3.60)	3.43 (2.33-4.46)
2-hr	0.554 (0.488-0.637)	0.692 (0.612-0.798)	0.895 (0.786-1.03)	1.09 (0.944-1.26)	1.41 (1.19-1.64)	1.70 (1.41-2.00)	2.05 (1.64-2.44)	2.46 (1.90-3.00)	3.14 (2.28-3.93)	3.76 (2.61-4.82)
3-hr	0.641 (0.574-0.726)	0.790 (0.708-0.898)	0.988 (0.879-1.12)	1.18 (1.04-1.34)	1.48 (1.28-1.69)	1.76 (1.49-2.04)	2.10 (1.73-2.47)	2.51 (2.00-3.01)	3.18 (2.42-3.97)	3.80 (2.77-4.87)
6-hr	0.851 (0.778-0.938)	1.04 (0.949-1.15)	1.26 (1.14-1.39)	1.46 (1.31-1.61)	1.75 (1.56-1.96)	2.00 (1.76-2.25)	2.30 (1.98-2.62)	2.65 (2.22-3.06)	3.32 (2.69-4.01)	3.92 (3.09-4.92)
12-hr	1.08 (0.989-1.19)	1.32 (1.21-1.46)	1.60 (1.45-1.76)	1.83 (1.66-2.02)	2.19 (1.96-2.44)	2.49 (2.20-2.79)	2.81 (2.43-3.19)	3.15 (2.68-3.63)	3.71 (3.06-4.38)	4.18 (3.36-5.03)
24-hr	1.32 (1.22-1.43)	1.61 (1.49-1.76)	1.93 (1.78-2.10)	2.19 (2.02-2.39)	2.55 (2.34-2.78)	2.83 (2.59-3.08)	3.11 (2.84-3.39)	3.40 (3.08-3.71)	3.78 (3.40-4.42)	4.22 (3.64-5.08)
2-day	1.54 (1.43-1.67)	1.89 (1.75-2.05)	2.26 (2.09-2.45)	2.55 (2.36-2.77)	2.96 (2.73-3.21)	3.27 (3.00-3.55)	3.58 (3.28-3.90)	3.90 (3.54-4.25)	4.31 (3.88-4.72)	4.62 (4.14-5.12)
3-day	1.68 (1.56-1.82)	2.07 (1.92-2.24)	2.47 (2.29-2.67)	2.81 (2.60-3.03)	3.26 (3.01-3.53)	3.61 (3.32-3.91)	3.97 (3.63-4.31)	4.34 (3.94-4.72)	4.82 (4.34-5.27)	5.19 (4.64-5.71)
4-day	1.83 (1.70-1.97)	2.24 (2.08-2.42)	2.69 (2.50-2.90)	3.06 (2.83-3.30)	3.56 (3.29-3.84)	3.96 (3.64-4.28)	4.36 (3.99-4.72)	4.78 (4.34-5.19)	5.32 (4.80-5.81)	5.75 (5.14-6.31)
7-day	2.19 (2.03-2.36)	2.68 (2.49-2.89)	3.21 (2.99-3.46)	3.64 (3.39-3.92)	4.23 (3.92-4.55)	4.68 (4.32-5.04)	5.14 (4.72-5.55)	5.60 (5.12-6.08)	6.22 (5.63-6.78)	6.68 (6.00-7.33)
10-day	2.49 (2.31-2.68)	3.06 (2.84-3.29)	3.64 (3.39-3.91)	4.11 (3.82-4.41)	4.72 (4.38-5.07)	5.17 (4.78-5.56)	5.62 (5.18-6.05)	6.06 (5.56-6.55)	6.62 (6.04-7.18)	7.03 (6.38-7.66)
20-day	3.25 (3.03-3.48)	3.99 (3.72-4.28)	4.73 (4.41-5.07)	5.29 (4.94-5.67)	6.00 (5.60-6.43)	6.52 (6.06-6.98)	7.01 (6.51-7.52)	7.47 (6.91-8.02)	8.04 (7.41-8.67)	8.44 (7.75-9.13)
30-day	3.94 (3.68-4.21)	4.83 (4.51-5.17)	5.68 (5.32-6.08)	6.34 (5.92-6.77)	7.17 (6.69-7.66)	7.77 (7.23-8.30)	8.35 (7.74-8.94)	8.88 (8.22-9.54)	9.55 (8.79-10.3)	10.0 (9.19-10.8)
45-day	4.88 (4.55-5.22)	5.97 (5.57-6.40)	7.01 (6.54-7.51)	7.82 (7.30-8.36)	8.84 (8.24-9.45)	9.58 (8.91-10.2)	10.3 (9.54-11.0)	10.9 (10.1-11.7)	11.7 (10.8-12.6)	12.3 (11.3-13.2)
60-day	5.78 (5.40-6.19)	7.08 (6.61-7.59)	8.32 (7.77-8.90)	9.27 (8.66-9.90)	10.5 (9.76-11.2)	11.3 (10.5-12.1)	12.1 (11.3-13.0)	12.9 (11.9-13.8)	13.8 (12.7-14.8)	14.4 (13.3-15.5)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.1059°, Longitude: -112.0254°



Maps & aerials

Small scale terrain

EXHIBIT 3 – SUMMARY OF ALLOWABLE LID BMPs



Summary of LID BMPs and Recommendations on Where to Allow
from *A Guide to Low Impact Development within Utah*

<https://deg.utah.gov/water-quality/low-impact-development>

LID BMP Category	LID BMP Type	Fact Sheet ID	Removal Effectiveness ¹	Primary Functions			Maintenance Effort	Where Permitted				
				Bioretention	Volume Retention	Biofiltration		Residential - Public Roads	Residential - Private Roads	Residential - Multi-family	Commercial	Industrial
Bioretention	Rain Garden	BR-1	high	yes	yes	yes	low-med	no	yes	yes	yes	yes
	Bioretention Cell	BR-2	high	yes	yes	yes	low-med	yes	yes	yes	yes	yes
	Bioswale	BR-3	medium	yes	some	yes	low	yes	yes	yes	yes	yes
	Vegetated Strip	BR-4	med-high	yes	some	yes	low	yes	yes	yes	yes	yes
	Tree Box Filter	BR-5	med-high	yes	varies	yes	medium	yes	yes	yes	yes	yes
	Green Roof	BR-6	med-high	yes	yes	yes	med-high	no ²	no ²	no ²	yes	yes
Pervious Surfaces	Pervious Surfaces	PS-1	high	yes	yes	some	low-med	no ²	no ²	yes	yes	yes
Infiltration Devices ⁵	Infiltration Basin ³	ID-1	high	yes	yes	yes	low	yes	yes	yes	yes	yes
	Infiltration Trench	ID-2	high	yes	yes	some	low	yes	yes	yes	yes	no
	Dry Well ^{3,4}	ID-3	high	yes	yes	no	low-med	no	yes	yes	yes	no
	Underground Infiltration Gallery ^{3,4}	ID-4	high	yes	yes	no	low-med	no	yes	yes	yes	yes
Harvest and Reuse	Harvest and Reuse ⁶	HR-1	varies	varies	yes	varies	low	no ²	no ²	no ²	yes	yes

Notes

- ¹ Sediment, Nutrients, Metals, Bacteria, Oil/Grease
- ² Individual homes may utilize BMP, but it will not count towards LID and retention requirement for development.
- ³ Requires pre-treatment
- ⁴ Requires UIC Class V injection well permit from State of Utah
- ⁵ Other factors (e.g. drinking water source protection zone, contaminated groundwater, etc.) may limit use.
- ⁶ Requires registration with DWRi

APPENDIX B – GEOTECHNICAL INVESTIGATION REPORT MINIMUM REQUIREMENTS

APPENDIX B

GEOTECHNICAL INVESTIGATION REPORT MINIMUM REQUIREMENTS

B1. General Provisions

- A. All reports shall include the Minimum Testing Requirements and use the Design Parameters as detailed below.
- B. All reports shall be signed and sealed by a registered Professional Engineer licensed in Utah.

B2. Report Contents

- A. Geotechnical Investigation Report submitted to Clearfield City shall generally include the following contents, as applicable.

CONTENTS

- 1.0 *Project Description/Overview*
 - 1.1 *Existing Conditions*
 - 1.2 *Proposed Improvements*
- 2.0 *Site Conditions*
 - 2.1 *Surface Conditions*
 - 2.2 *Subsurface Conditions*
 - 2.3 *Groundwater*
- 3.0 *Subsurface Investigation*
 - 3.1 *Percolation Test*
 - 3.2 *Infiltration Test*
- 4.0 *Laboratory Testing*
- 5.0 *Geologic Hazards*
 - 5.1 *Rock Fall*
 - 5.2 *Faulting*
 - 5.3 *Seismic/Ground Motions*
 - 5.4 *Lateral Spread*
 - 5.5 *Liquefaction Potential*
 - 5.6 *Landslide and Scarps*
 - 5.7 *Debris Flow/Alluvial Fan*
 - 5.8 *Expansive/Collapsible Soils*
 - 5.9 *Avalanche*
- 6.0 *Earthwork*
 - 6.1 *Site Preparation and Grading*
 - 6.2 *Temporary Excavations*
 - 6.3 *Permanent Cut and Fill Slopes*
 - 6.4 *Fill Material Composition, Placement, and Compaction*
 - 6.5 *Roadway and Embankments Fill*
 - 6.6 *Structural Fill*

- 6.7 *Utility Trenches*
- 6.8 *Re-use of Excavated Soil Materials*
- 7.0 *Foundations*
 - 7.1 *Foundation Recommendations*
 - 7.2 *Installation Requirements*
 - 7.3 *Estimated Settlement*
 - 7.4 *Lateral Resistance*
- 8.0 *Static and Seismic Lateral Earth Pressures (Active, Moderately Yielding, At-Rest, and Passive Conditions)*
- 9.0 *Floor Slabs*
- 10.0 *Drainage Recommendations*
 - 10.1 *Surface*
 - 10.2 *Subsurface*
 - 10.3 *Foundation Drains/Subdrains*
- 11.0 *Pavement Section*
 - 11.1 *(See Section B4)*
 - 11.2 *Exterior Concrete Flatwork*
- 12.0 *Retaining Walls (Required for all retaining walls taller than 4 feet, when used)*
 - 12.1 *Surface and Subsurface Drainage*
 - 12.2 *Internal and Global Stability (Static and Seismic Loading)*
 - 12.3 *Dimensions and Elevations*
 - 12.4 *Settlements*
 - 12.5 *Construction Inspection*
- 13.0 *Slope Stability (Required for slopes greater than 25%)*
- 14.0 *References*
- Tables*
- Figures*
 - A. *Project Location/Site Map*
 - B. *Boring/Test Pit Locations*
 - C. *Boring/Test Pit Logs*
 - D. *Key to Symbols for Boring/Test Pit Logs*
- Appendices, as needed*

B3. Minimum Testing Requirements

- A. Borings (B) and Test Pits (TP), either known as a “hole”
 - 1. Total: Minimum 1 hole per 2 acres, rounded up
 - a. Example: 5.5 acre site: $5.5 \div 2 = 2.75$, round up to 3 holes
 - 2. Roadway: 1 hole + 1 hole per 500 lf of roadway (rounded up, along centerline alignment) (counts towards Total)
 - a. Example: 10.5 acre subdivision with 1,850 lf of roadway centerline
 - i. Roadway: $1 + (1,850 \div 500) = 4.7$, round up to 5 holes
 - ii. Total, minimum: $10.5 \div 2 = 5.25$, round up to 6 holes

- iii. Therefore, 6 total holes are required for subdivision, with 5 of the holes being along the roadway alignment.
- 3. Commercial sites: 1 hole + 1 hole per 5,000 square feet (rounded up) for buildings
 - a. Example: 13,500 sf building: $1 + (13,500 \div 5,000) = 3.7$, round up to 4 holes
- 4. Additional borings or test pits as may be required for a representative sampling of the site, as determined by the geotechnical engineer.

B4. Minimum Design Parameters for Pavement

- A. Local/Residential
 - 1. 75,000 ESALS per year
 - 2. 20-yr design life
 - 3. 3% growth factor
- B. Cul-de-Sac
 - 1. 50,000 ESALS per year
 - 2. 20-yr design life
 - 3. 3% growth factor
- C. Minor Collector
 - 1. 300,000 ESALS per year
 - 2. 20-yr design life
 - 3. 3% growth factor
- D. Major Collector / Minor Arterial
 - 1. Contact City for traffic requirements

APPENDIX C – TRAFFIC IMPACT STUDY MINIMUM REQUIREMENTS

APPENDIX C

TRAFFIC IMPACT STUDY MINIMUM REQUIREMENTS

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C1. Purpose and General Provisions

- A. The level of the Traffic Impact Study (TIS) is based upon the size and magnitude of the proposed project.
- B. The purpose of the TIS is to identify the system and immediate area impacts associated with the proposed connection(s). Identification of impacts and appropriate mitigation measures allows the City to assess the existing and future system safety, performance, maintenance, and capacity needs.
- C. Threshold criteria for different levels of projects have been developed to avoid placing undue burden on applicants with small projects, while ensuring that large projects with significant impacts are thoroughly evaluated.
- D. Any proposed access onto a state road will be subject to all applicable UDOT provisions. In addition to any study required by UDOT, the City may require a separate TIS to identify impacts unique to the City's interests.
- E. All reports shall include the minimum requirements and use the study level parameters as detailed below.
- F. All reports shall be signed and sealed by a registered Professional Engineer licensed in Utah.

C2. Report Contents

- A. Traffic Impact Study submitted to Clearfield City shall generally include the following contents, as applicable.

CONTENTS

- 1.0 *Introduction and Summary*
- 2.0 *Proposed Project*
- 3.0 *Study Area Conditions*
- 4.0 *Analysis of Existing Conditions*
- 5.0 *Projected Traffic*
- 6.0 *Traffic Analysis*
- 7.0 *Conclusions*
- 8.0 *Recommendations*
- 9.0 *Appendices*
 - 9.1 *Traffic Counts*
 - 9.2 *Traffic Capacity Analysis*
 - 9.3 *Accident Summary*
 - 9.4 *Request for change or access (if applicable)*
- 10.0 *Figures and Tables*

B. The following items shall be documented in the Study:

1. Site location – showing area roadways.
2. Site Plan.
 - a. Identify geometric / physical concerns relating to area, site and specific access points.
 - b. Include adjacent street and access points.
3. Existing roadway and traffic control features:
 - a. Number of lanes
 - b. Lane widths
 - c. Alignment
 - d. Location of traffic signals
 - e. Signs
 - f. Off system features as related to site plan and access point(s)
4. Existing daily volumes (directional if possible) and peak hour training volumes.
 - a. Discuss traffic characteristics (vehicle mix, % makeup, and any special vehicle requirements)
5. Collection diagram summary.
6. Site generated trip summary.
 - a. Discuss trip vehicle make-up and any special vehicle requirements
 - b. Discuss trip reduction strategies (if applicable)
7. Directional distribution of site generated traffic.
8. Assignment of non-site related traffic (existing, background, and future).
 - a. Document both existing and committed development, and when appropriate other background planned development traffic
 - b. Assignment of total future non-site traffic for design year
9. Assignment of site traffic.
10. Traffic capacity analysis.
 - a. Projected levels of service without the project – coincide with development phase years
 - b. Projected levels of service with the project (by development phase year)
 - c. Recommended mitigation / improvement(s)

11. Scaled schematic drawings illustrating:

- a. Alignment
- b. Number of lanes
- c. Lane widths
- d. Signing
- e. Pavement markings
- f. Signal phasing
- g. Signal head locations
- h. Lane markings

C3. Level of Study

The following guidelines shall be used when determining the level of study required:

Study Level	Threshold	Typical Land Use Intensity Threshold (ITE Trip Generation)	
1	Projected Site Traffic < 100 ADT AND No proposed modifications to traffic signals or elements of the roadway	Single Family Apartment Lodging General Office Retail	< 10 units < 15 units < 11 occupied rooms < 9,000 square feet < 2,500 square feet
2	Projected Site Traffic 100 to 3,000 ADT OR Projected Peak Hour Traffic < 500 AND Minor modifications to traffic signals or elements of the roadway	Single Family Apartment Lodging General Office Retail Gas Station Fast Food Restaurant	10 to 315 units 15 to 450 units 11 to 330 occupied rooms 9,000 to 27,000 square feet 2,500 to 70,000 square feet 1 to 18 fueling positions 1,000 to 6,000 square feet 1,000 to 26,00 square feet
3	Projects Site Traffic 3,000 to 10,000 ADT OR Projected Peak Hour Traffic 500 to 1,200 OR Proposed installation or modification to traffic signals or elements of the roadway, regardless of project size	Single Family Apartment Lodging General Office Retail Fast Food	315 to 1,000 units 450 to 1,500 units 330 to 1,100 occupied rooms 270,000 to 900,000 square feet 70,000 to 230,000 square feet 6,000 to 20,000 square feet
4	Projected Site Traffic > 10,000 ADT OR Proposed installation / modification of two or more traffic signals, addition of travel lanes or proposed modification of highway or freeway, or interchange, regardless of project size	Single Family Apartment Lodging General Office Retail	> 1,000 units > 1,500 units > 1,100 occupied rooms > 900,000 square feet > 230,000 square feet

C4. Level 1 Study Requirements**A. When Required**

1. Project ADT < 100 trips
2. No proposed modifications to traffic signals or roadway elements or geometry.

B. Minimum Study Requirements

1. Incorporate traffic engineering principles and standards as required in the City Standards, State Standards, and national practices. Additional requirements and investigation may be imposed upon the applicant as deemed necessary by the City.
2. Study Area
 - a. Depending on the size and intensity of the development and surrounding development, the study area may be identified by parcel boundary, area of immediate influence, or reasonable travel time boundary.
 - b. May be limited to or include property frontage and include neighboring and adjacent parcels.
 - c. Shall identify site, cross, and all adjacent up and down stream access points within 1,000-ft of property boundaries.
 - d. May be extended or revised by the City Engineer, as deemed necessary.
3. Design Year
 - a. Current year of the project.
4. Analysis Conditions and Period
 - a. Identify site traffic volumes and characteristics.
 - b. Identify adjacent street(s) traffic volume and characteristics.
5. Right-of-Way Access
 - a. Identify right-of-way, geometric boundaries, and physical conflicts.
 - b. Investigate existence of federal or state, no access, or limited access control line.
6. Data Collection
 - a. Generate access point capacity analysis as necessary.
 - b. Analyze site and adjacent traffic for the following time periods:
 - i. Weekday AM and PM peak hours
 - ii. Saturday peak hours
 - c. Identify special event peak hour as necessary (per roadway peak and site peak)

7. Trip Generation

- a. Use equations or rates available in latest edition of ITE Trip Generation.
- b. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the City.

8. Design and Mitigation

- a. Identify operational concerns and mitigation measures to ensure safe and efficient operation in accordance with industry standards and the City's adopted minimum level of service.

C5. Level 2 Study Requirements (small)

A. When Required

1. Project ADT 100 to 3,000 trips

B. Minimum Study Requirements

1. Incorporate traffic engineering principles and standards as required in the City Standards, State Standards, and national practices. Additional requirements and investigation may be imposed upon the applicant as deemed necessary by the City.
2. Study Area
 - a. Defined by the Traffic Engineer completing the TIS.
 - b. Depending on the size and intensity of the development and surrounding development, the study area may be identified by parcel boundary, area of immediate influence, or reasonable travel time boundary.
 - c. Intersection of site access drives with state highways and any signalized and unsignalized intersection within 1,500-ft of property line.
 - d. Include any identified queuing distance at site and study intersection.
 - e. May be extended or revised by the City Engineer, as deemed necessary.
3. Design Year
 - a. Current year of the project.
4. Analysis Conditions and Period
 - a. Identify site and adjacent road traffic work weekday AM and PM peak hours.
5. Data Collection
 - a. Identify site and adjacent street roadway and intersection geometries.
 - b. Identify adjacent street(s) traffic volume and characteristics.

6. Trip Generation
 - a. Use equations or rates available in latest edition of ITE Trip Generation.
 - b. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the City.
7. Conflict / Capacity Analysis
 - a. Diagram flow of traffic at access point(s) for site and adjacent development.
 - b. Perform capacity analysis as determined by Traffic Engineer completing the TIS.
8. Right-of-Way Access
 - a. Identify right-of-way, geometric boundaries, and physical conflicts.
 - b. Investigate existence of federal or state, no access, or limited access control line.
9. Design and Mitigation
 - a. Determine and document safe and efficient operational design needs based on site and study data.
 - b. Identify operational concerns and mitigation measures to ensure safe and efficient operation in accordance with industry standards and the City's adopted minimum level of service.

C6. Level 2 Study Requirements (large)

- A. When Required
 1. Project ADT 100 to 3,000 trips
 2. Peak hour < 500 trips
 3. Any proposed modification to traffic signals or roadway elements or geometry.
- B. Minimum Study Requirements
 1. Incorporate traffic engineering principles and standards as presented in the City Standards, State Standards, and national practices. Additional requirements and investigation may be imposed upon the applicant as deemed necessary by the City.
 2. Study Area
 - a. Defined by Traffic Engineer completing the TIS.
 - b. Depending on the size and intensity of the development and surrounding development, the study area may be identified by parcel boundary, area of immediate influence, or reasonable travel time boundary.
 - i. An acceptable traffic study boundary, based on travel time, may be identified as a 10 to 20 minutes travel time or by market area influence.

- c. Intersection of site access drives with state highways and any signalized and unsignalized intersection within 2,000-ft of property line.
 - d. Include any identified queuing distance at site and study intersection.
 - e. May be extended or revised by the City Engineer, as deemed necessary.
- 3. Design Year
 - a. Current year of the project.
 - b. 5 years after project completion.
 - c. Document and include all phases of development.
- 4. Analysis Period
 - a. Analyze site and adjacent road traffic for weekday AM and PM peak hours including Saturday peak hours.
 - b. Identify special event peak hours as necessary (adjacent roadway peak and site peak).
- 5. Data Collection
 - a. Daily and turning movement counts.
 - b. Identify site and adjacent street roadway and intersection geometries.
 - c. Traffic control devices including traffic signals and regulatory signs.
 - d. Traffic accident data within the last 10 years.
- 6. Trip Generation
 - a. Use equations or rates available in latest edition of ITE Trip Generation.
 - b. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the City.
- 7. Trip Distribution and Assignment
 - a. Document distribution and assignment of existing site, background, and future traffic volumes or surrounding network of study area.
- 8. Conflict / Capacity Analysis
 - a. Diagram flow of traffic at access point(s) for site and adjacent development.
 - b. Perform capacity analysis for daily and peak hour volumes.
- 9. Right-of-Way Access
 - a. Identify right-of-way, geometric boundaries, and physical conflicts.
 - b. Investigate existence of federal or state, no access, or limited access control line.

10. Design and Mitigation

- a. Determine and document safe and efficient operational design needs based on site and study data.
- b. Identify operational concerns and mitigation measures to ensure safe and efficient operation in accordance with industry standards and the City's adopted minimum level of service.

C7. Level 3 Study Requirements

A. When Required

1. Project ADT 3,000 to 10,000 trips
2. Peak hour 500 to 1,200 trips
3. Any proposed installation or modification to traffic signals or roadway elements or geometry – regardless of project size or trip generation.

B. Minimum Study Requirements

1. Incorporate traffic engineering principles and standards as presented in the City Standards, State standards, and national practices. Additional requirements and investigation may be imposed upon the applicant as deemed necessary by the City.
2. Study Area
 - a. Defined by Traffic Engineer completing the TIS.
 - b. Depending on the size and intensity of the development and surrounding development, the study area may be identified by parcel boundary, area of immediate influence, or reasonable travel time boundary.
 - i. An acceptable traffic study boundary, based on travel time, may be identified as a 10 to 20 minutes travel time or by market area influence.
 - c. Intersection of site access drives with state highways and any intersection within ½ mile of property line on each side of project site.
 - d. May be extended or revised by the City Engineer, as deemed necessary.
3. Design Year
 - a. Current year of the project.
 - b. 5 years after project completion.
 - c. Document and include all phases of development.
4. Analysis Period
 - a. Analyze site and adjacent road traffic for weekday AM and PM peak hours including Saturday peak hours.

- b. Identify special event peak hours as necessary (adjacent roadway peak and site peak).
- 5. Data Collection
 - a. Daily and turning movement counts.
 - b. Identify site and adjacent street roadway and intersection geometries.
 - c. Traffic control devices including traffic signals and regulatory signs.
 - d. Automatic continuous traffic counts for at least 48 hours.
 - e. Traffic accident data within the last 10 years.
- 6. Trip Generation
 - a. Use equations or rates available in latest edition of ITE Trip Generation.
 - b. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the City.
- 7. Trip Distribution and Assignment
 - a. Document distribution and assignment of existing site, background, and future traffic volumes or surrounding network of study area.
- 8. Conflict / Capacity Analysis
 - a. Level of Service (LOS) for all intersections.
 - b. LOS for existing conditions, design year without project, design year with project.
- 9. Traffic Signal Impacts (for proposed traffic signals) shall follow all UDOT requirements and include:
 - a. Traffic signal warrants as identified.
 - b. Traffic signal drawings as identified.
 - c. Queuing analysis.
 - d. Traffic systems analysis (includes acceleration, deceleration, and weaving).
 - e. Traffic coordination analysis.
- 10. Right-of-Way Access
 - a. Identify right-of-way, geometric boundaries, and physical conflicts.
 - b. Investigate existence of federal or state, no access, or limited access control line.
- 11. Accident and Traffic Safety Analysis
 - a. Existing vs. proposed development.

12. Design and Mitigation

- a. Determine and document safe and efficient operational design needs based on site and study data.
- b. Identify operational concerns and mitigation measures to ensure safe and efficient operation in accordance with industry standards and the City's adopted minimum level of service.

C8. Level 4 Study Requirements**A. When Required**

1. Project ADT > 10,000 trips
2. Peak hour > 1,200 vehicles per hour
3. Any proposed installation or modification of 2 or more traffic signals
4. Addition of traffic lanes
5. Modification of freeway interchange

B. Minimum Study Requirements

1. Incorporate traffic engineering principles and standards as presented in the City Standards, State standards, and national practices. Additional requirements and investigation may be imposed upon the applicant as deemed necessary by the City.
2. Study Area
 - a. Defined by Traffic Engineer completing the TIS.
 - b. Depending on the size and intensity of the development and surrounding development, the study area may be identified by parcel boundary, area of immediate influence, or reasonable travel time boundary.
 - i. An acceptable traffic study boundary, based on travel time, may be identified as a 10 to 20 minutes travel time or by market area influence.
 - c. Intersection of site access drives with state highways and any intersection within ½ mile of property line on each side of project site.
 - d. Any intersection or freeway interchange impacted by more than 500 peak hour trips.
 - e. May be extended or revised by the City Engineer, as deemed necessary.
3. Design Year
 - a. Current year of the project.
 - b. 5 years after project completion.

- c. Document and include all phases of development.
- 4. Analysis Period
 - a. Analyze site and adjacent road traffic for weekday AM and PM peak hours including Saturday peak hours.
 - b. Identify special event peak hours as necessary (adjacent roadway peak and site peak).
- 5. Data Collection
 - a. Daily and turning movement counts.
 - b. Identify site and adjacent street roadway and intersection geometries.
 - c. Traffic control devices including traffic signals and regulatory signs.
 - d. Automatic continuous traffic counts for at least 48 hours.
 - e. Traffic accident data within the last 10 years.
- 6. Trip Generation
 - a. Use equations or rates available in latest edition of ITE Trip Generation.
 - b. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the City.
- 7. Trip Distribution and Assignment
 - a. Document distribution and assignment of existing site, background, and future traffic volumes or surrounding network of study area.
- 8. Conflict / Capacity Analysis
 - a. Level of Service (LOS) for all intersections.
 - b. LOS for existing conditions, design year without project, design year with project.
- 9. Traffic Signal Impacts (for proposed traffic signals) shall follow all UDOT requirements and include:
 - a. Traffic signal warrants.
 - b. Traffic signal drawings.
 - c. Queuing analysis.
 - d. Traffic systems analysis (includes acceleration, deceleration, and weaving).
 - e. Traffic coordination analysis.
- 10. Right-of-Way Access
 - a. Identify right-of-way, geometric boundaries, and physical conflicts.

- b. Investigate existence of federal or state, no access, or limited access control line.

11. Accident and Traffic Safety Analysis

- a. Existing vs. proposed development.

12. Design and Mitigation

- a. Determine and document safe and efficient operational design needs based on site and study data.
- b. Identify operational concerns and mitigation measures to ensure safe and efficient operation in accordance with industry standards and the City's adopted minimum level of service.

APPENDIX D – MINIMUM STANDARDS FOR EFFICIENT LANDSCAPE IRRIGATION SYSTEM DESIGN AND INSTALLATION

APPENDIX D
MINIMUM STANDARDS FOR
EFFICIENT LANDSCAPE IRRIGATION SYSTEM DESIGN AND INSTALLATION

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D1. Introduction and General Scope

- A. The purpose of these irrigation standards is to promote efficient irrigation design and installation. Emphasis on conserving water through modern irrigation practices is underscored throughout these standards.
- B. Irrigation systems shall be subject to construction and completion inspections as specified by the system designer prior to turning the system over to the city.
- C. Irrigation drawings shall include but not be limited to zone size, operating pressure, and scheduled flow rates.
- D. The city shall be provided with a complete scaled as-built drawing upon project completion (see Section D8).

D2. System Characteristics

- A. Design and construction of irrigation systems must meet all applicable codes. Components of the irrigation system shall be designed and installed in accordance with guidelines set forth by manufacturers.
- B. Spray or overhead type systems shall be designed to match / provide efficient watering cycles utilizing E.T. as the baseline.
- C. Systems shall be designed to provide a minimum of 60% Distribution Uniformity (DU) for spray type heads and 70% DU for rotor type heads.
- D. Pressure regulation devices will be installed to allow the entire system, including all remote-control valves and all sprinkler heads, to operate at optimum pressure designated by the product manufacturer. Pressure regulation devices may include one or all the following:
 - 1. Pressure regulation valve at main line POC
 - 2. Pressure regulation device on / at remote control valve
 - 3. Pressure regulation device on individual sprinkler heads
 - 4. Regulation of low volume drip / micro systems
- E. Booster pumps shall be installed on systems where supply pressure does not meet the minimum recommended pressures of sprinkler manufacturers.
- F. Systems shall be able to complete watering in 10 hours or less per night (applies to post established landscapes).
- G. Provide separate zones for turf, shrubs, and drip.
- H. Provide separate zones for different exposures (e.g. north side of building vs. south side).
- I. Match appropriate zones for plant material to irrigation.
- J. Provide separate zones for sloped areas. When irrigating slopes, take runoff at slope bottom into consideration. Run lateral lines parallel to slope.
- K. Systems shall contain check valves to prevent low point drainage where applicable.
- L. Provide separate zones for variations in site soil types.
- M. Design and / or install with reduced head spacing or low angle nozzles for windy conditions.

- N. Each zone shall have its own station on the controller.
- O. No single zone shall be designed or installed with sprinklers of differing pressure requirements or precipitation rates. Rotors, spray heads, or drip emitters may not be mixed within the same zone.
- P. All sprinkler heads shall be spaced at a maximum of 50% of the design performance diameter of the sprinkler. Spacing shall be reduced below 50% of the design performance diameter when conditions demand.
- Q. Irrigation systems with 1" POC or 2500 square feet or larger of landscaped area shall have a master valve installed.
- R. The UIA endorses the use of non-potable color indicators (equipment) for heads, valves, valve boxes, quick couplers, piping, etc., when irrigation systems are supplied by secondary or other non-potable water sources.

D3. Point of Connection

- A. Systems with irrigated area of 1 acre and larger shall have a master valve that is normally closed. Where necessary, the master valve shall be capable of manual operation to allow manual use of the irrigation system. A normally open master valve is acceptable if the controller can shut the valve off in the event of an unscheduled flow.
- B. Recommended Point of Connection component installation order:
 - 1. Connection to Source
 - 2. Stope & Waste Valve or Shut off
 - 3. Wye Strainer
 - 4. Pressure Regulator
 - 5. Backflow Preventer
 - 6. Quick Couple Blowout
 - 7. Master Valve
 - 8. Flow Meter (if required)
- C. In situations of secondary water supply, provide filtration system necessary to clean water supply and protect irrigation system components. Provide accessible pressure gauges immediately upstream and downstream of the filtration device (non-self-cleaning units).
- D. The UIA recommends with 1 ½" POC systems, an additional separate water meter be installed for use with the landscape.

D4. Controller / Wire

- A. Controller shall be able to provide separate programs for turf zones, shrub zones, and drip zones.

- B. Controllers shall be capable of temporarily shutting down the system by utilizing internal / external options such as rain, wind, and freeze devices.
- C. Controllers shall be programmable for multiple start times for repeat and rest periods and shall be capable of water budget adjustment.
- D. Power wire and control wire shall not be contained in the same conduit.
- E. Controller wiring with outdoor exposure shall be contained in steel rigid conduit. Indoor controller wiring shall be contained in EMT conduit.
- F. Remote control valve wiring shall be a minimum of 14-gauge UF UL or PE UL rated.
- G. All wire connections shall be made with watertight connectors and contained within a valve box.
- H. Provide slack / extra control wire at all changes in directions.
- I. Provide 36 inches of slack wire at each remote-control valve in valve box.
- J. Remote control valve wiring shall be installed with the main line pipe where possible, taped to the underside of the mainline pipe at regular intervals.
- K. Remote control valve wiring shall have separate colors for common, control, and spare wires.
- L. Provide a minimum of one spare wire for every five remote control valves in the system. The spare wire shall be available at all valve manifolds or clusters. All spare wires shall be a "home run" to the respective controller, with the end run common.
- M. Outdoor controllers shall be lockable and weather resistant.
- N. All wiring under hardscape shall be contained in sleeving.

D5. Pipe / Fittings

- A. All PVC pipe shall be rated ASTM D 1784 or 1785.
- B. Minimum standards for PVC Main line pipe:
 - 1. Schedule 40 for $\frac{3}{4}$ " through 1 $\frac{1}{2}$ "
 - 2. Schedule 80 for 2" through 3"
- C. Minimum standards for PVC pipe:
 - 1. Schedule 40 for $\frac{3}{4}$ " through 3"
 - 2. Class 200 for sizes 4" and larger
 - 3. $\frac{1}{2}$ " PVC pipe is not allowed
- D. Maximum flow velocity in any pipe shall not exceed 5 f/s (feet per second). Pressure Polyethylene pipe shall be ASTM D 2239 rated and is acceptable for lateral and drip tubing.

- E. All piping under hardscape shall be contained in sleeving separate from wire sleeving.
- F. All piping will be capable of winterization by air blowout with 1" quick coupler.
- G. Manual drains may be used in main line pipe applications.
- H. Minimum pipe depths:
 - 1. Lateral pipe – 12" cover
 - 2. Main line pipe – 18" cover
 - 3. Sleeving – 18" cover
- I. All piping will be backfilled with clean material, settled, and compacted to proper finish grade.
- J. All solvent weld joints shall be installed according to manufacturer specifications.
- K. All insert fittings shall be installed according to manufacturer specifications.
- L. PVC main lines shall use a minimum of:
 - 1. Push on ductile or mechanical cast iron fittings shall be used on PVC main line fittings 4" and larger.
 - 2. Proper thrust blocking shall be installed on all fittings 3" and larger.

D6. Valves

- A. Remote control valves shall be sized according to the zone demand requirement, lateral piping downstream, and manufacturer's specifications.
- B. All remote-control valves shall have flow control adjustment.
- C. Non potable (secondary) systems shall use compatible (dirty water) remote control valves.
- D. Control valves will be installed in a standard or larger, manufactured valve / meter box, capable of being bolted closed after installation.
- E. Remote control valve in valve box shall have ample space for service and to remove valve cover.
- F. Isolation valves shall be installed before control valves.
- G. Manifolds shall be built with Action gasket Valve release.

D7. Sprinkler Heads

- A. All sprinkler heads shall be attached to lateral line pipe with a flexible / adjustable swing assembly.
- B. Spray heads shall pop up a minimum of 4" in turf areas.

- C. Sprinkler heads adjacent to hardscape paving shall be spaced 1" to 3" away from paving. Sprinklers adjacent to walls, buildings, fences, or other structures shall be spaced a minimum of 6" away from structures.
- D. All sprinklers within a zone shall have matched precipitation rates.
- E. Shrub heads located adjacent to pedestrian areas shall be of the pop-up variety.
- F. Sprinklers in turf areas shall be fully spring / gear driven retractable and pop up a minimum of 4".

D8. Irrigation As-Built Drawings, Operations and Maintenance Manuals

- A. The following shall be included on Irrigation As-Built Drawings. In addition, provide a reduced color-coded drawing(s) showing all zones and assigned valves.
- B. Note all points of connection (POC), including tap size, line size, and static water pressure of service in pounds per square inch (PSI).
- C. Provide the name and phone number of the servicing water purveyor. Include the date the installation was completed and the date the as-built drawing was approved.
- D. Accurately locate all the following major components (including their size) installed on the project:
 - 1. Water Meters
 - 2. Backflow Preventers
 - 3. Pressure Reducing Valves (note pressure settings)
 - 4. Filters
 - 5. Stop and Waste
 - 6. Master Control Valves
 - 7. Isolation and Gate Valves
 - 8. Flow Sensors
 - 9. Remote Control Valves (note station assignment, size, flow rate, pressure settings, D.U. and actual flow rates if available from water audit).
 - 10. Drip System Pressure Regulators and Filters
 - 11. Quick Couplers and Hose Bibs
 - 12. Pressure Main Lines and Sizes
 - 13. Main Line Sleeves and Sizes
 - 14. Capped Main Lines and Future POC's
 - 15. Manual Drain Valves and Sumps

16. Remote Control Wire
 17. Controller Location(s) – note manufacturer, model, size, and number of stations used
 18. Rain Sensors
 19. Moisture Sensors
 20. Note and identify location(s) of existing utility systems as encountered during installation, e.g. gas, phone, power, drain lines, water, sewer, etc.
- E. Locate the following additional components installed on the project:
1. All Sprinkler Heads
 2. Lateral Lines and Sizes
 3. Lateral Line Sleeves and Sizes
 4. Manual or Automatic Flush Valves
 5. Air Release Valves / Blowouts
- F. Operations and Maintenance Manual
1. A signed and dated written description of the contractor's warranty and warranty period. Include name, address, phone number and license number.
 2. A description of system start-up and winterization process.
 3. All product literature and customer service information for products used / installed on the project.

APPENDIX E - MODIFICATIONS AND ADDITIONS TO MANUAL OF STANDARD SPECIFICATIONS

APPENDIX E

MODIFICATIONS AND ADDITIONS TO THE 2017 MANUAL OF STANDARD SPECIFICATIONS

as published by:
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Utah State University
Logan Utah
2017

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SECTION 03 20 00 M
CONCRETE REINFORCING (MODIFIED)

PART 3	EXECUTION
---------------	------------------

3.1 PLACING

Add paragraphs F and G as follows:

- F. No steel shall extend from or be visible on any finished surface.
- G. All steel shall have a minimum of 1.5-inches of concrete cover.

**SECTION 03 30 04 M
CONCRETE (Modified)****PART 2 PRODUCTS**

2.4 Add paragraph F as follows:

- F. Fiber Reinforcement: A minimum of 1.0 pounds per cubic yard of polyolefin fiber reinforcement shall be evenly distributed into the mix. Mixing shall be as recommended by the manufacturer/supplier such that the fibers do not ball up. Polyolefin fibers shall meet the requirements of ASTM C1116 and ASTM D7508.

2.5 **MIX DESIGN**

Replace Paragraph A with the following:

- A. **Class:** When not specified in the plans or project specifications, use the following table to select the class of concrete required for the application:

Class	Application
5,000	Reinforced Structural Concrete
4,000	Sidewalks, curb, gutter, cross gutters, waterways, pavements, and unreinforced footings and foundations
3,000	Thrust blocks
2,000	Anchors, mass concrete

SECTION 03 30 10 M
CONCRETE PLACEMENT (Modified)

PART 3	EXECUTION
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3.2 PREPARATION

Add paragraph F as follows:

- F. No concrete shall be placed until the surfaces have been inspected and approved by the City Engineer or City Inspector.

SECTION 31 23 16 M
EXCAVATION (Modified)

PART 3	EXECUTION
---------------	------------------

3.3 GENERAL EXCAVATION REQUIREMENT

Add paragraph I as follows:

- I. Excavation for pipelines under existing curb and gutter, concrete slabs, or sidewalks shall be open cut. Neither tunneling nor water jetting is allowed. At the option of the City Engineer, jacking or boring under permanent facilities may be allowed based on his/her direction.

Add Section 31 23 20 Fill

**SECTION 31 23 20
FILL**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-structural fill materials.
- B. Non-structural placement and compaction.

1.2 REFERENCES

A. ASTM Standards

- D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. When requested by ENGINEER, submit laboratory dry density and optimum laboratory moisture content for each type of fill to be used.

1.4 QUALITY ASSURANCE

- A. Do not change material sources without ENGINEER's knowledge.
- B. Reject material that does not comply with the requirements specified in this Section.

1.5 STORAGE

- A. Safely stockpile materials.
- B. Separate differing fill materials, prevent mixing, and maintain optimum moisture content of materials.

1.6 SITE CONDITIONS

- A. Do not place, spread, or roll any fill material over material that is damaged by water. Remove and replace damaged material at no additional cost to OWNER.
- B. Control erosion. Keep area free of trash and debris. Repair settled, eroded, and rutted areas.
- C. Reshape and compact damaged structural section to required density.

1.7 ACCEPTANCE

- A. General: Native material may be wasted if there is no additional cost to substitute material acceptable to ENGINEER.
- B. Lift thickness: One test per Lot.

- C. Compaction: One test per Lot. Verify density using nuclear tests, ASTM D 2922. Compaction and Lot sizes as follows:

- 1. Compact to 92% Standard Proctor
- 2. One Lot = 1500 square feet per lift

1.8 **WARRANTY**

- A. Repair settlement damage at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 **FILL MATERIALS**

- A. Material shall be free from sod, grass, trash, rocks larger than four (4) inches in diameter, and all other material unsuitable for construction of compacted fills.

2.2 **WATER**

- A. Make arrangements for sources of water during construction and make arrangements for delivery of water to site.
- B. Comply with local Laws and Regulations at no additional cost to OWNER when securing water from water utility company.

PART 3 EXECUTION

3.1 **PREPARATION**

- A. Implement the traffic control plan requirements, Section 01 55 26.
- B. Verify material meets maximum size requirements.
- C. If ground water is in the intended fill zone, dewater.

3.2 **PROTECTION**

- A. Protect existing trees, shrubs, lawns, structures, fences, roads, sidewalks, paving, curb and gutter and other features.
- B. Protect above or below grade utilities. Contact utility companies to repair utility damage. Pay all cost of repairs.
- C. Avoid displacement of and damage to existing installations while compacting or operating equipment.
- D. Do not use compaction equipment adjacent to walls or retaining walls that may cause wall to become over-stressed or moved from alignment.
- E. Restore any damaged structure to its original strength and condition.

3.3 **LAYOUT**

- A. Identify required line, levels, contours, and datum.
- B. Stake and flag locations of underground utilities.

- C. Upon discovery of unknown utility or concealed conditions, notify ENGINEER.
- D. Maintain all benchmarks, control monuments and stakes, whether newly established by surveyor or previously existing. Protect from damage and dislocation.
- E. If discrepancy is found between Contract Documents and site, ENGINEER shall make such minor adjustments in the Work as necessary to accomplish the intent of Contract Documents without increasing the Cost of the Work to CONTRACTOR or OWNER.

3.4 **SUBGRADE**

- A. Protect Subgrade from desiccation, flooding, and freezing.
- B. Before placing fill over Subgrade, get ENGINEER's inspection of subgrade surface preparations.
- C. If Subgrade is not readily compactable get ENGINEER's permission to stabilize the subgrade.

3.5 **TOLERANCES**

- A. Compaction: Ninety-two (92) percent minimum relative to a standard proctor density, Section 31 23 26.
- B. Lift Thickness (before compaction):
 - 1. Eight (8) inches when using riding compaction equipment.
 - 2. Six (6) inches when using hand held compaction equipment.

3.6 **CLEANING**

- A. Remove stockpiles from site. Grade site surface to prevent free standing surface water.
- B. Leave borrow areas clean and neat.

END OF SECTION

**SECTION 31 41 00 M
SHORING (Modified)**

PART 1 GENERAL

1.2 PRICE – MEASUREMENT AND PAYMENT

A. In Trenching, Shoring:

Revise subparagraph 1 to read as follows:

1. A two (2) part Protective System is required if each Side of the Trench is to be shored. The use of a Trench Box shall be classified as one Protective System.

1.4 DESIGN OF PROTECTIVE SYSTEMS

Add paragraphs C and D as follows:

- C. Trenches five (5) feet deep or greater require a protective system unless the excavation is made entirely in stable rock. If less than five (5) feet deep, a competent person may determine that a protective system is not required.
- D. Trenches 20 feet deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional engineer in accordance with 1926.652(b) and (c).

1.5 SUBMITTALS

Revise paragraph A to read as follows:

- A. Submit a Protective System plan:
 1. When excavation is over twenty (20) feet deep, or
 2. When requested by ENGINEER.

Add Article 1.6 as follows:

1.6 REFERENCES

- A. 29 CFR Part 1910 – Occupational Safety and Health Standards
- B. 29 CFR Part 1926 Subpart P – Excavations

PART 3 EXECUTION

3.4 INSPECTIONS

Add paragraph C as follows:

- C. OWNER and/or ENGINEER may order an immediate work stoppage if working conditions are thought to be unsafe. Work may resume only after proper safety precautions are implemented.

SECTION 32 01 06 M
STREET NAME SIGNS (Modified)

PART 1	GENERAL
---------------	----------------

1.2 REFERENCES

Add paragraph C as follows:

C. CLEARFIELD CITY Public Works Standard Drawings

SECTION 32 01 13.64 M
CHIP SEAL with CAPE SEAL (Modified)

PART 1	GENERAL
---------------	----------------

1.2 REFERENCES**A. ASTM Standards:**

Add the following to paragraph A:

- | | |
|-------|------------------------------------------------------------------------------|
| C 29 | Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate |
| C 330 | Standard Specification for Lightweight Aggregates for Structural Concrete |

Rename Article 1.5 as follows:

1.5 WEATHER AND CONDITIONS**D. Temperature**

Add subparagraph 4 as follows:

4. Do not place if forecasted temperature is expected to drop below 40 deg F within 72 hours of placement.

B. Moisture and Wind:

Add subparagraph 1 as follows:

1. Do not place chip seal coat if surface moisture is present.

PART 2	PRODUCTS
---------------	-----------------

2.1 ASPHALT BINDER

Revise paragraph B as follows:

- A. Emulsified Asphalt: CRS-2P or LMCRS, Section 32 12 03. Use any of the following additives to match aggregate particle charge, weather conditions, and mix design:
(Subparagraphs 1-5 remain unchanged.)

2.2 COVER AGGREGATE**A. Material:**

Revise subparagraph 2 to read as follows:

2. 100% Crusher processed rotary kiln lightweight expanded shale chips (Utelite or approved equal).

Replace Table 1 with the following:

Table 1 – Physical Properties of Lightweight Aggregate (ASTM C330)			
Property	ASTM	Min.	Max.
Clay Lumps and Friable Particles, percent	C142	-	2
Bulk Density Dry Loose Condition, lb/ft ³	C29	-	55

B. Gradation: Analyzed on a dry weight and percent passing basis.

Replace Table 2 with the following:

Table 2 – Master Grading Band for Lightweight Aggregate		
Sieve	ASTM	C330 Requirement
1/2"	C136	100
3/8"		80-100
No. 4		5-40
No. 8		0-20
No 16		0-10
No. 200		0-10

Replace Article 2.3 with the following:

2.3 CAPE SEAL

A. Material: Use Frictional Mastic Surface Treatment (FMST).

Add Article 2.4 as follows:

2.4 MIX DESIGN

- A. Select Type and grade of emulsified asphalt, ASTM D 3628.
- B. Use the following application rates, or submit mix design for approval by Engineer.
 - 1. Emulsion: Use Table 3.

Table 3 – Emulsion Application Rate	
Emulsion	Application Rate (gal/sy)
CRS-2P	0.32 – 0.35
LMCRS-2	0.32 – 0.35

2. Cover Material: Use Table 4.

Table 4 – Cover Material Application Rate	
Emulsion	Application Rate (lbs/sy)
CRS-2P	10.0 – 12.0
LMCRS-2	10.0 – 12.0

3. Cape Seal: As specified, see FMST.

PART 3 EXECUTION

3.2 PREPARATION

Add paragraph F as follows:

- F. Cover manholes, valves boxes, storm drain inlets, and other service utility features before placing any chip seal coat – match size and shape of existing concrete collar such that a minimum of 90 percent of the collar remains exposed after treatment.

3.4 APPLICATION

Revise paragraph A to read as follows:

- A. Asphalt Emulsion: Keep viscosity between 50 and 100 centistokes during application, ASTM D 2170. Keep temperature to a minimum of 145 deg F.

Revise Article 3.6 to read as follows:

3.6 FOG SEAL

- A. Fog Seal NOT SPECIFIED.

Revise Article 3.7 to read as follows:

3.7 CAPE SEAL

- A. Cape Seal SPECIFIED. Remove loose chips (by sweeping), and apply FMST within 48 hours of chip seal application.

SECTION 32 12 05 M
BITUMINOUS CONCRETE (MODIFIED)
(Amendment 2 of the 2017 Edition APWA Specifications)

PART 1	GENERAL
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1.4 SUBMITTALS

Revise paragraph C as follows:

Replace item 11 with the following:

11. Tensile Strength Ratio or Hamburg Rut Test results.

Add the following item:

14. Unless otherwise specified, Road Class II shall be used for the selection of Mix Design parameters.

SECTION 32 16 13 M
DRIVEWAY, SIDEWALK, CURB, GUTTER (Modified)

PART 3	EXECUTION
---------------	------------------

3.4 CONTRACTION JOINTS

D. Curb, Gutter, Waterway:

Revise subparagraph 1 to read as follows:

1. Place joints at intervals not exceeding 10 feet.

3.5 EXPANSION JOINTS

B. Sidewalks:

Add subparagraph 5 as follows:

5. Expansion joints are to be placed at 50-foot intervals (minimum) or wherever new sidewalk adjoins existing sidewalks, driveways, or aprons.

C. Curb, Gutter, Waterway:

Add subparagraph 4 as follows:

4. Place expansion joint where new curb and gutter adjoins existing curb and gutter.

SECTION 32 31 13 M
CHAIN LINK FENCES AND GATES (Modified)

PART 2 PRODUCTS

2.6 POSTS, CAPS, RAILS, COUPLINGS

- A. Posts, Frames, Stiffeners, Rails: ASTM F 1043:

Revise applicable rows of Table 1 to read as follows:

Top Rail	1-5/8" pipe
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PART 3 EXECUTION

3.6 INSTALLATION OF FENCE FABRIC

Revise paragraph A to read as follows:

- A. Place fence fabric on roadway side of posts unless otherwise specified. Place fabric approximately 1 inch above the grounds. Maintain a straight grade between posts by excavating ground high points and filling depressions with soil.

SECTION 32 31 16 M
WELDED WIRE FENCES AND GATES (Modified)

PART 1 GENERAL

1.2 REFERENCES

Add paragraph D as follows:

D. UDOT Standard Drawing

FG 2A Right of Way Fence and Gates (Metal Post)

FG 2B Right of Way Fence and Gates (Metal Post)

PART 3 EXECUTION

3.2 INSTALLATION

Add paragraph N as follows:

N. Install per UDOT Standard Drawings FG 2A and FG 2B.

Add Section 32 31 23 Poly(Vinyl Chloride)(PVC) Fences and Gates

**SECTION 32 31 23
POLY(VINYL CHLORIDE)(PVC) FENCES AND GATES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. PVC fencing, posts, gates, and appurtenances.

1.2 REFERENCES

A. **ASTM Standards:**

- | | |
|--------|--------------------------------------------------------------------------------------------------|
| D 1784 | Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds |
| F 626 | Fence Fittings |
| F 964 | Rigid Poly(Vinyl Chloride)(PVC) Exterior Profiles Used for Fencing and Railing |
| F 1999 | Installation of Rigid Poly(Vinyl Chloride)(PVC) Fence Systems |

1.3 SUBMITTALS

- A. Drawings: Indicate plan layout, grid, size and spacing of components, accessories, fittings, anchorage, and post section.
- B. Data: Submit manufacturer's installation instructions and procedures, including details of fence and gate installation.
- C. Submit sample of fence fabric and typical accessories.

PART 2 PRODUCTS

2.1 GENERAL

- A. Products from other qualified manufacturers having a minimum of 5 years' experience manufacturing PVC fencing will be acceptable by the architect as equal, if approved in writing, ten days prior to bidding, and if they meet the following specifications for design, size, and fabrication. PVC Profiles, lineals, and extrusions used as components must "meet or exceed" the minimum performance guidelines laid out in ASTM 964.

2.2 PVC FENCE

- A. Pickets, rails, and posts fabricated from PVC extrusion. The PVC extrusions shall comply with ASTM D 1784, Class 14344B and have the following characteristics:

Specific Gravity (+/- 0.02)	1.4
Using 0.125 specimen Izod impact ft. lbs./in. notch	23.0
Tensile strength, PSI	6,910
Tensile modulus, PSI	336,000
Flexural yield strength, PSI	10,104
Flexural modulus, PSI	385,000
DTUL at 264 PSI	67°C

- B. All fence parts made from PVC shall have a minimum thickness of 0.17 in except where specified otherwise.

2.3 POST CAPS

- A. Molded, one piece.
- B. Cross Section: Match post or gate upright cross section.
- C. Thickness: 0.095" minimum.
- D. Configuration: Flat or four-sided as required for installation to top of posts and gate.

2.4 ACCESSORIES

- A. Standard gate brace, screw caps, rail end reinforcers, and other accessories as required.

2.5 MISCELLANEOUS MATERIALS

- A. Stiffener Chemicals: Galvanized steel structural channel. Configure channels for concealed installation within PVC rails with pre-drilled holes for drainage. Aluminum extruded channel available upon request.
 - 1. Cross Section: 3.00" x 3.00" x 1.500" hourglass shape to grip picket.
 - 2. Thickness: 0.040 Gauge (minimum)
- B. Fasteners and Anchorage: Stainless Steel. All fasteners to be concealed or colored heads to match. Provide sizes as recommended by fence manufacturer.
- C. PVC Cement: As recommended by fence manufacturer.

2.6 GATE HARDWARE AND ACCESSORIES

- A. General: Provide hardware and accessories for each gate according to the following requirements.
- B. Hinges: Size and material to suit gate size, non-lift-off type, self-closing, glass filled nylon with stainless steel adjuster plate, offset to permit 120 degree gate opening. Provide one pair of hinges for each gate.
 - 1. Stainless Steel, painted with carbo zinc base.
 - 2. Finish: Pre-painted, 2 coats "Polane."
 - 3. Color: Black Gravity Latch or dual access gravity latch.
- C. Latch: Manufacturers' standard self-latching, thumb latch, pre-finished steel, or stainless steel gravity latch. Provide one latch per gate.

1. Finish: Match gate hinge finish.
- D. Hardware: Stainless Steel. Provide sizes as recommended by fence manufacturer.
 1. Finish: Match gate hinge finish.
- 2.7 **CONCRETE**
 - A. Use Class 3000 concrete. Section 03 30 04.
- 2.8 **REINFORCING FOR FILLED POSTS**
 - A. Steel Reinforcing:
 1. Steel Reinforcing Bars: ASTM A 615. Grade 60. Deformed (#4 or ½").
 2. Install 2 bars for each corner or gate post as specified in the drawings.

PART 3 EXECUTION

- 3.1 **PREPARATION**
 - A. Locate and preserve utilities, Section 31 23 16.
 - B. Excavation, Section 31 23 16.
 - C. Review to ASTM F 567 and CLFMI products manual for chain link fence installation.
 - D. Protect roots and branches of trees and plants to remain.
 - E. Limit amount of clearing and grading along fence line to permit proper installation.
- 3.2 **LAYOUT OF WORK**
 - A. Accurately locate and stake locations and points necessary for installation of fence and gates.
 - B. General arrangements and location of fence and gates are indicated. Install except for minor changes required by unforeseen conflicts with work of other trades.
- 3.3 **INSTALLATION – GENERAL**
 - A. Install fence in compliance with manufacturer’s written instructions.
 - B. PVC components shall be carefully handled and stored to avoid contact with abrasive surfaces.
 - C. Install components in sequence as recommended by fence manufacturer.
 - D. Install fencing as indicated on the drawings provided.
 - E. Variations from the installation indicated must be approved.
 - F. Variations from the fence and gate installation indicated and all costs for removal and replacement will be the responsibility of the CONTRACTOR.
- 3.4 **INSTALLATION OF POSTS**
 - A. Excavation
 1. Drill or hand-excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

2. If not indicated on drawings, excavate holes for each post to a minimum diameter of 12 inches.
3. Unless otherwise indicated, excavate hole depths not less than 30 inches or to frost line.

B. Posts

1. Install posts in one piece, plumb and in line. Space as noted in the drawings. Enlarge excavation as required to provide clearance indicated between post and side of excavation.
2. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
 - a. Unless otherwise indicated, terminate top of concrete footings 3 inches below adjacent grade and trowel to a crown to shed water.
 - b. Secure posts in position for manufacturer's recommendations until concrete sets.
 - c. After installation of rails and unless otherwise indicated, install reinforcing in posts in opposing corners of post as shown and fill end and gate posts with concrete to level as indicated. Concrete fill shall completely cover the reinforcing steel and gate hardware fasteners. Consolidate the concrete by striking the post face with a rubber mallet, carefully tamping around the exposed post bottom.
 - d. Install post caps. Use #8 screws, nylon washers and snap caps.
 - e. Remove concrete splatters from PVC fence materials with care to avoid scratching.

3.5 INSTALLATION OF RAILS

A. Top and Bottom Rails

1. Install rails in one piece into routed hole fabricated into posts to receive top and bottom rails, and middle where necessary. Except at sloping terrain, install rails level.
 - a. Prior to installation of rails into posts, insert concealed steel channel stiffeners in top rail, where necessary. Bottom rails shall include minimum 2- $\frac{1}{4}$ " drainage holes.
 - b. At posts to receive concrete fill, tape rail ends to prevent seepage when filling post with concrete.

B. Middle Rails:

1. Where necessary, install middle rails in one piece into routed hole in posts with larger holes facing down. Except at sloping terrain, install middle rails level. Secure mid rail to pickets with 2-#8 x 1- $\frac{1}{2}$ " screws evenly spaced.
 - a. At posts to receive concrete fill, tape rail ends to prevent seepage when filling post with concrete.

3.6 INSTALLATION OF FENCE FABRIC/PICKETS

- A. Pickets:** Install pickets in one piece as per manufacturer recommendations. Install pickets plumb.

3.7 INSTALLATION ON SLOPING TERRAIN

- A. At sloping terrain rails may be racked (sloped) or stepped to comply with manufacturer's recommendations.

3.8 INSTALLATION OF GATES

- A. Prior to installation of rails into posts, apply PVC cement into sockets per manufacturer's recommendations. Bottom rail shall include minimum 2-¼" drainage holes.
- B. Assemble gate prior to fence installation to accurately locate hinge and latch post. Align gate horizontal rails with fence horizontal rails.
- C. Install gates plumb, level, and secure for full opening without interference according to manufacturer's instructions.
- D. Gate Latch Installation. Install gate latch according to manufacturer's instructions.
- E. Allow minimum 72 hours to let concrete set-up before opening gates.

END OF SECTION

SECTION 32 92 00 M
TURF AND GRASS (Modified)

PART 1 GENERAL

1.3 SUBMITTALS

Add paragraph C as follows:

- C. Submit seed mix if proposing alternate seed mix shown in paragraph 2.1.0 below.

PART 2 PRODUCTS

2.1 SEED

Add paragraph D as follows:

- D. Seed Mix:

<u>SEED #</u>	<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>	<u>% by Weight</u>
1	Agropyron cristatum 'Fairway'	Fairway Crested Wheatgrass	15%
2	Agropyron riparium 'Sodar'	Streambank Wheatgrass	20%
3	Bromus inermis 'Manchar'	Smooth Brome	32%
4	Fescue rubra 'Fortress'	Red Fescue	25%
5	Poa compressa 'Reuben's'	Reuben's Canadian Bluegrass	6%
6	Trifolium repens	White Dutch Cover	2%

PART 3 EXECUTION

3.4 SEEDING

Revise paragraph A to read as follows:

- A. Apply seed at a rate of eight (8) pounds per 1,000 square feet evenly in two (2) intersecting directions. Rake in lightly.

Add Section 33 05 12 Conductive Tracer Wire for Pipe Installation

SECTION 33 05 12
CONDUCTIVE TRACER WIRE FOR PIPE INSTALLATION

PART 1 GENERAL

1.1 SUMMARY

This section covers the requirements for installation of a conductive tracer wire with underground pipe

1.2 SYSTEM DESCRIPTION

Install electrically continuous tracer wire with access points as described herein to be used for locating pipe with an electronic pipe locator after installation.

PART 2 PRODUCTS

- 2.1 Tracer wire shall be twelve (12) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors shall be 3M DBR, or approved equal, and shall be watertight and provide electrical continuity.

PART 3 EXECUTION

3.1 ERECTION / INSTALLATION / APPLICATION AND/OR CONSTRUCTION

A. General: Tracer wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to insure that the wire remains adjacent to the pipe. The tracer wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all new water valve boxes, water meter boxes, fire hydrants, sewer manholes, and sewer cleanouts as applicable to the utility line being installed.

B. Manholes: The wire shall be installed from the exterior of the manhole to the interior by installing the wire underneath the manhole frame.

3.2 TESTING

CONTRACTOR shall perform a continuity test on all tracer wire in the presence of ENGINEER of ENGINEER's representative. Testing shall be performed prior to road construction.

3.3 REPAIR / RESTORATION

If the tracer wire is found to be not continuous after testing, CONTRACTOR shall repair or replace the failed segment of wire.

END OF SECTION

**SECTION 33 05 25 M
PAVEMENT RESTORATION (Modified)**

PART 1	GENERAL
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1.2 REFERENCES

Replace paragraph A to read as follows:

- A. **CLEARFIELD CITY Public Works Standard Drawings**

PART 2	PRODUCTS
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2.2 ASPHALT PAVEMENT

Revise paragraph A to read as follows:

- A. Permanent Warm Weather Asphalt Concrete: Section 32 12 05 M unless indicated otherwise.

Revise paragraph C to read as follows:

- C. Pavement Sealing:
1. Crack Seal: Section 32 01 17
 2. Chip Seal: Section 32 01 13.64 and 32 01 13.64 M.
 3. Fog Seal: Section 32 01 13.50.

PART 3	EXECUTION
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3.5 ASPHALT PAVEMENT RESTORATION

Revise paragraphs A and B to read as follows:

- A. Follow CLEARFIELD CITY Public Works Standard Drawings.
- B. Match existing pavement thickness or 4-inches minimum, whichever is greater.

SECTION 33 08 00 M
COMMISSIONING OF WATER UTILITIES (Modified)

PART 3 EXECUTION

3.5 INFILTRATION TEST

Revise paragraph A to read as follows:

- A. General: 150 gallons per inch diameter per mile per day. If the ground water table is less than two (2) feet above the crown of the pipe, the infiltration test is not required.

Revise Article 3.6 in its entirety to read as follows:

3.6 EXFILTRATION TEST

A. Non-Pressurized System:

- 1. General: Air test or hydrostatic test is CONTRACTOR's choice.
- 2. Air Test:
 - a. Plastic Pipe: ASTM F 1417.
 - (i) For pipe up to 30 inches diameter, pressure drop is 0.5 psi.
 - (ii) For pipe larger than 30 inches diameter, isolated joint test is 3.5 psi maximum pressure drop is 1.0 psi in 5 seconds.
 - b. Concrete Pipe:
 - (i) ASTM C 1214 for concrete pipe 4" to 24" diameter.
 - (ii) ASTM C 1103 for concrete pipe 27" and larger.
- 3. Hydrostatic Test: Provide air release taps at pipeline's highest elevations and expel all air before the test. Insert permanent plugs after test has been completed.
 - a. Plastic Pipe: ASTM F 2497.
 - b. Concrete Pipe: ASTM C 497. Abide by Section 3 and Section 16 in the ASTM standard and applicable recommendations of manufacturer.

B. Pressurized System:

- 1. Pressure Test: All newly laid pipe segments and their valves, unless otherwise specified, shall be subjected to a hydrostatic pressure test of 225 psi or 50 psi above working pressure, whichever is higher. The hydrostatic pressure test shall be conducted after the pipe segments have been partially backfilled.
- 2. Duration of Pressure Test: The duration of each hydrostatic pressure test shall be at least two (2) hours.
- 3. Test Procedure: Each pipe segment shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. Testing against closed valves will be allowed. The pump, pipe connection, and all necessary apparatus including gauges

and meters shall be furnished by the CONTRACTOR. CONTRACTOR shall provide all labor and equipment necessary to perform the test.

4. Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, air release mechanisms shall be installed, if necessary, at points of highest elevation, and afterwards tightly capped.
5. Examination Under Pressure: All pipes, fittings, valves, hydrants, joints, and other hardware will be subject to examination under pressure during the hydrostatic test. Any defective pipes, fittings, hydrants, valves, or other hardware discovered in consequence of this pressure test shall be removed and replaced by the CONTRACTOR with sound material, at no expense to the OWNER, and the test shall be repeated until the ENGINEER is satisfied.
6. No piping installation will be acceptable until the leakage is less than the amount allowed by industry standards for the type of pipe material being tested. Or, if no standard prevails, then the number of gallons per hour is determined by the formula:

$$Q = \frac{LD\sqrt{P}}{148,000}$$

Where: Q = allowable leakage, gallons per hour
 L = length of pipe under test, feet
 D = diameter of pipe, inches
 P = average test pressure, psig

SECTION 33 11 00 M
WATER DISTRIBUTION AND TRANSMISSION (Modified)

PART 1	GENERAL
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1.2 REFERENCES

Revise paragraph B to read as follows:

B. Clearfield City Public Works Standard Drawings

Add to paragraph C. AWWA Standards:

C105	Polyethylene Encasement for Ductile Iron Pipe Systems
C110	Ductile-Iron and Gray-Iron Fittings
C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C223	Fabricated Steel and Stainless-Steel Tapping Sleeves
M14	AWWA Recommended Practice for Backflow Prevention and Cross-Connection Control

Add paragraph F and G as follows:

F. ANSI/NSF Standards:

61	Drinking Water System Components
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G. Utah Administrative Code

R309	Drinking Water
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1.3 PERFORMANCE REQUIREMENTS

Replace paragraph A with the following:

A. Depth of Cover:

1. Minimum as indicated on the drawings. If minimum cannot be achieved, contact ENGINEER.
2. Maximum of 72 inches unless indicated on the plans or approved by ENGINEER.

1.5 SITE CONDITIONS

Revise paragraph D to read as follows:

- D. Do not operate any water valve until its owner and water company's permission is secured.

PART 2 PRODUCTS

2.1 PIPES AND FITTINGS

Revise paragraph A to read as follows:

- A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, and capacities indicated. Use only NSF 61 approved products in drinking water systems. All such products shall be appropriately stamped with the NSF logo.

Add paragraphs E and F as follows:

- E. Mechanical Joint Fittings: Ductile iron, Class 250
- F. Flanged Fittings: Ductile iron, Class 250

2.3 VALVE BOX

Revise paragraph A to read as follows:

- A. Buried Valves in Traffic Areas: Cast iron two (2) piece slip sleeve type, 5-1/4 inch shaft, with a drop lid, rated for HL-93 loading.

Add Articles 2.9 and 2.10 as follows:

2.9 TAPPING SLEEVE AND VALVE

- A. AWWA C223.
- B. Sleeve shall be full circumferential seat with all stainless steel tapping sleeve.
- C. Flanged outlet with flanged by MJ valve.

2.10 FIRE SPRINKLER/SUPPRESSION LINES

- A. Lines:
 - 1. Ductile iron, Class 51, or as approved in writing by OWNER or ENGINEER.
 - 2. Meet all specifications for main lines.
- B. Valve:
 - 1. All fire lines shall be equipped with an isolation gate valve located at the main line.

PART 2 EXECUTION

3.3 LAYOUT

Replace paragraph B with the following:

- B. The Utah Division of Drinking Water must grant an exception where a potable water line crosses under a sanitary sewer line.

3.4 INSTALLATION – PIPE AND FITTING

- A. General:

Add subparagraphs 3 through 7 as follows:

- 3. Encase all buried ductile iron valves, fitting, connections, and specialties in minimum 8 mil. polyethylene sheets in accordance with AWWA C105.
- 4. Waterline shall be laid and maintained to lines and grades established by the drawings, with fittings and valves at the required locations. Deviations as approved in writing by OWNER or ENGINEER.
- 5. Lay water lines on a continuous grade to avoid high points except as shown on the plans.
- 6. Cut edges and rough ends shall be ground smooth. Bevel end for push-on connections.
- 7. Do not drop pipe or fittings into trench.

Add paragraph I as follows:

- I. Tie-Ins:
 - 1. All tie-ins shall be made dry and not on a day proceeding a weekend or holiday.
 - 2. OWNER requires 48-hours' notice for water turn-off.
 - 3. At least 24-hours prior to a service disruption, CONTRACTOR shall notify all affected water users.
 - 4. Where shutting down a line is not feasible as determine by OWNER or ENGINEER, CONTRACTOR shall make a wet tap using a tapping sleeve and valve.

3.5 INSTALLATION – CONCRETE THRUST BLOCK

Revise paragraph A to read as follows:

- A. Clearfield City Public Works Standard Drawings.

3.8 INSTALLATION – TAPS

Revise paragraph A to read as follows:

- A. Clearfield City Public Works Standard Drawings.

3.9 INSTALLATION – SERVICE LINE

Revise paragraph C to read as follows:

- C. Meter Box: Clearfield City Public Works Standard Drawings.

Add paragraph D as follows:

- D. New Water Service Line
 - 1. 1" Service
 - a. All laterals must be of one continuous copper tube between the corp stop and the meter box. No joints or copper to copper connectors are allowed.
 - 2. 1.5" and 2" Services
 - a. All solder joints shall be 95-5 solder or better, or Mueller compression fittings.

3.10 INSTALLATION – WATERMAIN LOOP (SYPHON)

Revise paragraph A to read as follows:

- A. Clearfield City Public Works Standard Drawings.

3.12 BACKFILLING

- B. Trenches: Section 33 05 20:

Revise subparagraphs 1 and 2 to read as follows:

- 1. Pipe zone backfill, Clearfield City Public Works Standard Drawings.
- 2. Trench backfill, Clearfield City Public Works Standard Drawings.

3.13 SURFACING RESTORATION

- A. Roadway Trenches and Patches: Section 33 05 25:

Revise subparagraphs 1 and 2 to read as follows:

- 1. Asphalt concrete patch, Clearfield City Public Works Standard Drawings.
- 2. Concrete pavement patch, contact OWNER for instructions.

Add new Article 3.14 as follows:

3.14 FIRE SPRINKLER/SUPPRESSION LINES

- A. Notify OWNER 48 hours prior to installation.
- B. Unless written authorization is given by OWNER, no services shall be connected to the fire sprinkler/suppression lines.
- C. Location: As approved by OWNER.

SECTION 33 12 16 M
WATER VALVES (Modified)

PART 1 GENERAL

1.2 REFERENCES

Modify the fourth (4th) item in paragraph A to read as follows:

C509 Resilient-Seated Gate Valves for Water Supply Service

Add paragraph B as follows:

B. Clearfield Public Works Standard Drawings

PART 2 PRODUCTS

2.1 VALVES – GENERAL

A. Underground:

Add subparagraph 3 as follows:

3. Valves over five (5) feet in depth shall have a valve nut extension stem.

2.2 GATE VALVES

Add paragraph D as follows:

D. Model: Mueller A-2361

Add Article 2.10 as follows:

2.10 AIR/VACUUM RELIEF VALVES

- A. Operation: Relieve air build-up and/or allow intrusion of air to prevent vacuum conditions within pipe.
- B. Location: Valve and vent placement location as approved by OWNER or ENGINEER.
- C. Connection: Service saddle.

PART 3 EXECUTION

3.1 INSTALLATION

Add paragraphs D, E, and F as follows:

- D. Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure-containing bolting, and cleanliness of valve ports and seating surfaces.
- E. Examine all valves for damage or defects immediately prior to installation.
- F. Mark and hold defective materials for inspection by OWNER or ENGINEER. Replace rejected materials.

**SECTION 33 12 19 M
HYDRANTS (Modified)**

PART 1 GENERAL

1.2 REFERENCES

Revise paragraph A to read as follows:

- A. Clearfield City Public Works Standard Drawings

PART 2 PRODUCTS

2.1 DRY-BARREL FIRE HYDRANT

Add paragraph C as follows:

- C. Model: Mueller Super Centurion.

2.2 VALVES

Revise paragraph A to read as follows:

- C. Gate Valve: Section 33 12 16.

2.3 ACCESSORIES

Revise paragraph D to read as follows:

- D. Valve Box, Valve Chamber: Section 33 11 00.

PART 3 EXECUTION

3.2 INSTALLATION

Revise paragraph A to read as follows:

- C. Install hydrant according to Clearfield City Public Works Standard Drawings and AWWA M17.

Revise paragraph H to read as follows:

- H. Install thrust block according to Clearfield City Public Works Standard Drawings.

SECTION 33 12 33 M
WATER METER (Modified)

PART 1 GENERAL

1.2 REFERENCES

Add paragraph B as follows:

- E. **Clearfield City Public Works Standard Drawings.**

PART 2 PRODUCTS

2.2 METERS FOR SERVICE PIPING

Revise paragraph A to read as follows:

- F. OWNER shall provide all meters for City Projects. CONTRACTOR shall install all meters for City Projects. OWNER shall provide and install all meters for Development Projects. DEVELOPER is responsible to pay for all meters for Development Projects.

2.3 SERVICE LINE, VALVES, AND FITTINGS

Revise paragraph A to read as follows:

- A. Service Pipe: Smooth wall polyethylene, Section 33 05 06.

Revise paragraph B to read as follows:

- B. Service Valves and Fittings:
1. AWWA C800.
 2. ¾-Inch and 1-Inch Service Laterals – Brass corporation stops with CC thread.
 3. 1.5-Inch and 2-Inch Service Laterals – Copper or brass screw-type fittings (ball valves, strainers, nipples, tees, bends, etc.).
 4. 3-Inch and 4-Inch Service Laterals
 - a. Ductile iron pipe.
 - b. Cast iron, flanged valves and fittings.
 5. Greater than 4-Inch – Coordinate with and obtain approval from OWNER and ENGINEER.

Replace Article 2.4 with the following:

2.4 METER BOXES

- A. See Clearfield City Public Works Standard Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

Revise paragraph D to read as follows:

- D. OWNER Supplied Meters: Installed by OWNER unless indicated otherwise.

Add paragraphs E and F as follows:

- E. Install one solid piece of Poly DR9 CTS Pipe from main to meter.
- F. Install service laterals with 60-inches of cover, minimum.

SECTION 33 13 00 M
DISINFECTION (Modified)

PART 1 GENERAL

1.2 REFERENCES

Modify paragraph B to read as follows:

- B. Utah Administrative Code
 R309 Drinking Water

Add paragraph C as follows:

- C. NSF/ANSI Standards:
 60 Drinking Water Treatment Chemicals – Health Effects

1.4 SUBMITTALS

Delete paragraphs B, C, and D in their entirety.

Add Article 1.8 as follows:

1.8 WORK PERFORMED BY OWNER

- A. OWNER will perform bacteriological and high chlorine sampling and testing. CONTRACTOR shall provide all other work associated with this Section.

PART 2 PRODUCTS

1.1 DISINFECTANT

Add paragraph E as follows:

- E. All products shall comply with NSF/ANSI 60.

PART 3 EXECUTION

3.1 PREPARATION

Add paragraphs C and D as follows:

- C. Notify OWNER at least 72 hours prior to any flushing or disinfecting.
- D. Install temporary connections for flushing water lines after disinfection. After the satisfactory completion of the flushing work, remove and plug the temporary connection.

3.2 DISINFECTION OF WATER LINES

Revise paragraph D to read as follows:

- D. Coordinate with OWNER to collect a bacteriological water sample at end of line to be tested. If sample fails bacteriological test, flush system and retest. Continue flushing and retesting until sample passes test.

Revise paragraph G to read as follows:

- G. After a passing bacteriological test sample is obtained, let the system relax for 24 hours. Flush and coordinate with OWNER to collect a subsequent bacteriological sample for testing. If the subsequent test passes, then water line is acceptable.

3.5 FIELD QUALITY CONTROL

- A. Bacteriological Test:

Revise subparagraphs 1 and 2 to read as follows:

1. Coordinate with OWNER to collect samples for testing no sooner than 16 hours after system flushing.
2. OWNER will have water samples analyzed per State of Utah requirements.

Add Article 3.6 as follows:

3.6 SPECIAL PROCEDURE FOR TAPPING SLEEVES

- A. Before a tapping sleeve is installed, the exterior of the main to be tapped shall be thoroughly cleaned, and the interior surface of the sleeve shall be lightly dusted with calcium hypochlorite powder.