

TOWN OF CASTLE ROCK

Wastewater Collection Design

2018 CRITERIA MANUAL



TABLE OF CONTENTS

Chapter 1. GENERAL PROVISIONS

1.1	Introduction.....	7
1.2	Jurisdiction.....	7
1.3	Purpose.....	7
1.4	Amendments and Revisions.....	7
1.5	Enforcement Responsibility.....	8
1.6	Review and Acceptance.....	8
1.7	Interpretation.....	8
1.8	Relationship to Other Standards.....	9
1.9	Variances from these Criteria.....	9
1.10	Supplemental Information to these Criteria.....	9
1.11	Acronyms.....	10
1.12	Definitions of Terms.....	12
1.13	References.....	15

Chapter 2. WASTEWATER COLLECTION POLICIES

2.1	Introduction.....	16
2.2	Planning Policy.....	16
2.3	Design Policy.....	16
2.4	Construction of Public Improvements Policy.....	17
2.5	Ownership of Public Improvements Policy.....	17
2.6	Operations and Maintenance Policy.....	17
2.7	Regulatory and Legal Policy.....	18
2.8	Hazard Minimization and Public Safety.....	18

Chapter 3. WASTEWATER COLLECTION SYSTEM SUBMITTAL REQUIREMENTS

3.1	Introduction.....	19
3.2	Review Process.....	19
3.2.1	Pre-Application Consultation.....	19

3.2.2	Utility Report Requirements.....	19
3.2.2.1	Format.....	20
3.2.2.2	Checklists.....	20
3.2.2.3	Approval Block.....	20
3.2.2.4	Stand-Alone Document.....	20
3.2.2.5	Combined Reports.....	20
3.2.2.6	Submittal Adequacy.....	21
3.2.3	Review by Referral Agencies.....	21
3.3	Acceptance.....	21
3.3.1	Final Utility Report Required for Construction.....	21
3.3.2	One Year Approval Limitation for Final Utility Report.....	21
3.4	Concept Wastewater Utility Letter.....	21
3.4.1	PDP Wastewater Utility Information.....	23
3.4.2	Castle Rock Water Responsibility.....	23
3.5	Preliminary Wastewater Utility Report.....	24
3.5.1	SDP Wastewater Utility Plan.....	28
3.5.2	Castle Rock Water Responsibility.....	29
3.6	Final Wastewater Utility Report.....	29
3.6.1	Disclaimer.....	33
3.7	Construction Drawings.....	34
3.7.1	Wastewater System Improvements.....	34
3.7.2	Indemnification Statement.....	34
3.7.3	Construction Drawing Requirements.....	34
3.7.3.1	Utility Construction Drawings for Wastewater System Improvements.....	35
3.8	Record Drawings.....	37

Chapter 4. WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA

4.1	Reference Design Documents.....	38
4.2	Prohibited Installations.....	38
4.3	Unlawful Connections.....	38
4.4	Minimum Wastewater System Design Criteria.....	39
4.4.1	Design Flows.....	39
4.4.1.1	Wastewater System Average Daily Flow (ADF).....	40

4.4.1.2 Peaking Factor.....	41
4.4.1.3 Peak Design Flow Rate.....	41
4.4.2 Hydraulic Design.....	41
4.4.3 Pipe Sizes and Grades.....	42
4.4.4 General Wastewater System Layout Criteria.....	42
4.4.4.1 Location.....	42
4.4.4.2 Horizontal Layout.....	43
4.4.4.3 Vertical Layout.....	43
4.4.5 Utility Crossings.....	43
4.4.5.1 Sanitary Sewer Main Crossing under a Water Main.....	44
4.4.5.2 Sanitary Sewer Main Crossing over a Water Main.....	44
4.4.5.3 Sanitary Sewer Main Crossing of a Storm Sewer.....	44
4.4.5.4 Limits on Minimum Vertical Clearance.....	45
4.4.6 Bored Crossings.....	45
4.4.7 Manholes.....	46
4.4.7.1 Layout.....	46
4.4.7.2 Manhole Sizing.....	47
4.4.7.3 Drops through Manholes.....	47
4.4.7.4 Main Connections to Existing Manholes.....	48
4.4.7.5 Metering Vault.....	48
4.4.8 Sanitary Sewers and Manholes Greater than Twenty Feet.....	48
4.4.9 Inverted Wastewater Siphons.....	49
4.4.10 Fill Areas.....	49
4.4.11 Trail Access.....	49
4.4.12 Future Connections.....	50
4.4.13 Sanitary Sewer Service Lines.....	50
4.4.13.1 Ownership.....	51
4.4.13.2 Layout.....	51
4.4.13.3 Cleanouts.....	52
4.5 Easements.....	52
4.6 Utility Easement Note Required on Plats.....	53
4.7 Sand/Oil and Grease Interceptors.....	53
4.8 Facility Upgrade Schedule.....	53

4.9	Underdrains.....	53
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Chapter 5. LIFT STATION AND FORCE MAIN DESIGN CRITERIA

5.1	General.....	54
5.1.1	Scope.....	54
5.1.2	Castle Rock Water Review and Approval.....	54
5.1.3	Relationship to Other Standards.....	54
5.1.4	Reference Design Documents.....	54
5.1.5	Location.....	55
5.1.6	Flood Protection.....	55
5.1.7	Accessibility and Security.....	55
5.1.8	Grit.....	55
5.1.9	Station Ventilation.....	55
5.1.10	Odor Control.....	56
5.2	Minimum Lift Station Design Criteria.....	56
5.3	Pump Equipment and Protection.....	57
5.3.1	Pump Characteristics.....	57
5.3.2	Pump Protection.....	58
5.4	Overflow Basins.....	58
5.5	Force Main Design Criteria.....	59
5.5.1	Pipe Materials.....	59
5.5.2	Velocity and Pipe Diameter.....	59
5.5.3	Pipe and Design Pressure.....	59
5.5.4	Pipe Separation from Water Lines.....	59
5.5.5	Shutoff and Check Valves.....	60
5.5.6	Isolation Valves.....	60
5.5.7	Combination Air Release and Air/Vacuum Valves.....	60
5.5.8	Drain Valves.....	60
5.5.9	Pig Launching and Retrieval Stations.....	60
5.5.10	Termination.....	61
5.5.11	Identification.....	61
5.6	Site Improvements.....	61
5.6.1	Property.....	61

5.6.1.1	Property Dedication.....	61
5.6.1.2	Site Configuration.....	61
5.6.2	Site Amenities.....	62
5.7	Supervisory Control and Data Acquisition System (SCADA).....	63
5.7.1	Scope.....	63
5.7.2	Purpose and Rationale of the SCADA System.....	64
5.7.3	General Design Criteria.....	64
5.7.3.1	Design Responsibility.....	64
5.7.3.2	Programming.....	64
5.7.3.3	Base Standards to be Met.....	64
5.7.4	Minimum Facility Design Requirements.....	65
5.7.4.1	General.....	65
5.7.4.2	Wastewater Lift Station Instrumentation.....	65

Chapter 1 - General Provisions

1.1 Introduction

These criteria and design standards together with all future amendments shall be known as the Town of Castle Rock Wastewater Collection System Design Criteria Manual (hereafter called “Criteria”). All utility reports and plans, analyses, and designs, submitted as a requirement of the Town of Castle Rock Regulations (hereafter called “Regulations”), shall comply with these *Criteria*.

1.2 Jurisdiction

These Criteria shall apply to all land within the incorporated area of the Town of Castle Rock, or served by the Town, including any public lands. These Criteria shall apply to all systems and facilities constructed in or on Town rights-of-way, easements dedicated for utilities across public or private property, easements for public use, and to all privately owned and maintained system facilities.

1.3 Purpose

Presented in these Criteria are the policies and minimum technical criteria for the planning, analysis and design of wastewater collection systems within the boundaries of the Town of Castle Rock and areas served by the Town. All subdivisions, re-subdivisions, Planned Unit Developments, or any other proposed construction submitted for acceptance under the provisions of the Regulations shall include adequate and appropriate wastewater system planning, analysis and design. Such planning, analysis and design shall conform with or exceed the Criteria set forth herein. Wastewater collection system planning, analysis, and design that require policies and technical expertise not specifically addressed in these Criteria shall follow the provisions of the appropriate regulatory entity, which shall include, but not be limited to, those of the Colorado Department of Public Health and Environment (CDPHE).

1.4 Amendments and Revisions

Policies and criteria may be amended as new technology is developed, or if experience gained in the use of these Criteria indicates a need for revision. All technical criteria and policy changes must be recommended by the Director of Castle Rock Water or his designee. Minor revisions will require the approval of the Director of Castle Rock Water. All major revisions will require adoption, by Ordinance, from the Town Council following a public hearing thereon. The Director of Castle Rock Water shall monitor the performance and effectiveness of these Criteria and will recommend amendments and revisions as needed.

EXAMPLES OF MINOR AND MAJOR REVISIONS

MINOR	MAJOR
Grammar	Policy Changes
Submittal Requirements	Technical Criteria Changes
Clarifications	
Construction Detail Revisions for clarification, minor modification	

1.5 Enforcement Responsibility

Castle Rock Water shall review all sanitary sewer system reports, plans, analyses, and designs, submitted as a requirement of the Regulations, for compliance with these Criteria. The Regulations are enforced by the Town of Castle Rock and authorized representatives.

1.6 Review and Acceptance

The Town shall review all submittals for general compliance with these Criteria. An acceptance by the Town **does not** relieve the Owner, Engineer, or Designer from the responsibility of ensuring that the design, calculations, plans, specifications, construction, and record drawings are in compliance with these Criteria, as stated in the Owner's and Engineer's certifications, and in compliance with other applicable State and Federal regulations.

The Town may, but is not required to, refer submittals to other agencies that have an interest or responsibility for wastewater system issues. Other review agencies may include regional, State, or Federal agencies responsible for wastewater collection, industrial pretreatment, treatment and other wastewater related issues.

1.7 Interpretation

In the interpretation and application of these Criteria, the provisions shall be regarded as the minimum requirements for the protection of the public health, safety and welfare of the residents of the Town. These Criteria shall therefore be regarded as remedial and shall be liberally construed to further its underlying purposes.

Whenever a provision of these Criteria and any other provision of the Regulations or any provision in any law, ordinance, resolution, rule or regulation of any kind, contains any requirement(s) covering any of the same subject matter, the requirements that are more restrictive or impose higher standards shall govern, as determined by the Director of Castle Rock Water.

These Criteria shall not abrogate or annul any binding agreements, including Development Agreements and Public Subdivision Improvement Agreements, or any easements, permits,

utility reports or construction drawings either recorded, issued, or accepted by the Town prior to the effective date of these Criteria. In the event that there is an alleged or material discrepancy in these Criteria, the Director of Castle Rock Water shall make any final determinations as to the intent and application of these Criteria.

1.8 Relationship to Other Standards

If the CDPHE, Federal Government, or other applicable regulatory agency imposes stricter criteria, standards, or requirements than those contained herein, such provisions shall apply, and shall be subsequently incorporated into the Town's requirements after due process and public hearing(s) to modify the Town's Regulations and these Criteria.

1.9 Variances from these Criteria

Modifications to these Criteria shall require a formal variance request. Variances from the provisions of these Criteria may be considered on a case-by-case basis for specific applications only, and shall not establish a precedent for any other project or future development. All revisions to these Criteria shall be documented on CDs for construction and inspection purposes and on Record Drawings for operational purposes. All variances on a project shall be listed on Site Plans (if applicable) and CDs including the variance number, description of the variance, any conditions of approval, and the approval date. Formal requests for variances from the standards, policies or requirements of these Criteria shall be submitted with documentation and justification to the Development Services Project Manager. The variance request and supporting documentation will be reviewed by Castle Rock Water, and the Director of Castle Rock Water or his designee will issue a formal response to the request. Submittal requirements for variances and information regarding the appeals process shall be as established in the Development Procedures Manual.

1.10 Supplemental Information to these Criteria

Supplemental information, forms, checklists, notes, etc., referenced herein, are available on the Town of Castle Rock website (CRgov.com/codecentral) and shall be referenced or submitted in accordance with the requirements set forth in these Criteria. Please contact Castle Rock Water at 720-733-6000 with any questions regarding the downloading of these files. It is the responsibility of the developer and engineer to obtain the latest version of any submitted document, as these items will be periodically updated by the Town.

1. Preliminary and Final Utility Report Checklists
2. Utility Report Approval Block
3. Variance Request Form
4. Engineer's Cost Opinion Form
5. Drawing and Digital Submittal Requirements Upon Approval of Construction Drawings
6. Development Procedures Manual
7. Construction Methodology and Materials Manual
8. General Construction Drawing Cover Sheet Notes
9. Utility Construction Drawing Notes
10. Standard Construction Details
11. Record Drawing Checklists

1.11 Acronyms

As used in the Town's Water and Wastewater Criteria Manuals, the following acronyms shall apply:

AC	Acre
ADD	Average Day Demand (water)
ADF	Average Daily Flow (wastewater)
AF/YR	Acre-Feet per Year
ANSI	American National Standards Institute
APWA	American Public Works Association
ARV	Combination Air Release/Vacuum Valve
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BOP	Bottom of Pipe
C	Hazen-Williams Pipe Roughness Coefficient
CD and CDs	Construction Drawing(s)
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFS	Cubic Feet per Second
DA	Development Agreement
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
DRCOG	Denver Regional Council of Governments
DP	Design Point
DPP	Development Procedures Manual
DU	Dwelling Unit
FDC	Fire Department Connection
FF	Fire Flow
FT	Feet
FPS	Feet per Second
GESC	Grading, Erosion and Sedimentation Control
GPAD	Gallons per Acre per Day
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
GPM	Gallons per Minute
GPSD	Gallons per Student per Day
HGL	Hydraulic Grade Line
HP	High Point
I/I	Infiltration and Inflow
IBC	International Building Code
IFC	International Fire Code
IMC	International Mechanical Code
INS	Institutional
IPC	International Plumbing Code
IRC	International Residential Code
ISO	Insurance Service Offices
LP	Low Point

Max	Maximum
Min	Minimum
MDD	Maximum Day Demand
MG	Million Gallon
MGD	Million Gallons per Day
MJ	Mechanical Joint
NAVD	North American Vertical Datum
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OWTS	On-Site Wastewater Treatment System PCWRA Plum Creek Water Reclamation Authority
PD	Planned Development
PDF	Peak Design Flow or Portable Document Format
PDP	Planned Development Plan
PE	Professional Engineer
PF	Peaking Factor
PHD	Peak Hour Demand
PLS	Professional Land Surveyor
PRK	Park
PRV	Pressure Reducing Valve
PSI	Pounds per Square Inch
PUD	Planned Unit Development
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
ROW	Right-of-Way
RMF	Residential Multi-Family
RSF	Residential Single-Family
SCADA	Supervisory Control and Data Acquisition
SDP	Site Development Plan
SF	Square-Foot; Square Feet
SFE	Single Family Equivalent
SIA	Subdivision Improvement Agreement
STD	Standard
TB	Thrust Block
TCR	Town of Castle Rock
TOP	Top of Pipe
VFD	Variable Frequency Definitions of Terms

1.12 Definitions of Terms

CIVIL CONSTRUCTION PERMIT shall mean a permit, including Standard Conditions and Special Conditions as applicable, issued by the Town to construct Public and/or Private Improvements for the Project based on Construction Drawings approved by the Town.

CODE or MUNICIPAL CODE shall mean the Town of Castle Rock Municipal Code, as amended.

CONSTRUCTION DRAWING(S) (CD or CDs) shall mean Construction Drawings prepared by a Professional Engineer licensed in the State of Colorado for the developer and approved by the Town depicting Public and/or Private Improvements to be constructed for the Project.

CONSULTANT ENGINEER shall mean the Professional Engineer retained by the developer responsible for the creation and submission of Utility Reports and Construction Drawings to the Town for approval for the purpose of one-time construction of facilities.

CRITERIA or DESIGN CRITERIA shall mean the design criteria and requirements contained herein for water and wastewater facilities to be constructed in the Town.

CUSTOMER shall mean any person or entity to which the Town provides goods or services.

DESIGN CRITERIA – See CRITERIA.

DETAILS or STANDARD DETAILS shall mean details issued by Castle Rock Water to be used in Construction Drawings. These Details are maintained and periodically updated on the Town's website (CRgov.com/codecentral).

DEVELOPER shall mean the party or parties desiring to construct Public and/or Private Improvements within Town rights-of-way or easements, securing all required approvals and permits from the Town and other applicable entities, and assuming full and complete responsibility for the Project.

DEVELOPMENT AGREEMENT (DA) shall mean a formal agreement between an Annex or Master Developer and the Town that comprehensively addresses development conditions and obligations.

DEVELOPMENT SERVICES DEPARTMENT shall mean the Town of Castle Rock Development Services Department located at 100 N. Wilcox St., Castle Rock, CO 80104, telephone number 720-733-2200.

EASEMENT shall mean the right of the Town to use lands owned by a private party for the purposes of maintenance, access, utilities, drainage or other use, as specified in an agreement between the Town and the private party.

FINAL ACCEPTANCE shall mean the written notification to the developer from the Town, after satisfactory Warranty Period completion, that all Public Improvements are free of defects, and the Town releases the developer from future maintenance obligations.

INITIAL CONVEYANCE AND ACCEPTANCE shall mean the Town's document and process,

which initially accepts for ownership, maintenance and warranty, the Public Improvements identified in the approved Construction Drawings and Improvement Agreement for a specific Project.

MUNICIPAL CODE – See CODE.

OWNER shall mean the person(s) in title to any portion of the Property, according to the records of the Douglas County Clerk and Recorder. The use of the singular “Owner” shall refer to all Owners of the Property.

PLANNED DEVELOPMENT PLAN (PDP) shall mean a development submittal equivalent to a Preliminary PD Site Plan as defined in the Town’s Municipal Code.

PRIVATE IMPROVEMENTS shall mean those improvements not identified as Public Improvements, and which are not generally installed within the Town rights-of-way, easements, or other Town-owned lands.

PROFESSIONAL ENGINEER shall mean an individual currently registered with the Colorado State Board of Registration as a Professional Engineer, practicing engineering in accordance with State law (Title 12, Article 25, Part 1).

PROJECT shall mean the Public or Private Improvements as designated in the approved Construction Drawings to be constructed in conformance with these Design Criteria. The Project is inclusive of any and all Public or Private Improvement Projects for or within the Town, whether Development Projects, Private Utility Projects or Capital Improvement Projects.

PROPERTY shall mean the real property located in Douglas County, Colorado as described in the Development Agreement, Subdivision Improvement Agreement, or legal description of the real property on which the Project is located.

PUBLIC HEARING shall mean a meeting of the Town Planning Commission or the Town Council for the purpose of hearing comments, testimony, recommendations and other responses from Town staff, developers, interested parties and the general public.

PUBLIC IMPROVEMENTS shall mean those public facilities including, but not limited to, pavement, curb and gutter, sidewalk, pedestrian/bike/equestrian paths, storm drain facilities with related appurtenances, culverts, channels, bridges, water distribution, transmission and storage facilities with related appurtenances, sanitary sewer collection facilities with related appurtenances, water and wastewater treatment facilities, pavement markings/signage/striping, traffic signals and related appurtenances, and those processes integral to construction of other Public Improvements listed herein, which upon their completion are to be dedicated to the Town for operation and maintenance by the Town and which are installed within the Town rights-of-way, easements, or other Town-owned lands.

REGULATIONS shall mean the Charter, ordinances, resolutions, rules and regulations of the Town, including the Code, and other provisions of all zoning, subdivision and building codes or any other applicable design criteria adopted by the Town, as the same may be amended periodically and applied uniformly throughout the Town.

SHALL means a mandatory requirement or condition, as approved by the Town.

SITE DEVELOPMENT PLAN (SDP) shall mean a development submittal equivalent to a Preliminary Plat, General Site Plan, Final PD Site Plan, and/or Combined Preliminary Plat/ Final PD Site Plan as defined in the Town's Municipal Code.

STANDARD DETAILS – See DETAILS.

SUBDIVISION IMPROVEMENT AGREEMENT (SIA) shall mean a formal agreement between a developer and the Town, and identifies the Public Improvements required to support the development. The SIA provides assurances that the Public Improvements will be constructed in accordance with established criteria and standards in a timely manner and comprehensively addresses development conditions and obligations.

TOWN shall mean the Town of Castle Rock, Colorado, a Home Rule Municipality.

TOWN COUNCIL shall mean the governing body of the Town of Castle Rock, Colorado having all the legislative powers and functions and all other powers possessed by the Town and not conferred on others by the Town Charter.

CASTLE ROCK WATER shall mean the Town of Castle Rock Water Department located at 175 Kellogg Court, Castle Rock, CO 80109, telephone number 720-733-6000.

DIRECTOR OF CASTLE ROCK WATER shall mean the Director of Water of the Town of Castle Rock or other authorized representative of Castle Rock Water.

VARIANCE REQUEST shall mean a formal request with adequate documentation and justification for a variance from the standards, provisions, policies or submittal requirements set forth in these Design Criteria that meets the requirements in Section 1.9 of these Design Criteria.

WASTEWATER MASTER PLAN shall mean the Town of Castle Rock "Wastewater and Reclaimed Water Master Plans" or any updates of this Plan.

WEBSITE shall mean the Town of Castle Rock website at CRgov.com, or more specifically CRgov.com/codecentral.

1.13 References

The most current version of the following codes are adopted as a secondary code to this Wastewater Collection System Design Criteria Manual:

- American Public Works Association, Standard Plans, with all amendments
- Colorado Department of Public Health and Environment, Design Criteria Considered in the Review of Wastewater Treatment Facilities, Policy 96-1

Chapter 2 – Wastewater Collection System Policies

2.1 Introduction

Provisions for adequate service, wastewater collection and treatment are necessary to preserve and promote the general health, welfare, and economic well-being of the residents of the Town of Castle Rock. The Town of Castle Rock must provide coordination, review, and master planning of the system in order that the integration of each component of the system meets the intent and purpose of the system as a whole.

The development of the Town's wastewater system is governed by the policies provided below, as facilitated through the implementation of the Criteria contained herein. Wastewater system facilities shall be designed, constructed, and maintained to provide for the health, safety and welfare of the Town and its surrounding areas. These Criteria shall formally implement interim policies that have been updated from time-to-time by Castle Rock Water since the effective date of the previous version.

2.2 Planning Policy

All land developed within, and served by the Town of Castle Rock shall receive full site planning and engineering analyses. Utility reports and plans shall be submitted for all new development and redevelopment within the Town's jurisdiction in conformance with the requirements set forth herein and the provisions stipulated in the Concept, Preliminary and Final Development Packages. Redevelopment shall be defined as any land disturbance or reconstruction that results in a reconfiguration of existing wastewater system facilities, or an increase in discharge.

In the initial planning stages of the development, a pre-application meeting shall be coordinated with the Town of Castle Rock Development Services Department in accordance with Chapter 3 of these Criteria. The Town has adopted and maintains a Wastewater Master Plan, which establishes the requirements of the wastewater system and identifies the required public improvements necessary to provide the intended level of wastewater service throughout the Town. The Wastewater Master Plan may be ratified by Town Council from time-to-time, as necessary to accommodate changes within the Town's jurisdiction.

2.3 Design Policy

Wastewater system planning and design within the Town shall adhere to the Criteria contained herein, the latest edition of CDPHE Design Criteria, the Plum Creek Wastewater Authority Code of Rules and Regulations, any applicable Watershed Protection District ordinances, and the latest Wastewater Master Plan prepared for the Town. Prohibited facilities and connections shall be as described in these Criteria.

2.4 Construction of Public Improvements Policy

The construction of improvements for and within the Town shall conform to the Town Civil Construction Permit, the Town's Construction Notes, Standard Details and Construction Methodology and Materials Manual, and shall adhere to all Town, County, State, and Federal regulations applicable to the work. This shall include the acquisition of all necessary permits, which may include but not be limited to, 404 permitting through the U.S. Army Corps of Engineers; Stormwater Management Plans; Discharge Permits and Construction Dewatering Permits administered by the State; Town Grading, Erosion and Sediment Control (GESC) permits; flood plain development permits; and traffic control permits. At the completion of construction, all permits and service agreements with power companies and any other private utilities shall be transferred into the Customer's name, and shall under no circumstances be transferred to, or held in the name of the Town, unless the Town is the customer.

Any work proposed to take place within existing Town of Castle Rock streets must be reviewed and approved by the Public Works Department. The type of crossing allowed, traffic control, street repair specifications, etc. shall be as determined by Public Works.

Prior to placing the facilities into service and initial acceptance by the Town, all construction related provisions required by the Town shall be satisfied, including startup procedures, inspections and testing of the facilities, and receipt of O&M Manuals and Record Drawings. Additionally, all requirements and responsibilities shall be complied with in association with the warranty period as set forth in the Town's Regulations.

2.5 Ownership of Public Improvements Policy

The delineation between Town-owned and privately owned portions of the system and the associated maintenance responsibilities for each, shall be as set forth in the latest editions of the Municipal Code and Standard Details. Upon execution of Final Acceptance, sanitary sewer mains, force mains, lift stations, and all appurtenant Town-owned facilities shall become the sole property of the Town, and full legal and equitable title thereto shall be vested in the Town free and clear of any liens, claims or rights of any third party in or to the Public Improvements.

2.6 Operations and Maintenance Policy

The design of all wastewater system facilities within the Town must provide for access and long-term operation and maintenance of the facilities by the Town. Operation and Maintenance manuals associated with all components to be installed as part of the wastewater system shall be provided to the Town with the Record Drawings required in these Criteria, unless otherwise specifically waived by Castle Rock Water.

Utility easements or tracts and access easements shall be provided for all wastewater system facilities outside of public right-of-way as set forth in these Criteria, or as otherwise required by Castle Rock Water, and shall be adequate for the operation, maintenance and replacement of the facilities.

2.7 Regulatory and Legal Policy

The planning, design and construction and maintenance of the Town's wastewater system facilities shall provide for and facilitate strict conformance with the regulatory and legal policies of the Town of Castle Rock and the CDPHE. In addition to the adherence of Town and CDPHE Design Criteria, this shall include, without limitation, policies associated with ongoing reporting requirements and documentation, emergency procedures and remediation, public notification requirements, and the training and certification of staff to operate and maintain the Town's facilities.

2.8 Hazard Minimization and Public Safety Policy

Public safety and the protection of Town staff shall be an essential objective when planning, designing, constructing, operating, and maintaining the Town's wastewater collection system facilities. All such facilities shall be designed with careful consideration of the potential hazards associated with the use and long-term operation and maintenance of the facility. The design phase of all projects shall evaluate the health and safety risks associated with the facilities, and shall include appropriate design features to minimize these risks and to adequately protect the general public and Town personnel from the hazards. Equipment for confined space entry in accordance with OSHA and other applicable regulatory agency requirements shall be provided at all Town of Castle Rock facilities, as required. Hatches with fall prevention covers, intermediate platforms, handrails, safety lighting, etc. shall be as required by Castle Rock Water, or any applicable code.

Chapter 3 – Wastewater Collection System Submittal Requirements

3.1 Introduction

The requirements presented in this chapter shall be used to aid the engineer or applicant in the preparation of utility reports, modeling evaluations, and Construction Drawings (CDs) for wastewater collection system facilities. This Chapter applies primarily to submittal requirements for wastewater collection systems and the associated Criteria provided in Chapter 4. Submittal requirements for lift stations and force mains, etc., may differ from those set forth in this Chapter, and will be discussed at the pre-application consultation as described in the Section that follows. The requirements presented herein are the minimum necessary, and will be used to evaluate the adequacy of all submittals made to the Town.

3.2 Review Process

3.2.1 Pre-Application Consultation

A pre-application consultation with the Town of Castle Rock Development Services Department is strongly encouraged for any type of development or redevelopment. The purpose of this meeting is to discuss general information about the project, pertinent aspects of the Criteria, the required scope of the utility reports, and any special procedures, analyses, and submittal requirements that may be applicable.

3.2.2 Utility Report Requirements

Different levels of utility reports shall be included with each of the submittals required by the Town of Castle Rock Development Services Department. The first of the three utility reports shall be the Concept Utility Letter, which shall be submitted in conjunction with the Planned Development Plan (PDP). The purpose of the Concept Utility Letter is to provide sufficient information to determine the adequacy and ability of the Town's wastewater collection system to serve the proposed development.

Once the PDP has been approved, a subsequent Preliminary Utility Report shall be submitted in conjunction with the Site Development Plan (SDP). The purpose of the Preliminary Utility Report is to establish preliminary locations and preliminary sizing for the proposed mains, connections and necessary infrastructure extensions, and to set forth the design parameters and sizing criteria for all other appurtenant wastewater facilities required to serve the proposed development.

Upon approval of the SDP and completion of the final utility system designs, a Final Utility Report shall be submitted in conjunction with the Final Construction Documents. The purpose of the Final Utility Report is to provide all final design information and calculations necessary to support the proposed wastewater Improvements. The Construction Documents shall include, among other requirements, the submittal of Construction Drawings (CDs), Final Utility Report, Opinion of Estimated Costs, easements by separate document, signed variances, and the Final Plat. Once

approved, the Construction Documents will enable the developer to move forward with the acquisition of the necessary permits for the project.

3.2.2.1 Format

All required reports shall be in Portable Document Format (PDF). The pages within the reports shall be prepared on 8½" x 11" PDF pages. The reports shall follow the format contained in the report checklists. Supporting drawings, figures, and tables may be prepared on 11" x 17" PDF pages. Reports shall include a narrative presenting the project for review in accordance with the information presented in these Criteria, and the requirements established by the Town for the appropriate submittal.

One electronic PDF file shall be transmitted to the Development Services project manager in conjunction with each required submittal. Paper copies are not required unless specifically requested.

3.2.2.2 Checklists

Report checklists are available on the Town of Castle Rock website (CRgov.com/codecentral), and must be completed and submitted with each utility report. Appropriate notations shall be provided with the checklist to assist the reviewer in determining whether the report is complete. For example, if a specific item is not addressed or not applicable, an explanation needs to be provided.

3.2.2.3 Approval Block

The Concept Utility Letter shall be signed and sealed by a Professional Engineer licensed in the State of Colorado. The Preliminary and Final Utility Reports shall be certified by a Professional Engineer licensed in the State of Colorado and signed by the Owner using the approval block sheet available on the Town website. The signed approval block shall be in the report behind the title sheet.

3.2.2.4 Stand-Alone Document

Utility reports shall be stand-alone documents. When references are made or assumptions are based on previously submitted reports, the reports must include the appropriate excerpts, pages, tables, and maps containing the referenced information. Assumptions made in previous reports must be verified and substantiated in subsequent reports. Reports shall be legible, or a resubmittal will be required.

3.2.2.5 Combined Reports

Whenever possible, water and wastewater utility reports should be combined into a single document, provided that separate sections clearly identify the information associated with each of the two systems.

3.2.2.6 Submittal Adequacy

Any report with incomplete or missing information shall result in the report being returned without review. The Town reserves the right to require additional information beyond that specifically required in these Criteria.

3.2.3 Review by Referral Agencies

The review and approval of the project by State, Federal, and local agencies other than the Town, shall be the responsibility of the developer. The developer shall be required to address all referral agency comments, and to have such comments incorporated into the applicable utility report and plans submitted to the Town.

3.3 Acceptance

3.3.1 Final Utility Report Required for Construction

The Final Utility Report shall conform to the CDs to be used to bid the project, and shall be approved by Castle Rock Water prior to the construction of any Wastewater system improvements. A Preliminary Utility Report will not be an acceptable substitute for a Final Utility Report, even if the project has not fundamentally changed from that proposed in the Preliminary Utility Report.

3.3.2 One Year Approval Limitation for Final Utility Report

The approval of the Final Utility Report shall expire simultaneously with the expiration of the approval of the CDs, unless extended in conformance with the provisions of the Municipal Code. At the time the approval of the Final Utility Report expires, the report shall be deemed invalid and a resubmittal will be required. In order to be reapproved, it must be demonstrated that the concepts, designs, and calculations presented in the report are consistent with the Town's current Criteria. The Concept Utility Letter and the Preliminary Utility Report are not subject to the one-year acceptance period.

3.4 Concept Wastewater Utility Letter

The Concept Wastewater Utility letter shall be signed and sealed by a Professional Engineer licensed in the State of Colorado. The following outline sets forth the required **minimum** content to be provided in the Concept Wastewater Utility Letter that shall be submitted with the PDP:

- I. PROJECT INFORMATION
 - A. Name of project, including legal name of development
 - B. Address
 - C. Owner
 - D. Developer
 - E. Engineer
 - F. Submittal date and revision dates, as applicable

II. PROJECT LOCATION AND DESCRIPTION

A. Site Location

1. Site vicinity map
2. Township, Range, Section, and ¼ Section
3. Streets, roadways and highways adjacent to the proposed development
4. Names of surrounding or adjacent developments

B. Description of Property and Land Use

1. Total area in acres
2. Total number of SFEs proposed for the overall development at build-out, based upon proposed site zoning calculated by utilizing the table in Section 4.4.1.1 of these Criteria
3. Area (acres) and land use for all parcels to be served within the development boundaries
4. Navigable waterways, major and minor drainageways and floodplains
5. Existing irrigation canals or ditches
6. Significant geologic features and topography
7. Existing On-Site Wastewater Treatment System (OWTS).
8. Existing water wells

III. EXISTING WASTEWATER SYSTEM

A. Existing Collection System

1. Discuss the existing sanitary sewer mains, interceptors, lift stations, and force mains in the vicinity of the development, including sizes and location that will serve the proposed development.
2. Identify the existing or master-planned wastewater collection subbasin(s) that encompass the proposed development.
3. Describe how service to the proposed development area was addressed in the Wastewater Master Plan.
4. Discuss any known shortcomings associated with the existing collection system that may impact the Town's ability to adequately serve the development.

IV. PROPOSED WASTEWATER SYSTEM

A. Proposed Collection System

1. Provide a general overview of the anticipated collection system layout, and discuss any extensions from the site to the existing wastewater system necessary to serve the development parcels as shown on the PDP. Include a statement that, "Any future development of the existing wastewater infrastructure needed to serve this site is the responsibility of the developer."
2. The proposed facilities shall conform to the Town's Wastewater Master Plan unless otherwise approved by variance; therefore, identify any proposed facilities that are not consistent with the Master Plan. If the proposed SFEs exceed the number used in the Town's Wastewater

- Master Plan hydraulic modeling, then include additional information on what improvements this project will need (either on-site or off-site) to show that the system will be able to handle this higher proposed SFE demand.
3. Identify any assumptions made in the Town's Wastewater Master Plan regarding the proposed development area that may need to be reevaluated in order to serve the development.

B. Proposed Wastewater Facilities

1. Discuss any anticipated lift stations, force mains, pretreatment facilities, etc., that will likely be required to adequately serve the development.

V. REFERENCES

Reference all criteria, master plans, reports, or other technical information utilized in the Concept Wastewater Utility Letter.

VI. APPENDICES

Report appendices shall include, but not be limited to, the following items:

- A. Copies of all pertinent information from reference materials
- B. Vicinity Map
- C. Planned Development Plan (PDP), as described in Section 3.4.1
- D. Utility Map(s) provided by Castle Rock Water

3.4.1 PDP Wastewater Utility Information

The purpose of the PDP Wastewater Utility Information is to confirm that the utilities proposed for the development can be feasibly connected to the Town's wastewater collection system, that the Town's system can adequately support the development, and to ensure consistency with the Town's Wastewater Master Plan. In addition to the general formatting and information to be included on all sheets of a PDP required by the Planned Development Plan Submittal Checklist found on the Town's website, the following information shall be included on the PDP:

1. The locations and sizes of all existing major utility lines and appurtenances (water, sanitary, stormwater, etc.) on and adjacent to the site.
2. The location of all existing water wells and On-Site Wastewater Treatment System (OWTS) on and adjacent to the site.
3. The proposed tie-ins to the existing wastewater collection system, including sizes of existing mains.

3.4.2 Castle Rock Water Responsibility

Castle Rock Water is not responsible or liable for assumptions made by the developer regarding utility information associated with the proposed development.

3.5 Preliminary Wastewater Utility Report

For the Preliminary Wastewater Utility Report, information contained in the Concept Wastewater Utility Letter shall be updated to reflect the latest projections for land use and densities. Hydraulic modeling shall only be required for the site proposed in the SDP. Castle Rock Water may request further hydraulic modeling beyond the site proposed in the SDP, if Castle Rock Water needs more information to confirm the Town's ability to serve the development. This modeling may be waived on a case-by-case basis at the discretion of Castle Rock Water if it is adequately demonstrated that the SDP is already consistent with the Town's Wastewater Master Plan, and that the existing adjacent wastewater infrastructure is adequate to support the development without modifications, or if the SDP is for a commercial structure on a single lot. The modeling shall accurately reflect the sizes and locations of all proposed sanitary sewer mains associated with the SDP layout. In addition to providing updated land use and density information, the following items shall be specifically addressed:

- Further analysis of any concerns raised in the Concept Utility Letter regarding the Town's ability to serve the development
- Updated discussion of appurtenant wastewater facilities other than collection mains that will be necessary to serve the development, and the principal design parameters that will be utilized in the final design of such facilities
- Status of any variances that have been obtained, or will be pursued
- Updated discussion of maintenance access and any associated concerns
- Updated status of permitting requirements
- Updated appendices

The Preliminary Utility Report shall be submitted with the latest version of the Town's Preliminary Utility Report Checklist, available on the Town's website. The following outline sets forth the required **minimum** content to be provided in the Preliminary Wastewater Utility Report that shall be submitted with the SDP:

I. TITLE SHEET

- A. Name of Project, including legal name of development
- B. Address
- C. Owner
- D. Developer
- E. Engineer
- F. Submittal date and revision dates, as applicable

II. APPROVAL BLOCK SHEET (Available on Town's website, CRgov.com)

III. TABLE OF CONTENTS

IV. PROJECT LOCATION AND DESCRIPTION

- A. Site Location
 - 1. Site vicinity map (In Appendix D).
 - 2. Township, Range, Section, and 1/4 Section
 - 3. Streets, roadways and highways adjacent to the proposed

development

4. Names of surrounding or adjacent developments

B. Description of Property and Land Use

1. Total area in acres
2. Discussion of project phasing, if applicable
3. Total number of SFEs proposed for the development at build-out, with a breakdown of units by type projected by phase (if applicable), calculated by utilizing the table in Section 4.4.1 of these Criteria
4. Area (acres) and land use for all parcels to be served within the development boundaries (initial and future phases, if applicable) and number of lots if available.
5. Easements/tracts may not be known at this time; however, provide a statement that easement or tracts necessary for utilities will be provided at time of either platting or at time of final design/construction documents, in accordance with Town standards regarding location and size of easements and tracts.
6. Navigable waterways, major and minor drainageways and floodplains
7. Existing irrigation canals or ditches
8. Significant geologic features and topography
9. Existing On-Site Wastewater Treatment System (OWTS)
10. Existing water wells

V. CALCULATED FLOWS (See Section 3.5.XI, Appendix A)

A. Average Daily Wastewater Flows (ADF)

Tabulate the ADFs for the initial and future phases, if applicable, of all development types for the SDP development areas in accordance with the flow rates presented in Chapter 4 of these Criteria. ADFs shall be subtotaled by land use as a flow rate in gallons per day (gpd), gallons per minute (gpm), and cubic feet per second (cfs).

B. Peaking Factor

Compute the wastewater Peaking Factor based on the ADF of the development in accordance with Section 4.4.1.1.

C. Peak Design Flows (PDF)

Tabulate the PDFs for the initial and future phases, if applicable, of all development types for the SDP development areas using the equation set forth in Section 4.4.1.2 of these Criteria. PDFs shall be subtotaled by land use as a flow rate (gpd, gpm, and cfs).

VI. EXISTING WASTEWATER SYSTEM

A. Existing Collection System

1. Discuss the existing sanitary sewer mains, interceptors, lift stations, and force mains in the vicinity of the development, including sizes and locations that will need to be extended to serve the proposed development.
2. Identify the existing or master-planned wastewater collection

- subbasin(s) that encompass the proposed development.
3. Describe how service to the proposed development area was addressed in the Town's Wastewater Master Plan, including a general discussion of which sanitary sewer mains, interceptors, lift stations, force mains, and wastewater treatment facilities would be relied upon to provide service to the development.
 4. Discuss any known shortcomings or bottlenecks associated with the existing collection system that may impact the Town's ability to adequately serve the development.

VII. PROPOSED WASTEWATER SYSTEM

A. Proposed Collection System

1. Provide a general overview of the anticipated collection system for the SDP layout, including the proposed line sizes. Describe the tie-ins to the existing wastewater system and the sizes and lengths of any extensions necessary to serve the development. Include a statement that "Any future development of the existing wastewater infrastructure needed to serve this site is the responsibility of the developer".
2. Discuss how the project complies with the Town's Wastewater Master Plan. The proposed facilities shall conform to the Town's Wastewater Master Plan unless otherwise approved by variance; therefore, identify any proposed facilities that are not consistent with the Master Plan. If the proposed SFEs exceed the number used in the Town's Wastewater Master Plan hydraulic modeling, then include additional information on what improvements this project will need (either on-site or off-site) to show that the system will be able to handle this higher proposed SFE demand.
3. Identify any assumptions made in the Town's Wastewater Master Plan regarding the proposed development area that may need to be reevaluated in order to serve the development.

B. Proposed Wastewater Facilities

1. Discuss any lift stations, force mains, pretreatment facilities, etc., that will likely be required to adequately serve the development.

C. Land Dedication Requirements

1. Generally comment on any portion of the proposed wastewater system that will be potentially difficult for the Town to access or maintain. Information shall be provided regarding the nature of the difficulty, and how the particular concern will be addressed.

VIII. PROPOSED WASTEWATER SYSTEM ANALYSIS AND MODELING
(See Section 3.5.XI, Appendix B)

A. Hydraulic Models

1. Unless specifically approved by Castle Rock Water, acceptable network hydraulic models shall be EPA SWMM 5.0, FlowMaster, SewerCAD, or InfoSewer, other approved models, and Excel spreadsheet for smaller basins.
2. Anticipated primary collection lines and connections to the existing system shall be represented in the model. The developer shall evaluate all downstream sewer segments that Castle Rock Water determine need to be evaluated.

B. Hydraulic Modeling Scenarios

1. Average Daily Flow (ADF) in accordance with the assumptions for initial and full build-out of the development.
2. Peak Design Flow (PDF) in accordance with the assumptions for initial and full build-out of the development.

C. Hydraulic Modeling Output and Required Schematics

1. Pipe reports that identify pipe material, Manning's "n" coefficient (See Section 4.4.2), pipe size, design slope, and computed velocities (including velocity at PDF) for each scenario.
2. Pipe segment tabulation identifying the total number of tributary SFEs, upstream and downstream manhole ID, ADF, Peaking Factor (See Section 4.4.1.1), PDF, full pipe flow, maximum capacity (75 percent of full pipe flow) and the ratio of PDF divided by maximum capacity expressed as a percentage. Flow information may be expressed in either cfs or gpm. Pipe size, slope, manhole identification, etc., shall match the corresponding information shown on the Utility Plan/CDs.
3. Schematics shall be provided that depict the modeled network with pipe and junction IDs (Design Points), superimposed on a street layout or other recognizable base map that generally corresponds to the proposed wastewater system. Pipe size, slope, manhole identification, etc., shall match the corresponding information shown on the Utility Plan/CDs.
4. Summary narrative discussing the modeling results as compared to the required hydraulic design criteria set forth in Chapter 4 of these Criteria.

IX. POTENTIAL PERMITTING REQUIREMENTS

General discussion of all foreseeable Federal, State, County, and Local permitting requirements associated with the project.

X. REFERENCES

Reference all criteria, master plans, reports, or other technical information utilized in the report.

XI. APPENDICES

Report appendices shall include, but not be limited to, design calculations, copies of all pertinent information from reference materials, and:

- **Appendix A - Wastewater Flows**
Calculate and tabulate wastewater flows in gpd, gpm, and cfs for the development for ADF and PDF utilizing the flow rates and peaking factors in Chapter 4 of these Criteria (See Section 3.5.V of these Criteria).
- **Appendix B - Hydraulic Modeling**
Provide hydraulic modeling results for the proposed wastewater system design as described in Section 3.5.VIII of these Criteria. Required hydraulic design criteria are specified in Chapter 4 of these Criteria.
- **Appendix C - Maps and Plans**
 - A. Vicinity Map
 - B. Utility Map(s) provided by Castle Rock Water
 - C. Site Development Plan
 - D. Wastewater Utility Plan, as described in the following Section

3.5.1 SDP Wastewater Utility Plan

A SDP Wastewater Utility Plan shall be included in the appendices of the Preliminary Utility Report. The purpose of the SDP Wastewater Utility Plan is to establish locations and sizes of Public Improvements proposed for the development and to ensure compliance with the Town's Wastewater Master Plan. If desired, Water and Wastewater Utility Plans may be combined into a single SDP Utility Plan. Please refer to the Wastewater System Design Criteria Manual regarding requirements for a SDP Wastewater Utility Plan. In addition to the general formatting and information to be included on all sheets of a SDP required by the Site Development Plan Submittal Checklist found on the Town's website, the following information shall be included on the SDP Wastewater Utility Plan:

1. Legend: Each sheet shall show the symbols pertaining to the sheet.
2. The latest Water Utility Site Development Plan notes found on the Town's website shall be included on the SDP.
3. Vertical Datum: All elevations used for the planning, design and construction of facilities shall be on the NAVD88 Datum. No conversion equation is allowed.
4. Plan views shall show the location of all existing and proposed utility lines and appurtenances (water, sanitary, stormwater, gas, electric, telephone, cable, fiber optic, etc.) on and adjacent to the site. Actual sizes shall be shown for all existing utility lines and preliminary sizes shall be shown for all proposed lines.
5. Plan views shall show the location of all existing water wells and On-Site Wastewater Treatment System (OWTS) on and adjacent to the site.
6. Plan views shall show proposed sanitary sewer mains and force mains with preliminary sizes; manholes; lift stations; and other proposed appurtenances on and adjacent to the site.
7. Plan views shall show existing and proposed curb, gutter, and sidewalks on

and adjacent to the site as shown on the SDP in order to identify potential utility conflicts.

8. Plan views shall show subbasin boundaries and Design Points (DPs) for the proposed wastewater system.
9. Plan views shall show the proposed tie-ins to the existing wastewater collection system, including sizes of existing mains. The nearest manholes on existing mains shall be shown or, at a minimum, the distance to these manholes shall be included on the plan view.
10. Plan views shall show general locations of anticipated off-site improvements, extensions of service or upgrades to the Town's wastewater collection system.
11. The Utility Plan shall be submitted along with a Preliminary Grading Plan, or the Utility Plan shall include screened five-foot contours showing existing and proposed preliminary grading.
12. Plan views shall show and label as to type and width, all existing easements with recordation information that are on and adjacent to the site.

3.5.2 Castle Rock Water Responsibility

Castle Rock Water is not responsible or liable for assumptions made by the developer regarding utility information associated with the proposed development.

3.6 Final Wastewater Utility Report

For the Final Wastewater Utility Report, the Preliminary Wastewater Utility Report and associated hydraulic modeling shall be thoroughly updated to reflect the final design and layout of all wastewater system facilities and mains since the approval of the SDP, and as now shown on the Construction Drawings (CDs). The Final Wastewater Utility Report shall expand on the information provided in the Preliminary Wastewater Utility Report, and shall resolve any outstanding issues regarding the Town's ability to serve the development. Pipe size, slope, manhole identification, etc. shown on the CDs shall match the corresponding information contained in the Final Wastewater Utility Report. As applicable, hydraulic modeling shall be provided for both the initial phase of development represented on the CDs, and for full build-out of the overall site. The Final Utility Report shall include a discussion of applicable SCADA requirements. In addition to updating the Preliminary Utility Report, the following items shall be submitted for review:

- Construction Drawings in accordance with the requirements set forth herein.
- Final design discussion and statement of design parameters associated with all appurtenant wastewater facilities, other than collection mains, as depicted on the CDs.
- Copies of signed variances obtained from Castle Rock Water.
- Final easement, tract and parcel descriptions and exhibits to be conveyed to the Town. Note that all utility easements and tracts for the Development required by these Criteria shall be dedicated to the Town in a Final Plat or conveyed to the Town by separate document in an Easement Agreement acceptable to the Town.
- Engineer's cost opinion for the Improvements represented on the CDs.

The Final Utility Report shall be submitted with the latest version of the Town's Final Utility

Report Checklist, available on the Town's website (CRgov.com/codecentral).

The following outline sets forth the **required minimum** content to be provided in the Final Wastewater Utility Report that shall be submitted with the Construction Documents:

I. TITLE SHEET

- A. Name of Project, including legal name of Development
- B. Address
- C. Town of Castle Rock Project Manager
- D. Owner
- E. Developer
- F. Engineer
- G. Submittal date and revision dates, as applicable

II. APPROVAL BLOCK SHEET (Available on Town's website)

III. TABLE OF CONTENTS

IV. PROJECT LOCATION AND DESCRIPTION

A. Site Location

- 1. Site Vicinity Map (In Appendix D)
- 2. Township, Range, Section, and 1/4 Section
- 3. Streets, roadways, and highways adjacent to the proposed development
- 4. Names of surrounding or adjacent developments

B. Description of Property and Land Use

- 1. Total area in acres
- 2. Discussion of project phasing, if applicable
- 3. Total number of SFEs proposed for the development at build-out with a breakdown of units by type projected by phase (if applicable), calculated by utilizing the table in Section 4.4.1 of these Criteria.
- 4. Area (acres), land use for all parcels to be served within the development boundaries (initial and future phases, if applicable) and number of lots.
- 5. Sizes of schools, commercial and industrial buildings (initial and future phases, if applicable).
- 6. Navigable Waterways, major and minor drainageways and floodplains
- 7. Existing irrigation canals or ditches
- 8. Significant geologic features and topography
- 9. Existing On-Site Wastewater Treatment System (OWTS)
- 10. Existing water wells

V. CALCULATED FLOWS (See Section 3.6.XII, Appendix A)

A. Average Daily Wastewater Flows (ADF)

Tabulate the ADFs for the initial and future phases, if applicable, of all development types in accordance with the flow rates presented in Chapter 4 of these Criteria. ADFs shall be subtotaled by land use as a flow rate in gallons per

day (gpd), gallons per minute (gpm), and cubic feet per second (cfs).

B. Peaking Factor (PF)

Compute the wastewater Peaking Factor based on the ADF of the development in accordance with Section 4.4.1.1.

C. Peak Design Flows (PDF)

Tabulate the PDFs for the initial and future phases, if applicable, of all development types using the equation set forth in Section 4.4.1.2 of these Criteria. PDFs shall be subtotaled by land use as a flow rate (gpd, gpm, and cfs).

VI. EXISTING WASTEWATER SYSTEM

A. Existing Collection System

1. Discuss the existing sanitary sewer mains, interceptors, lift stations, and force mains in the vicinity of the development, including sizes and locations that will need to be extended to serve the proposed development.
2. Identify the existing or master-planned wastewater collection subbasin(s) that encompass the proposed development.
3. Describe how service to the proposed development area was addressed in the Town's Wastewater Master Plan, including a general discussion of which sanitary sewer mains, interceptors, lift stations, force mains, and wastewater treatment facilities would be relied upon to provide service to the development.
4. Discuss any known or anticipated shortcomings or bottlenecks associated with the existing collection system that may impact the Town's ability to adequately serve the development.

VII. PROPOSED WASTEWATER SYSTEM

A. Proposed Collection System

1. Provide a description of all proposed wastewater facilities and a general overview of the anticipated collection system layout, including the proposed line sizes. Describe the tie-ins to the existing wastewater system and the sizes and lengths of any extensions necessary to serve the development. Include a statement that "Any future development of the existing wastewater infrastructure needed to serve this site is the responsibility of the developer".
2. Discuss how the project design complies with the Town's Wastewater Master Plan. The proposed facilities shall conform to the Town's Wastewater Master Plan unless otherwise approved by variance; therefore, identify any proposed facilities that are not consistent with the Master Plan. If the proposed SFEs exceed the number used in the Town's Wastewater Master Plan hydraulic modeling, then include additional information on what Improvements this project will need (either on-site or off-site) to show that the system will be able to handle this higher proposed SFE demand.
3. Identify any assumptions made in the Town's Wastewater Master Plan regarding the proposed development area that may need to be reevaluated in order to serve the development.

B. Proposed Wastewater Facilities

1. Discuss any lift stations, force mains, pretreatment facilities, etc., that will likely be required to adequately serve the development.

C. Land Dedication Requirements

1. Generally describe any portions of the proposed wastewater system that are not planned to be located in public right-of-way, and will therefore require the dedication of tracts or utility easements to the Town.
2. Generally comment on any portion of the proposed wastewater system that will be potentially difficult for the Town to access or maintain. Information shall be provided regarding the nature of the difficulty, and how the particular concern will be addressed.

VIII. PROPOSED WASTEWATER SYSTEM ANALYSIS AND MODELING
(See Section 3.6.XII, Appendix B)

A. Hydraulic Models

1. Unless specifically approved by Castle Rock Water, acceptable network hydraulic models shall be EPA SWMM 5.0, FlowMaster, SewerCAD, or InfoSewer, other approved models, and Excel spreadsheet for smaller basins.
2. Anticipated primary collection lines and connections to the existing system shall be represented in the model.

B. Hydraulic Modeling Scenarios

1. Average Daily Flow (ADF) in accordance with the assumptions for initial and full build-out of the development.
2. Peak Design Flow (PDF) in accordance with the assumptions for initial and full build-out of the development.

C. Hydraulic Modeling Output and Required Schematics

1. Pipe reports that identify pipe material, Manning's "n" coefficient (See Section 4.4.2), pipe size, design slope, and computed velocities (including velocity at PDF) for each scenario.
2. Pipe segment tabulation identifying the total number of tributary SFEs, upstream and downstream manhole ID, ADF, Peaking Factor (See Section 4.4.1.1), PDF, full pipe flow, maximum capacity (75 percent of full pipe flow), and the ratio of PDF divided by maximum capacity expressed as a percentage. Flow information may be expressed in either cfs or gpm. Pipe size, slope, manhole identification, etc., shall match the corresponding information shown on the Utility Plan/CDs.
3. Schematics shall be provided that depict the modeled network with pipe and junction IDs (Design Points), superimposed on a street layout or other recognizable base map that generally corresponds to the proposed wastewater system. Pipe size, slope, manhole identification, etc., shall match the corresponding information shown on the Utility Plan/CDs.
4. Summary narrative discussing the modeling results as compared to the

required hydraulic design criteria set forth in Chapter 4 of these Criteria.

IX. POTENTIAL SUBDIVISION IMPROVEMENTS AGREEMENT (SIA) ITEMS

Discuss any potential SIA items such as needed off-site Improvements, improvements necessary for a project or project phase to be independently sustainable, wastewater facilities land dedication requirements, etc.

X. POTENTIAL PERMITTING REQUIREMENTS

General discussion of all foreseeable Federal, State, County, and Local permitting requirements associated with the project.

XI. REFERENCES

Reference all criteria, master plans, reports or other technical information utilities in the report.

XII. APPENDICES

Report appendices shall include, but not be limited to, design calculations, copies of all pertinent information from reference materials, and:

- Appendix A - Wastewater Flows
Calculate and tabulate wastewater flows in gpd, gpm, and cfs for the development for ADF and PDF utilizing the flow rates and peaking factors in Chapter 4 of these Criteria (See Section 3.6.V of these Criteria). Include drainage fixture unit counts and service line or building sewer sizing calculations, per the IPC as soon as available.
- Appendix B - Hydraulic Analysis and Modeling
Provide hydraulic modeling results for the proposed wastewater system design as described in Section 3.6.VIII of these Criteria. Required hydraulic design criteria are specified in Chapter 4 of these Criteria.
- Appendix C - Maps and Plans
 - A. Vicinity Map
 - B. Utility Map(s) provided by Castle Rock Water
 - C. Overall Utility Plan from the CDs
 - D. Wastewater Utility Plan(s), as described in Section 3.7.3

3.6.1 Disclaimer

Castle Rock Water is not responsible or liable for assumptions made by the developer regarding utility information associated with the proposed development. Also see "Indemnification Statement" in Section 3.7.2 of these Criteria.

3.7 Construction Drawings

3.7.1 Wastewater System Improvements

Wastewater system Improvements within public rights-of-way, utility easements, or Town of Castle Rock property are required to be designed, approved, and constructed in accordance with the Town's regulations, subdivision requirements of the Municipal Code, the Town's Design Criteria and Standard Details, sound engineering principles, and the conditions of any variances obtained from the Town.

If a variance has been granted, the pertinent CD sheets and CD cover page must contain the variance number, a description of the variance, any conditions associated with the approval, and the approval date. CDs must be prepared for all system improvements and submitted to the Town of Castle Rock Development Services Department for review and approval. The Town must issue a Civil Construction Permit prior to the commencement of any construction activity.

All easements, tracts and parcels to be conveyed to the Town shall be clearly shown on the CDs as they have, or will be recorded, prior to the issuance of the Civil Construction Permit by the Town.

3.7.2 Indemnification Statement

Construction Drawings are reviewed by Castle Rock Water for concept only. The review does not imply responsibility by Castle Rock Water or the Town of Castle Rock for accuracy and correctness of calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed for any reason as acceptance of financial responsibility by the Town for additional quantities of items shown that may be required during the construction phase.

3.7.3 Construction Drawing Requirements

In general, CDs shall include plan and profile drawings that convey the horizontal and vertical alignment of the improvements, and all other pertinent plans, sections and detailing necessary to construct the proposed facilities. Requirements pertaining to the standard CD formatting, general construction notes, approval blocks and certifications shall be as stipulated in the Construction Documents Submittal Checklist found on the Town's website (CRgov.com/codecentral).

The following documents are available on the Town's website to assist in the preparation of CDs:

- Standard Wastewater Utility Construction Notes
- Standard Detail Drawings
- Approved Wastewater Utilities Materials List
- Record Drawing Checklist

Upon final Town approval of the CDs, all "Digital Submittal Requirements," as posted on the Town's website (CRgov.com/codecentral), shall be transmitted to the Town prior to the issuance of the Town Civil Construction Permit for the project. All CDs submitted to Castle Rock Water for review, comment, and approval of wastewater system improvements shall be prepared by, or under the direct supervision of a Professional Engineer licensed in the State of Colorado. Said Professional Engineer shall be responsible for the information contained on the

CDs, which shall bear the Professional Engineer's seal prior to final approval for construction.

The developer, contractor, and professional engineer associated with the CDs shall be responsible for the adequacy and satisfactory performance of the designs and the installation of all items therein, and any failure or unsatisfactory performance of the system, so constructed, shall not be a cause for action against the Town. Approval of the CDs by the Town signifies only that the CDs meet the minimum stipulations of these design criteria and Town requirements based upon the information provided to Castle Rock Water by the Professional Engineer and/or developer, and makes no finding, representation, or warranty that the system and associated components will perform satisfactorily.

3.7.3.1 Utility Construction Drawings for Wastewater System Improvements

In addition to the general formatting and information to be included on all sheets of a construction drawing set required by the Land Development Procedures (e.g., north arrow, scale, project boundaries, lot lines, rights-of-way, tracts, approval blocks, etc.), the following information shall be included on the final Wastewater Utility Plans. The final Wastewater Utility Plans shall be included in the CDs and the appendices of the Final Utility Report. A Utility Map showing existing utilities on and adjacent to the site may be requested from Castle Rock Water.

1. Legend: Each sheet shall show the symbols pertaining to the sheet.
2. Vertical Datum: All elevations used for the planning, design and construction of facilities shall be on the NAVD88 Datum. No conversion equation is allowed.
3. Horizontal Benchmark and Coordinates: The horizontal benchmark shall be specified. In order to facilitate Castle Rock Water's GIS mapping efforts, all CDs shall be placed in the State Plane NAD83, Colorado Central Zone FIPS 0502 Coordinate System and include the coordinates of a known property corner on or adjacent to the site.
4. The latest Wastewater Utility Construction Notes found on the Town's website (CRgov.com/codecentral) shall be included on the CDs.
5. Overall Wastewater System: In plan view, provide all information and dimensions for horizontal layout of proposed sanitary sewer and force mains including but not limited to manholes, wye connections, sanitary sewer service lines, clean-outs, lift stations, and any other appurtenances that are part of the wastewater collection system.
6. Plan views shall show the locations and sizes of all existing and proposed utility lines and appurtenances (water, sanitary sewer, stormwater, gas, electric, telephone, cable, fiber optic, etc.) on and adjacent to the site.
Plan views shall show the location of all existing water wells and On-Site Wastewater Treatment System (OWTS) on and adjacent to the site.
7. Plan views shall show existing sanitary sewer and force mains with sizes; manholes; sanitary sewer service taps and lines; clean-outs; lift stations; and any other appurtenances that are part of the wastewater collection system on and adjacent to the site.
8. Plan views shall show existing and proposed curb, gutter, and sidewalks; and all existing and proposed obstructions, such as vaults, catch basins, traffic islands, street lights, walls or other permanent structures on and adjacent to the site.
9. Plan views and profiles shall show the tie-ins to the existing wastewater

- collection system, including sizes of existing mains. In addition, the nearest manholes on existing mains shall be shown or, at a minimum, the distance to these manholes shall be included on the CDs.
10. Plan views and profiles shall show all needed off-site improvements, extensions of service or upgrades to the Town's wastewater collection system.
 11. Plan views shall show and label as to type and width, all existing and proposed easements that are on and adjacent to the site. Recordation information shall be included for all existing easements.
 12. Profile views are required for all sanitary sewer and force mains and may be shown on street profiles. Profiles and utility crossing information shall be included for all sanitary sewer and force mains outside of streets where street profiles do not exist. The following information shall be included:
 - a. All high points (HP) and low points (LP) along the sanitary sewer and force mains shall be identified;
 - b. Where required by these Criteria, combination air release and air/vacuum valves and drain valves shall be shown on force mains, with the TOP elevations provided; and
 - c. All utility crossings shall be identified and shall include the information in Section 3.7.3.1.13 below.
 13. Profile views or plan views: Adequate pipe elevation information is required for all utility crossings of water, sanitary sewer, force main, stormwater, gas, electric lines, etc. The following information shall be included:
 - a. Types and sizes of the utility lines at the crossing and the stationing of the crossing; and
 - b. If any pipes at crossing are encased, the coordinates at each end of the encasement, and the type and thickness of the encasements shall be specified. In addition, all utility crossing shall include either:
 - A reference to the sheet where the crossing information is shown; or
 - TOP and BOP elevations and vertical clearance at the crossing with a callout of "(Min. = 1.5')" wherever the clearance is two feet or less.
 14. Wastewater System Details: All pertinent details related to wastewater system improvements, such as manholes, outside drop manholes, sanitary sewer service line connections, sanitary sewer clean-outs, proposed utility crossings, including concrete blankets, trenching, etc., shall be shown on detail sheets on the CDs. Where applicable, Castle Rock Water Standard Details may be found on the Town's website (CRgov.com/codecentral) for this purpose.
 15. Plan views shall show subbasin boundaries and Design Points (DPs) for the proposed wastewater system as appropriate.
 16. The Utility Plans shall contain the following note: "Contractor shall provide a minimum Forty-Eight (48) hour notice to, and obtain approval from the on-site Town of Castle Rock Public Works Inspector, (720) 733-2200, prior to making any connections/tie-ins to existing Water, Sanitary Sewer, and/or Storm Sewer systems."

3.8 Record Drawings

All wastewater system improvements constructed within public rights-of-way, dedicated easements and Town of Castle Rock Property must be formally accepted by Castle Rock Water. The Town's acceptance process will confirm that the improvements have been constructed in accordance with the Town's current Criteria and Regulations.

Record drawings and "Statements of Substantial Completion" as required by the engineer and surveyor, shall be submitted in accordance with the Town's Regulations and "Digital Submittal Requirements upon Approval of Construction Drawings" prior to placing the facilities into service. Record drawings shall contain all required information as set forth in the latest version of the Record Drawing Checklist available on the Town's website (CRgov.com/codecentral).

Chapter 4 – Wastewater Collection System Design Criteria

4.1 Reference Design Documents

Primary standards and reference publications pertinent to the design of wastewater facilities within the Town of Castle Rock are listed below. Unless otherwise specified, the latest editions shall apply.

- American Public Works Association (APWA)
- Insurance Service Offices (ISO)
- Ductile Iron Pipe Research Association (DIPRA)
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- All applicable International Codes recognized by the Town including, but not limited to, the International Building Code (IBC), the International Plumbing Code (IPC), the International Fire Code (IFC), the International Residential Code (IRC), and the International Mechanical Code (IMC)
- American Society for Testing and Materials (ASTM)
- American National Standards Institute (ANSI)
- Colorado Department of Public Health and Environment (CDPHE) Design Criteria for Wastewater Treatment Facilities
- Denver Regional Council of Governments (DRCOG) Wastewater Utility Plan Guidance
- Town of Castle Rock Municipal Code
- Town of Castle Rock Wastewater Master Plan
- Plum Creek Water Reclamation Authority (PCWRA) Code of Rules and Regulations

4.2 Prohibited Installations

The following installations are prohibited unless otherwise approved through Castle Rock Water by variance in accordance with Section 1.9 of these Criteria. Certain items listed below reference Sections contained in these Criteria that provide the minimum design requirements to be addressed, should a variance be pursued.

- On-Site Wastewater Treatment System (OWTS)
- Gray-water systems
- Private Ejector Pumps and Lift Stations (variance request must address pertinent Chapter 5 requirements contained herein)
- Inverted Wastewater Siphons (variance request must address Section 4.4.9 requirements contained herein)
- Manholes and sewer lines over twenty feet deep (variance request must address Section 4.4.8 requirements contained herein)
- Elevated Wastewater Pipelines

4.3 Unlawful Connections

It shall be unlawful to discharge roof drainage, foundation drainage, sump pumps, surface drainage, stormwater, solid wastes, or any other illicit discharges to the wastewater collection system, as stipulated in the Municipal Code, the Plum Creek Water Reclamation Authority

Code of Rules and Regulations, and all applicable Federal, State and Local regulations. Criteria governing the acceptable design of underdrains are contained within the Town's Storm Drainage Design and Technical Criteria Manual, and shall under no circumstances be connected to the Town's wastewater collection system.

4.4 Minimum Wastewater System Design Criteria

This section presents the minimum technical criteria for the analysis and design of wastewater systems within the boundaries of the Town of Castle Rock, including collection mains, sanitary sewer service lines, and the applicable appurtenances associated with these installations. Refer to the Sanitary Sewer Construction Notes and Construction Methodology and Materials Manual on the Town's website (CRgov.com/codecentral) for acceptable materials. Any special criteria beyond those contained herein, and as determined necessary by the Town, shall be discussed at the pre-application consultation.

It is the intent of this section to provide sufficiently detailed information to enable the engineer to design the majority of wastewater system components associated with a typical project. The wastewater system shall be designed by a Registered Professional Engineer licensed in the State of Colorado and shall conform to the most current technical standards available. It is assumed that any number of engineers may be involved in the design, depending on the technical expertise necessary to design and certify the various components of the project. It is further assumed that sound engineering will be applied throughout the design process to produce standard of the industry designs that incorporate specific Town input conveyed to the engineer during the review process. As established in Chapter 3 of these Criteria, specific information will ultimately be required on the record drawings in accordance with the Record Drawing Checklist. In order to expedite the eventual preparation of the record drawings, a thorough review of these requirements during the design phase of the project, and prior to the preparation of the CDs, is strongly recommended.

If there is a question or a concern regarding the design of any portion of the wastewater system that is not adequately addressed in this chapter, the developer shall contact Castle Rock Water to resolve all issues prior to proceeding with the design of any such component. Any variance from these Criteria must be approved in accordance with Section 1.9 of these Criteria. The submittal review process and the specific wastewater system requirements associated with the Town's Concept, Preliminary, and Final Development Packages are documented in Chapter 3 of these Criteria.

4.4.1 Design Flows

The tabulation below provides the Average Daily Flow (ADF) rates that shall be applied to compute the wastewater flows associated with the various types of land use within the development. Flows shall be computed for initial and full build-out phases of the development, and shall be assigned to the appropriate design points within the model to accurately reflect the geographical distribution of land use throughout the site.

4.4.1.1 Wastewater System Average Daily Flow (ADF)

Land Use	Typical ADF/Unit	Typical SFEs/Unit
Single Family Residential and Duplexes	200 gpd/dwelling unit	1.00/dwelling unit
Multi-Family Residential (Townhomes and Condos)	130 gpd/dwelling unit	0.65/dwelling unit
Retail/Offices	0.1 gpd/SF	0.0005/SF
Hotels/Motels	75 gpd/room	0.375/room
Restaurants	1.5 gpd/SF	0.0075/SF
Car Washes	5,000 gpd/acre	25.0/acre
Industrial/Other Commercial	600 gpd/acre	3.0/acre
Institutional	400 gpd/acre	2.0/acre
Churches	300 gpd/church	1.5/church
Gym/Fitness Center	0.5 gpd/SF	0.00125 SFE/SF
Irrigated Land	0 gpd/acre	0.0/acre
<u>Rates for Typical Douglas County School Sizes:</u>		
Elementary (10 ac, 675 Students)	3,375 gpd/school	16.88/school
Middle (25 ac, 850 students)	8,500 gpd/school	42.50/school
High (50 ac, 1700 students)	17,000 gpd/school	85.00/school
<u>Rates for Alternate School Sizes:</u>		
Elementary	5 gpd/student	0.025/student
Middle	10 gpd/student	0.050/student
High	10 gpd/student	0.050/student

The demands noted in the table above represent the “winter time” or “dry weather” Average Daily Flow (ADF) with no allowance for infiltration and inflow (I/I). I/I shall be accounted for in accordance with the Peak Design Flow computation discussed in the sections to follow.

Regarding design flows for schools, planned school sizes shall be confirmed with the Douglas County School District and documented in the Utility Report. The tabulated rates

shown above shall be applied as appropriate, depending on the information provided by the School District. Reasonable engineering judgment shall be used in determining the estimated ADF for commercial, industrial and institutional sites. Individual evaluation and justification shall be provided when the proposed use is not specifically represented in the table above, or when the proposed flows will be inconsistent with the tabulated values. Justification of all non-residential flows shall be addressed in the Utility Report.

4.4.1.2 Peaking Factor

The portion of the Peak Design Flow calculation exclusive of I/I shall be determined by multiplying the ADF in the preceding section by a peaking factor (PF). The PF is a function of ADF, and shall be computed as follows: $PF = 3.65 \times [(ADF)^{-0.168}]$.

The maximum PF shall be 5.0, and ADF shall be expressed in units of million gallons per day (MGD).

4.4.1.3 Peak Design Flow Rate

The Peak Design Flow (PDF) shall be computed at all pertinent design points throughout the system, and used to size the corresponding wastewater facilities. The PDF shall be determined by multiplying the ADF by the calculated peaking factor (PF), plus an I/I allowance equal to ten percent of the ADF as expressed by the following formula:

$$PDF = \text{peak base flow} + \text{I/I allowance} = (ADF \times PF) + (0.1 \times ADF)$$

Once computed, the PDF shall be used to determine the sizes of the facilities in accordance with the criteria established below.

4.4.2 Hydraulic Design

Wastewater systems shall be designed to provide a minimum velocity of two feet per second at the Peak Design Flow. In situations where the minimum velocity of 2.0 feet per second cannot be met, an explanation and justification shall be included in the Final Utility Report. The maximum velocity shall not exceed ten feet per second. Drop manholes shall be provided to break steep slopes to limit the velocities in conformance with this criterion. Where drop manholes are impractical for velocity reduction, the sewer must be approved by variance and shall be of PVC or other abrasion resistant material approved by Castle Rock Water.

Where actual flow will be much below normal for several years, the minimum velocity shall be achieved by suitable grades at the partial design flow rate. Care shall be taken to design invert elevations at manholes in such a manner that the energy gradient is consistently falling in the direction of the flow. Sanitary sewers shall be sized to convey the Peak Design Flow while flowing no more than 75 percent of the maximum pipe flow capacity. Computation of velocity of flow shall be based on a coefficient of roughness "n" in the Manning formula of 0.011 for PVC. At all junctions where a smaller diameter main discharges into a larger one, the invert of the larger sanitary sewer shall be lowered so that the energy gradients of the sewers at the junction are at the same level. Generally, this condition will be met by placing the 0.80 depth point of both sewers at

the same elevation. No surcharging of sanitary sewer lines is allowed.

4.4.3 Pipe Sizes and Grades

Sanitary sewer mains shall be a minimum of eight inches in diameter. Service lines shall be a minimum of four inches in diameter. The sanitary sewer shall be designed to carry the PDF within the ranges of grades shown below, unless otherwise approved by variance in accordance with Section 1.9. All changes in pipe size shall occur at a manhole.

Sewer Diameter	Minimum Grade	Maximum Grade
4-inch service line	2.0%	--
6-inch service line	2.0%	--
8 inch	0.40%	7.5%
10 inch	0.28%	5.5%
12 inch	0.22%	4.5%
15 inch	0.15%	3.5%
18 inch	0.11%	2.5%
21 inch	0.09%	2.0%
24 inch	0.08%	1.8%
27 inch	0.07%	1.5%
30 inch or larger	0.06%	1.3%

4.4.4 General Wastewater System Layout Criteria

4.4.4.1 Location

All sanitary sewer mains and appurtenances shall be installed in dedicated right-of-way or dedicated utility easements. Under no circumstances shall sanitary sewer mains or manholes be installed parallel to, and directly below, any concrete such as sidewalks, trails, curbs, or gutters. Mains designed within the street right-of-way shall be located in accordance with the Standard Details available on the Town's website (CRgov.com/codecentral), unless otherwise approved in writing by Castle Rock Water. In general, sanitary sewer mains shall be located in public streets near the center of the south or west lane wherever possible. Sanitary sewer mains and manholes shall not be located in vehicle wheel paths. Under no circumstances shall a main be closer than five feet from a gutter pan.

Sanitary sewer lines and manholes shall not be located within detention pond areas. In areas of fill, sewer lines and manholes shall be subject to the requirements established

in Section 4.4.10 of these Criteria. Where it is necessary to locate a sanitary sewer main along back lot lines, the alignment shall be specifically approved by Castle Rock Water, and manholes with locking-type covers in accordance with Section 4.4.7.1.3.b of these Criteria shall be located to provide reasonable access for maintenance crews.

4.4.4.2 Horizontal Layout

Sanitary sewer mains shall be laid with a minimum separation of ten feet horizontally, edge-to-edge, from all water lines. Mains shall have a minimum separation of ten feet horizontally, centerline-to-centerline, from all other existing or proposed utilities wherever possible. The Town of Castle Rock Water Department must specifically approve any variance from these requirements in the event that it has been determined that it is impossible to maintain the specified horizontal separation distances.

Sanitary sewer mains adjacent to developments shall be designed to extend along the entire frontage of the property to be served from property line to property line, and with termination in a manhole in order that service will thereupon be available to adjacent developers or builders to subsequently extend from in the future. Within developments, sanitary sewer mains shall be extended at least ten feet uphill from the lowest lot corner of the uppermost lot, and shall terminate in a manhole.

No permanent structures, (e.g., retaining walls, trees, light pedestals, sign foundations, power poles, mailboxes, sheds, buildings, private utilities, etc.), shall be within ten feet of a sanitary sewer main.

Horizontal separation from sanitary sewer mains to dry utilities and any dry utility infrastructure shall be ten feet, edge-to-edge.

4.4.4.3 Vertical Layout

Sanitary sewer mains shall have a minimum cover of five feet to finished ground surface, and a maximum cover of twenty feet, unless otherwise approved by variance in accordance with Section 1.9 of these Criteria.

Sanitary sewer mains shall be deep enough to collect wastewater from all basements by gravity flow. When less than nine feet of elevation difference exists between the finished lot grade at the building line and the top of the sanitary sewer main, such conditions shall be clearly addressed in the required Utility Reports, with notes provided on the record drawings indicating which lots are served by a "shallow sanitary sewer." Appropriate elevation information shall be provided on the record drawings for all such mains. All sanitary sewer mains shall have a minimum of 18 inches vertical clearance (edge- to-edge) between any water or storm sewer crossings. Where this clearance cannot be maintained, provisions shall be made as set forth in the "Utility Crossings" section of these Criteria.

4.4.5 Utility Crossings

Construction plans shall show details of the crossings of sanitary sewer mains, including force mains, and all other utility lines (water, irrigation, storm sewer, electric, gas, fiber optic, etc.). Utility lines shall be protected from one another at crossings, as detailed in the sections that follow, in order to protect the potable water supply to the greatest extent possible. In general, sanitary sewers and force mains that cross water mains or storm sewers shall be laid to provide a minimum vertical clearance of 18 inches between the outside of the water main and the outside of the sanitary sewer, force main or storm sewer. In all cases, proper soil compaction, suitable backfill or other structural support shall be provided to preclude settling and failure of either pipe at the crossing. Special structural support for the crossing pipes may be required at the discretion of Castle Rock Water. Unless otherwise approved by variance, the Criteria set forth below shall apply to both the crossing of new mains, and the crossing of a new main and an existing main.

4.4.5.1 Sanitary Sewer Main Crossing under a Water Main

When sanitary sewer mains or force mains cross under a water main, regardless of vertical clearance, one full standard length section of water pipe shall be located such that both joints will be as far from the sanitary sewer main or force main as possible. When a water main crosses over a sanitary sewer main or force main with less than two feet between the outside of the water main and the outside of the sanitary sewer or force main, the sanitary sewer or force main shall be encased with a minimum of six inches of concrete from springline to six inches above the top of the sanitary sewer or force main. The encasement shall extend along the centerline of the sanitary sewer main or force main for a minimum of one foot beyond the outside of the water main at each end. When less than 18 inches of vertical clearance exists between the top of the sanitary sewer main or force main and the bottom of the water main, the water main shall be lowered or deflected under the sanitary sewer or force main wherever possible to achieve a minimum vertical clearance of 18 inches, and the requirements of Section 4.4.5.2 shall apply. These situations will be reviewed by Castle Rock Water on a case-by-case basis.

4.4.5.2 Sanitary Sewer Main Crossing Over a Water Main

When sanitary sewer mains or force mains cross over a water main, regardless of vertical clearance, one full standard length section of water pipe shall be located such that both joints will be as far from the sanitary sewer main or force main as possible. In all cases, a minimum of 18 inches of vertical clearance shall be provided at the crossing, which may require that the water main be lowered in conformance with the Town's Standard Details.

4.4.5.3 Sanitary Sewer Main Crossing of a Storm Sewer

When sanitary sewer mains or force mains cross a storm sewer, regardless of vertical clearance and which pipe crosses over the other, each joint of the storm sewer within the trench width of the crossing shall be encased in a concrete collar at least six inches thick and extending at least six inches each side of each joint. When sanitary sewer mains or force mains cross under a storm sewer pipe greater than 48 inches in diameter, or a

culvert 4' x 4' or larger, the sanitary sewer main must be installed within a casing pipe that conforms with section 4.4.6 of this criteria, and extends at least five feet beyond the outside edge of the culvert, or as determined by plan review.

4.4.5.4 Limits on Minimum Vertical Clearance

Under no circumstances shall the minimum vertical clearance between any two crossing utilities be less than 18 inches, unless approved by variance in accordance with Section 1.9 of these Criteria.

4.4.6 Bored Crossings

When a sanitary sewer main passes under a State roadway, an arterial or collector roadway as defined by the Town, railroad, navigable waterway, drainageway or irrigation ditch, the main shall be located within a steel casing pipe, and boring under the obstacle is required unless otherwise allowed to be open cut by the jurisdictional entity being crossed. The carrier pipe shall be sleeved, sealed, and fully restrained within the casing pipe in accordance with the Town's Standard Details, and shall have a minimum of five feet of cover to the top of the casing. The casing pipe shall extend the entire width of the right-of-way or easement of the crossing structure, the entire width of the 100-year floodplain, or as directed by Castle Rock Water or other jurisdictional entity. Manholes shall be located near each right-of-way or easement line, just beyond the ends of the casing pipe.

In the event that the roadway, railroad, navigable waterway, drainageway, irrigation ditch or other such crossing is widened, the casing pipe shall be extended to the newly defined full width of the right-of-way, easement or crossing structure, the entire width of the 100 year floodplain, or otherwise the sanitary sewer main and casing pipe shall be realigned and rebored to span the full width of the newly widened crossing. Manholes shall be relocated as necessary to just beyond the ends of the newly extended casing pipe, near each right-of-way or easement line.

Crossings under navigable waterways, drainageways and irrigation ditches shall include all required stream stabilization associated with the crossing as analyzed and designed by the engineer, at the direction of Castle Rock Water. Additionally, drainageway crossings shall be subject to a combination of Town approval and any 404 permitting requirements stipulated by the Army Corps of Engineers. Depending on the nature of the waterway or drainageway, a scour analysis may be required, and may result in the need for an engineered concrete encasement around the casing pipe that would allow the installation to withstand the hydraulic forces that may occur during major flooding events.

Casing pipe shall be smooth-walled, non-coated pipe of welded steel construction conforming to ANSI/AWWA C200, and shall be seamless or straight seam steel pipe with minimum yield strength of 35,000 psi. The casing pipe shall be constructed of new material and have a minimum wall thickness as follows, unless specified otherwise, or if a more stringent requirement applies (for example, under a railroad).

Carrier Pipe Nominal Diameter	Min. Casing Pipe O.D.	Min. Wall Thickness
4"	12"	0.188"
6"	16"	0.250"
8"	18"	0.282"
16"	28"	0.406"
20"	32"	0.469"

Casing pipe shall be cathodically protected by burying a pair of sacrificial anodes ten feet from each end of the casing. Anode wires shall pass from the casing pipe to terminal boards inside surface-mounted cast iron lids at each casing end, and then on to the anodes themselves. All anodes shall be buried vertically or horizontally with the top of the anodes set at a depth equal to the casing springline. Anodes shall be buried vertically or horizontally with the top of the anodes set at a depth equal to the casing springline. Anode pairs shall be offset perpendicularly five feet away from the casing pipe, and shall be placed in native soils, not imported backfills. The cathodic protection system shall be designed by competent technical personnel experienced with these types of systems, and shall be submitted to the Town for review and approval. Long-term maintenance of the system, including anode assessment and replacement, shall be addressed in the submittal.

4.4.7 Manholes

4.4.7.1 Layout

1. Location: Manholes for access to sewers shall be provided at the following locations:
 - a. All junctions of sanitary sewers
 - b. All points of change in alignment, grade or pipe size
 - c. All points of industrial and commercial discharge as required by the Plum Creek Wastewater Authority Industrial Wastewater Pretreatment Program to facilitate observation and sampling
 - d. The upstream terminus of the main
 - e. Cleanouts shall not be allowed to replace manholes on sanitary sewer lines eight- inch and larger.
2. Alignment and Spacing: Sanitary sewer manholes shall be aligned and spaced as follows:
 - a. Sanitary sewer mains shall be installed in a straight alignment, both in line and grade, and not curved between manholes.
 - b. Maximum spacing between manholes shall be 400 feet for lines 15 inches or smaller and 500 feet for lines 18 inches and larger.
 - c. Maximum change in alignment shall not exceed 90 degrees.
 - d. Manhole lids shall not be aligned with vehicle wheel paths, or within two feet either direction of the street crown.
 - e. No drop-in style riser or paver rings are allowed. Grade rings beneath the ring and cover are allowable for final grade adjustment with a maximum of 18 inches.

3. Access: Provisions for manhole access shall be as follows:

- a. Manholes shall not be located in areas that are subject to flooding from surface runoff. If the possibility of surface runoff flooding cannot be avoided, a watertight lid as approved by Castle Rock Water shall be installed to prevent inflow. Ventilation of gravity sewers shall be provided where water-tight appurtenances along continuous sections greater than 1,000 feet in length are incurred.
- b. Manholes shall be located in areas that allow direct access by maintenance vehicles when it is not feasible to locate the manhole in a public street.
- c. Manholes shall not be located in open space access roads, wherever possible. If it is impossible to locate a manhole outside an access road, then the cover shall be at the grade of the access road and a 10' x 10' concrete collar shall be installed around the manhole. All manholes located outside dedicated paved right-of-way shall be designed and constructed with a locking-type cover and the manhole ring shall be bolted to the manhole cone and the manhole lid shall be raised in accordance with the Town's Standard Detail. Marker posts in accordance with the Town's Standard Details shall be installed to mark the location of manholes outside of pavement.
- d. All manhole lids shall be depressed $\frac{1}{4}$ " to $\frac{1}{2}$ " below any adjacent finished street surface.

4.4.7.2 Manhole Sizing

Manholes for sanitary sewers up to 18 inches in diameter shall have an inside diameter not less than four feet. Manholes for sanitary sewers 18 inches to 36 inches shall have an inside diameter of not less than five feet. Manholes for sanitary sewers 36 inches to 54 inches shall have an inside diameter of six feet. Manholes for sanitary sewers over 54 inches shall be of special design. If the angle of deflection does not permit use of a six foot inside diameter manhole, then a special manhole detail must be submitted for review and approval by Castle Rock Water. There shall be a bench located below the bottom manhole ladder rung.

4.4.7.3 Drops through Manholes

1. Standard Manhole Slopes: Manholes that do not meet the criteria for drop manholes shall be designed in accordance with the following provisions:
 - a. Invert channels in terminal manholes shall be built at a slope of not less than one inch per one foot.
 - b. Where the drop to the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.
 - c. The minimum drop through a manhole for a sanitary sewer shall be 0.30 feet.
2. Drop Manholes: Manholes that contain a drop of 24 inches or greater shall be designated as outside drop manholes, and shall conform to the following requirements:
 - a. Drop manholes shall be used to limit velocities in accordance with the

requirements set forth in these Criteria, and to avoid site obstructions such as existing pipes, utilities or geologic features, but not to reduce the depth of excavation for other planned pipes.

- b. Drop manholes shall be provided for a sanitary sewer entering a manhole at an elevation 24 inches or more above the manhole invert and shall be made by means of an outside connection in accordance with the Town's Standard Details.

4.4.7.4 Main Connections to Existing Manholes

When designing new sanitary sewers to tie into existing manholes, the invert out elevation at the inside manhole wall shall be stated on the plans, so that the invert of the new tie-in is not established lower than the existing invert. When the existing sanitary sewer line is larger than the new connection, the crown of the new pipe shall be no lower than the highest crown of the existing line within the manhole.

4.4.7.5 Metering Vault

Metering stations that monitor wastewater flow rates may be required at major junctions in the collection system, as determined by Castle Rock Water.

The vault shall be constructed for the installation of a measuring flume of the size and type required by Castle Rock Water. The flume shall be accompanied by a non-contacting ultrasonic flow meter, and the associated electrical, control and telemetry components necessary to measure, record, and transmit the signal to Castle Rock Water. It is the developer's responsibility to contact Castle Rock Water regarding the necessity of a metering manhole for a particular development, and to coordinate the design and provision of equipment associated with the installation.

4.4.8 Sanitary Sewers and Manholes Greater than Twenty Feet

Where sanitary sewer mains or manholes cannot be designed at depths less than twenty feet, a variance shall be obtained in accordance with Section 1.9. The submitted request shall fully justify the need for deep sanitary sewers and manholes, and describe the alternatives considered. The length and depth of sanitary sewers greater than twenty feet deep, and the number of manholes greater than twenty feet deep, shall be minimized to the maximum extent possible through the alternatives evaluation process. The requirements described below shall be included in the variance request.

1. Sanitary sewers greater than twenty feet deep: The following requirements for sanitary sewers greater than twenty feet deep from invert to finished grade surface shall be met:
 - a. Pipe material shall be SDR 26 PVC and shall conform to ASTM D-3034. If any portion of a sanitary sewer between any two manholes is more than twenty feet deep from invert to finished grade, the entire segment of sanitary sewer between the manholes shall be SDR 26 PVC pipe.
 - b. Class B bedding material and installation shall be in accordance with the Town's standards.

2. Manholes greater than twenty feet deep: The following requirements for manholes greater than twenty feet deep from invert to rim elevation shall be met:
 - a. Manholes shall be six-foot diameter with an eight-foot diameter base and a 30" frame and cover.
 - b. "Riser-Wrap" TM as manufactured by Pipeline Seal and Insulator, Inc. (PSI) or approved equal shall be applied to each manhole section before it is set in place, to reduce skin friction and mitigate differential stresses on the manhole.
3. Utility easement widths: Required Utility Easements shall have a width of at least two times the depth to the pipe invert in accordance with Section 4.5 of these Criteria. Final Plats and CDs shall show the correct Utility Easement widths for deep sanitary sewers and manholes.

If the variance is approved, notes including requirements #1 and #2 above shall be added to each CD sheet where the variance applies. Pertinent CD sheets shall contain the variance number, description of the variance, any conditions of approval, and the approval date.

4.4.9 Inverted Wastewater Siphons

The design of inverted wastewater siphons, or sag pipes, shall be avoided to the greatest extent possible. However, should an inverted siphon be the only feasible alternative, a variance request with detailed justification shall be submitted to the Director of Castle Rock Water pursuant to Section 1.9.

When inverted siphon construction is deemed necessary and approved by the Director of Castle Rock Water, the facility shall have at least two separate barrels with a minimum pipe size of eight inches, and shall include appurtenances for convenient flushing and maintenance. Inlet and outlet structures shall have adequate clearance for access and maintenance operations, and sufficient head shall be provided and pipes sized to ensure velocities of at least 3.0 feet per second under average flow for both initial and future build-out conditions. The inlet and outlet shall be arranged so that normal flows can be diverted to one barrel, and that either barrel may be removed from service for cleaning or repair. A grinder facility ("Muffin Monster" by JWC Environmental, or approved equal) shall be approved by Castle Rock Water and be incorporated into the design upstream of the siphon.

4.4.10 Fill Areas

Where sanitary sewer lines will be constructed in fill areas, all fill materials shall be placed and compacted in accordance with Town requirements to final grade prior to the installation of the sanitary sewer line and appurtenances. All fill material shall meet the Town's standards and be approved by Castle Rock Water.

4.4.11 Trail Access

Where sanitary sewer mains and manholes cannot be located in public right-of-way, the

facilities shall be located in utility easements that allow direct access by maintenance vehicles. Trails that are proposed to be used to access sanitary sewer mains and manholes must meet the following requirements, and shall be submitted for review and approval by Castle Rock Water and the Parks and Recreation Department:

1. In accordance with Section 4.5, the longitudinal slope must not exceed ten percent and the cross slope must not exceed four percent, unless approved by variance.
2. The Parks and Recreation Department must approve this use.
3. The width of the drivable surface shall be a minimum of ten feet for a straight portion of trail and at least twelve feet wide for curved portions, depending on the curve radii. A shoulder may be required.
4. The trail shall be designed to support a minimum vehicle weight of 60,000 pounds.
5. Manholes shall not be located directly within trail surfaces.
6. The trail must be in a utility, public access and trail easement a minimum of 25 feet wide in accordance with Town Regulations.
7. Where trails are in or adjacent to utility easements for sanitary sewers, odor mitigation measures, including air-tight manhole covers, may be required as determined by Castle Rock Water.

Information regarding the width, type and depth of material specified for trails to be used to access sanitary sewer system facilities shall be submitted for review by Castle Rock Water, and shall include acknowledgement from the Parks and Recreation Department that utility access is approved for the particular trail.

4.4.12 Future Connections

Manholes shall have pipes stubbed out that are sized to accommodate flows from the upstream basin whenever a future extension of the sanitary sewer main is anticipated. The main line stub-out shall extend between four and ten feet from the terminal manhole and shall be capped and sealed. Unless otherwise approved by Castle Rock Water, the stubbed-out end shall coincide with the right-of-way or utility easement boundary at the upstream end of the development. Other reasonable stub-outs may be required by the Town based on knowledge of adjacent developments, pursuant to the Municipal Code.

4.4.13 Sanitary Sewer Service Lines

All single family residential dwellings, each individual building in multi-family complexes, each unit of duplexes and townhomes, and each commercial business and industrial customer shall be served by a separate, independent sanitary sewer service line. When townhomes and duplexes are on a single lot with a single owner, each building may be served by a single service line and meter.

4.4.13.1 Ownership

After a building is connected through a service line to the sanitary sewer, the service shall become a part of the building, and the owner of the premises shall be responsible for the operation and maintenance of the entire building sewer

between the building and the main, excluding the wye at the connection.

Although the service line up to the wye is the responsibility of the owner, the service lines and associated connections to the main shall be inspected and tested by the Town prior to backfill. The inspection of service line stub-outs will take place at the same time inspections are conducted for the installation of the sanitary sewer main. Inspection of the entire service line will be made when the service line is extended to the building.

4.4.13.2 Layout

The developer shall install a service line stub-out from the sanitary sewer main to each individual lot. Where sidewalks are proposed to be constructed, the stub-out shall be constructed to fifteen feet beyond the back of the sidewalk. Where sidewalks will not be constructed, the stub-out shall be constructed a minimum of one foot beyond the property line. The stub-outs shall be plugged and the end marked with a green painted T-post installed in the ground directly above the location of the plugged end. Where curbs exist, the location of each service line shall be marked on the curb with an "S" symbol impression in the concrete.

All service line sizes and locations shall be shown on the sanitary sewer Construction Drawings to be approved by Castle Rock Water. The services shall be constructed as shown on the CDs unless otherwise approved in writing by Castle Rock Water. The stationing, length and direction of the service line, and the pipe size and percent grade shall be shown in plan view on the CDs.

The depth below finished ground elevation of the service shall be shown on the profile. Additional service line layout details are as follows, which shall be in accordance with the Town's Standard Details:

1. For new construction, all service lines shall connect to sanitary sewer mains using an in-line manufactured wye in accordance with the Town's Standard Details. No tee connections are allowed.
2. When connecting to existing mains, service lines shall connect to the main with a sewer saddle approved by Castle Rock Water.
3. All sanitary sewer service connections shall be made at the exact location required for proper alignment with the service line.
4. Service lines shall be connected to the main a minimum distance of five feet clear from manhole walls.
5. Service lines shall be laid with ten feet of clear horizontal separation, measured edge-to-edge, from any water main or service line.
6. A minimum of 18 inches of vertical clearance shall be provided at all sanitary service line crossings with potable water mains and services and storm sewers.
7. Services shall be laid at the grades provided in the CDs and shall have a minimum of five feet of cover.
8. Service lines shall be constructed on the shortest and straightest route possible.
9. The service line shall be a minimum of five feet from the side property line and shall not be constructed through or in front of any adjoining property.

10. When possible, the service line shall be located ten feet toward the low side of the lot from the centerline of the property and be a minimum of ten feet from the water service line.
11. No direct connections of service lines to manholes will be allowed.
12. Service lines shall be bored under any existing sidewalks or curbs in lieu of trenching and concrete replacement.
13. Abandonment of sanitary sewer service lines shall be in accordance with the Town's Standard Details.
14. Any service connection to sewer mains 15 inch diameter or larger, or otherwise considered an interceptor, is prohibited, unless written approval is received from Castle Rock Water.

4.4.13.3 Cleanouts

Cleanouts shall be required on sanitary sewer service lines in accordance with the Town's Standard Details and in accordance with the IPC. Cleanouts shall be located at a maximum interval of 100 feet, at any horizontal deflection greater than 45 degrees, or change in grade, and five feet from the building in accordance with the IPC. Construction shall be such that no surface load will be transferred to the wye, 1/8 bend, riser pipe or service line. The cleanout diameter shall match the nominal diameter of the service line, and the surrounding grading shall insure that surface water does not accumulate around the cleanout. Cleanouts located in paved areas shall have traffic-rated covers. Castle Rock Water reserves the right to require the Owner to repair or relocate clean-outs to limit excessive infiltration and inflow.

4.5 Easements

Where mains cannot be installed in right-of-way, they shall be located within utility easements approved by the Town and shall be centered in the easement. All utility easements shall have a minimum width of at least two times the depth to the pipe invert. The minimum easement width shall be twenty feet for one utility, thirty feet for two utilities, and forty feet in width for three utilities. Site-specific circumstances may dictate the need for wider easements. Utility easements and dedicated utility tracts shall be defined by bearings and distances around the perimeter of the easement. Centerline legal descriptions are not acceptable.

All utility easements shall be for the exclusive use of the Town. No permanent structures, (e.g., retaining walls, trees, light pedestals, sign foundations, power poles, mailboxes, sheds, buildings, etc.), shall be placed in the easement. Any temporary structures placed in the easement, including paving and fencing, shall be removed and replaced by the Owner upon the request of Castle Rock Water so that maintenance may be performed. The Owner of the land shall agree to hold the Town harmless for any loss of property or landscaping removed from the easement or damaged due to maintenance activities, and all associated costs.

All utility easements shall meet the following minimum criteria to provide vehicular access for Castle Rock Water:

1. Maximum cross slope of four percent and a maximum longitudinal slope of ten percent.
2. No trees, large boulders, or permanent structures as defined above shall be placed within the easements.

3. Easements may not straddle residential property lines, but shall be placed adjacent or coincident with the property line, lying wholly within one property or the other. In limited cases, easements may straddle commercial property lines and will be reviewed by Castle Rock Water on a case-by-case basis.

4.6 Utility Easement Note Required on Plats

The following dry utility easement note shall be required on Preliminary Plats, Final PD Site Plans, and Final Plats approved by the Town.

“Unless otherwise noted, all lots shall have a ten-foot utility easement along the front and rear lot lines and along all public rights-of-way, and shall have five-foot utility easements along each side lot line. These utility easements are for the installation, maintenance and operation of utilities and drainage facilities including, but not limited to, electric lines, gas lines, cable television lines, fiber optic lines, and telephone lines, as well as perpetual right for ingress and egress for installation, maintenance and replacement of such lines. Dry utility crossings may be permitted in other utility or drainage easements provided the crossings are at a 90-degree angle. In all cases, prior approval from Town of Castle Rock Water Department shall be obtained for dry utility crossings of exclusive wet utility easements and exclusive drainage easements.”

4.7 Sand/Oil and Grease Interceptors

Sand/oil and grease interceptors shall be installed on service lines in accordance with the Plum Creek Wastewater Authority Code of Rules and Regulations.

4.8 Facility Upgrade Schedule

Wastewater treatment plants, lift stations, force mains and major interceptors shall be upgraded in accordance with the Colorado Department of Public Health and Environment Criteria under the following schedule:

When plant, lift station, force main, or interceptor reaches: 70%

capacity - Facility upgrade studies shall have begun

80% capacity - Facility upgrade design shall have begun

90% capacity - Construction of facility upgrades shall have begun

4.9 Underdrains

Connections from underdrains to the Town’s wastewater collection system are specifically prohibited, as set forth in Section 4.3 of these Criteria. Refer to the Town’s Storm Drainage Design and Technical Criteria Manual for design criteria pertaining to allowable connections to the Town’s storm drainage system.

Chapter 5 – Lift Station and Force Main Design Criteria

5.1 General

5.1.1 Scope

New lift stations are discouraged and shall only be allowed in those locations where there is no feasible way the development can be served by gravity extension of the Town's existing wastewater collection system. If it is determined that a lift station is required, the collection system to the lift station must combine as many basins as possible to increase the flows being lifted and to preempt the need for future lift stations within the same service area.

If permitted, the developer shall submit a complete set of design calculations and drawings to Castle Rock Water for review and approval in accordance with the Criteria set forth herein. Design, material, equipment, and construction of the facilities shall conform to all applicable local, State and Federal regulations, codes, and standards.

5.1.2 Castle Rock Water Review and Approval

New lift stations must be specifically approved by Castle Rock Water. If approved, the developer shall submit a utility report with a complete set of design calculations and drawings for review and acceptance by Castle Rock Water.

5.1.3 Relationship to Other Standards

Lift station designs shall satisfy all of the requirements of the Colorado Department of Public Health and Environment (CDPHE) and the Denver Regional Council of Governments (DRCOG). Castle Rock Water will require that the developer's engineer prepare the "Application for Site Approval" for submittal to the CDPHE and DRCOG.

5.1.4 Reference Design Documents

Primary standards and reference publications pertinent to the design of lift stations and force mains within the Town of Castle Rock are listed below. Unless otherwise specified, the latest editions shall apply. Also refer to the Reference Design Documents in Section 4.1 of these Criteria.

- Colorado Department of Public Health and Environment (CDPHE) Design Criteria for Wastewater Pumping Stations (Lift Stations)
- Denver Regional Council of Governments (DRCOG) Wastewater Utility Plan Guidance
- Recommended Standards for Water Works as published by the Water Supply Committee of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers

5.1.5 Location

The lift station shall be so located that the proposed site will meet the requirements for sanitary protection of water quality, hydraulics of the system, and protection against the interruption of service by fire, flood, or any other hazard.

5.1.6 Flood Protection

Lift station structures and the associated electrical and mechanical equipment shall be protected from physical damage by the 100-year flood, and shall remain fully operational and accessible during such an event. Local, State and Federal regulations pertaining to floodplain obstructions shall be satisfactorily accounted for in the design. Grading shall be provided to protect the site by directing surface flows away from the facilities.

5.1.7 Accessibility and Security

Lift stations shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys. Depending on the nature and location of the facility, security fencing with controlled entry keypads, card-reader access to buildings, security cameras, lockable access hatches, and motion-detection safety lighting may be required by Castle Rock Water. All lock sets shall have compatible key-ways in compliance with the Town's current system.

5.1.8 Grit

Where it is necessary to pump wastewater prior to grit removal, the design of the wet well and lift station piping shall receive special consideration to avoid operational problems from the accumulation of grit. If grit accumulation is anticipated as a result of initial low flow conditions, consideration shall be given to temporary concrete fill in the wet well areas subject to grit deposition, or the provision of temporary baffle walls to reduce the effective area of the wet well until the wastewater influent has sufficiently increased.

5.1.9 Station Ventilation

Adequate ventilation at lift stations shall be provided to mechanically ventilate the dry well, and if screens or mechanical equipment requiring maintenance or inspection are located in the wet well, it shall also be mechanically ventilated. There shall be no inter-connection between the wet well and dry well ventilating systems. In pits over 15 feet deep, multiple inlets and outlets are required. Dampers should not be used on exhaust or fresh air ducts and fine screens or other obstructions in the air ducts should be avoided to prevent clogging. Switches for the operation of ventilation equipment should be clearly marked and conveniently located. Consideration should be given to automatic controls where operations may be intermittent.

Where excessive moisture or low temperatures are a concern, consideration shall be given to installation of heating and/or dehumidification equipment. If mechanical wet well ventilation is required it should be continuous and provide for at least twelve

complete air changes per hour. Ventilation in dry wells may be either continuous or intermittent. For continuous operation, at least six complete air changes per hour shall be provided. For intermittent operation, at least thirty complete air exchanges per hour shall be provided. A system of two speed ventilation with an initial ventilation rate of thirty changes per hour for ten minutes and automatic switch-over to six changes per hour may be used to conserve heat. The air change requirements shall be based on 100 percent fresh air.

5.1.10 Odor Control

Unacceptable levels of odors may be produced at lift stations and within force mains due to excessive hydrogen sulfide generation. At a minimum, every lift station shall be designed to accommodate the necessary storage tanks and automatic chemical feed equipment required for odor control and treatment.

5.2 Minimum Lift Station Design Criteria

The following design criteria shall be applicable to lift stations:

1. Lift stations must be equipped with instrumentation and SCADA equipment to collect and transmit all relevant data as stipulated in these Criteria.
2. Backup electrical power provided by a diesel or natural gas generator with an automatic transfer switch in an all-weather enclosure shall be provided to insure that all lift station components function properly for a period of at least one week in the event that the primary power is lost. Electrical power to the lift station site shall be underground. In addition, an emergency overflow basin shall be provided that will accommodate a minimum twelve hours of storage at ADF. The basin shall be designed and configured to allow for complete draining after an overflow event, either by gravity or submersible sump pumps permanently installed in the basin. See Section 5.4 below.
3. Lift stations shall include a wet well sized to reduce the cycling of the pumps and the settling of solids from the flows. Wet well capacity shall provide a holding period not to exceed thirty minutes for the design minimum flow, and for a holding period of at least five minutes at the PDF. In addition, an emergency overflow basin shall be provided that will accommodate a minimum twelve hours of storage at ADF at build-out. The basin shall be designed and configured to allow for complete draining after an overflow event, either by gravity or submersible sump pumps permanently installed in the basin. See Section 5.4 of these Criteria.
4. A corrosion protection system shall be applied to, and shall completely cover all interior surfaces of wet wells, and any in-line vaults or manholes that precede the wet well. The system shall be specifically designed to protect concrete from hydrogen sulfide attack, and shall be Sikagard 62 or equal.
5. All lift station wet wells shall be considered an explosion hazard. All electrical equipment and wiring installed therein shall be approved for use in a Class I, Division 1, Groups C&D environment, in accordance with all applicable Articles of the NEC, in particular Articles 500 through 517. All devices used in Class I, Division 1, Groups C&D areas must have visible manufacturer installed nameplates specifically stating the Class, Division and Group for which the device is approved.
6. Installation of suitable devices for measuring, recording and totalizing sewage influent and effluent flow and power consumption shall be included.

7. The lift station design shall consider changes in flows over the life of the station and allow for proper operation of the station and force main throughout the intended design life.
8. Lift station upgrades shall follow the following schedule in accordance with CDPHE Criteria:

When lift station capacity reaches:

70% capacity - Station upgrade studies shall have begun 80%

capacity - Station upgrade design shall have begun 90%

capacity - Construction of station upgrade shall begun

9. Where high groundwater conditions are anticipated, buoyancy of the lift station structures shall be evaluated and protected against.
10. Construction materials shall be selected that are appropriate for long-term exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. This is particularly important in the selection of metals and paints. Contact between dissimilar metals should be avoided or other provisions made to minimize galvanic corrosion.
11. Access hatches and ingress and egress provisions shall be approved by Castle Rock Water, and shall comply with all applicable OSHA regulations associated with confined spaces.
12. The lift station shall include a wet well bypass-to-overflow basin to allow the wet well to be temporarily removed from service for maintenance.

5.3 Pump Equipment and Protection

The type of pumping equipment to be installed in the lift station will be influenced by the interim and ultimate capacity of the station and an evaluation of the period of time that the service of the station will be required. For wastewater lift stations with an ultimate rated capacity of 1 MGD or less, Castle Rock Water will consider the use of either self-priming suction lift pumps, or a wet well / dry well configuration using submersible pumps in the dry well. For stations with an ultimate capacity in excess of 1 MGD, only a wet well / dry well self-priming configuration will be accepted.

Submersible pumps in wet wells will be considered by Castle Rock Water on a case-by-case basis.

5.3.1 Pump Characteristics

1. Pumps shall be explosion proof, and shall be able to pump the projected PDF for all existing and proposed development flows to be conveyed to the site.
2. Primary and secondary (backup) level control equipment for the operation of the pumps shall be provided. Primary level control shall be by a bubbler system with an Ultrasonic system as a secondary backup. Where such systems are electrical (e.g. float switches), they shall be approved for a Class I, Division 1, Groups C&D environment in accordance with all applicable Articles of the NEC.
3. The lift station shall be provided with multiple pump units programmed to alternate sequentially. Should only two units be provided, equal capacity is required, and each pump train shall be capable of handling the PDF. A third identical pump and motor shall be provided on a pallet for replacement in case of the failure of an installed

pump and motor. Where three or more pumps are provided, they shall be individually sized to meet the PDF with any one pump out of service, and as appropriate for actual flow conditions under normal operations.

4. The station shall be designed such that the number of motor starts per hour shall not exceed ten, or the number of starts recommended by the motor manufacturer, whichever is less. Duplex pump operation and controllers shall be provided such that the lead and lag pump positions are alternated with each successive motor start.
5. Provisions acceptable to Castle Rock Water shall be made to facilitate the removal of pumps, motors, and other mechanical and electrical equipment. Typically, in wet well / dry well stations, a bridge crane shall be provided for removing pumps. In suction lift stations, slide or overhead rails with hoists for removing pumps shall be provided.

5.3.2 Pump Protection

Pumps handling raw wastewater shall be preceded by approved comminutors (a.k.a.: grinders or macerators) that are installed to protect the pumps from clogging damage by reducing the particle size of wastewater solids in the flow stream. The grinder shall be located in a lined vault or manhole that precedes the wet well. Raw wastewater approaching the lift station flows through the comminutor vault influent channel equipped with the grinder. In the event that the grinder must be taken out of service, slide gates shall be provided to direct the influent flow to a bypass bar screen. Furthermore, in the event that flow backs up upstream of the grinder, the influent channel wall shall be equipped with an overflow notch just upstream of the bar screen. Bar screens shall be stainless steel, and shall be arranged to facilitate manual cleaning of the bar screen with a rake to be provided.

5.4 Overflow Basins

Overflow basins for lift stations shall be sized to contain the volume of twelve hours the Average Daily Flow at build-out. The basin shall be designed and configured to allow for complete draining after an overflow event, either by gravity or submersible sump pumps permanently installed in the basin. Basins shall be designed to include a vault or manhole outside the overflow basin to facilitate the complete removal of any liquid that accumulates in the basin, and shall require the installation of a pipe between the basin and vault, with positive slope to the vault. A pump-back or gravity system shall be included in the lift station design to return wastewater to the wet well.

Any lighting and electrical equipment within the overflow basin shall be approved for a Class I, Division 1, Groups C&D environment in accordance with all applicable Articles of the NEC. Odor control, ventilation, and provisions for necessary alarms shall be evaluated and considered in the design as appropriate.

5.5 Force Main Design Criteria

5.5.1 Pipe Materials

Force main pipe materials, including restraint devices and fittings, shall be in conformance with Town Criteria for potable water mains. All DIP sanitary sewer force main materials shall be lined with Induron Protecto 401 Ceramic Epoxy, or an equivalent product as approved by the Town. If high levels of hydrogen sulfide gas are anticipated, potable water grade PVC shall be used in lieu of lined DIP, unless the use of DIP is approved by Castle Rock Water as a result of adequate justification by the engineer.

5.5.2 Velocity and Pipe Diameter

Sanitary sewer force mains shall be a minimum of four inches in diameter. At the design-pumping rate (initial and ultimate), the velocity shall be at least three FPS, but not more than seven FPS. The design-pumping rate shall be based on the PDF.

5.5.3 Pipe and Design Pressure

Force main pipe materials shall be in accordance with Town Criteria for potable water mains. The force main, joint restraint, thrust blocking, and station piping shall be analyzed and designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift station pumps. Water hammer shall be evaluated for the normal operation of the lift station, as well as for a power outage while the pumps are running. The modulus of elasticity of the pipe material shall be considered when evaluating water hammer effects and cyclical loadings. At a minimum, the following shall be addressed in the analysis to be submitted for approval by Castle Rock Water:

1. Transient pressures due to water hammer and the effect of these pressures on the entire system
2. Cyclical loading of the force main
3. Evaluation of the pipeline profile to determine the possibility of column separation
4. Reverse rotation characteristics of the pumps
5. Shut-off characteristics of all proposed control valves, including check valves
6. Substantiation for the use of surge control valves and other surge protection devices, when necessary, listing recommended size and computed discharge pressures

All elements of the piping system must be designed to withstand the maximum water hammer, in addition to the static head and cyclical loading. A safety factor of 1.5 shall be used when determining the adequacy of all piping system components with regard to withstanding system pressures.

5.5.4 Pipe Separation from Water Lines

Sanitary sewer force main separation distances and clearances to other utilities shall conform to those established for gravity sanitary sewers in Section 4.4.4.2.

5.5.5 Shutoff and Check Valves

Suitable shutoff and check valves shall be placed on the discharge line of each pump. Shutoff valves shall be full flow, gear-operated plug valves, with indicator and hand wheel. The check valve shall be located between the shutoff valve and the pump and will prevent reverse flow (or siphoning) from the force main back into the lift station wet well. Check valves shall be suitable for the material being handled and shall be placed on the horizontal portion of discharge piping except for ball checks, which may be placed in the vertical run. Valves shall be capable of withstanding operational design pressures and water hammer.

All shutoff and check valves shall be operable from the floor level and accessible for maintenance. Outside levers are required on swing check valves.

5.5.6 Isolation Valves

Isolation valves shall be installed at intervals no greater than 1500 feet along force mains, and shall be full-port plug valves.

5.5.7 Combination Air Release and Air/Vacuum Valves

Combination air release and air/vacuum valves shall be located at force main high points, on pump discharge piping as close as possible to the check valve, and between isolation valves. During the design, the engineer shall consider the economics of air valve installation against the installation of deeper force main piping. The evaluation shall take into account the installation and long-term maintenance costs of the air valves. The valves shall be specifically designed for wastewater service and be sized per the manufacturer's recommendations. Air valves on force mains shall be contained in a vault and vented above ground. A manually controlled isolation valve suitable for wastewater service shall be installed between the force main and air valve.

5.5.8 Drain Valves

When required by the Town, the engineer shall include at least one force main dewatering connection at the lift station and additional drains at other major force main low points. The design shall consist of as few low points along the force main as is practically possible. Drains shall generally include a plug valve installed on a tee and drain piping to an existing sanitary sewer manhole, or to a separate manhole that can then be pumped by Town personnel. Provisions shall be made to drain the force main back to the wet well.

5.5.9 Pig Launching and Retrieval Stations

Pig launching and retrieval stations shall be incorporated into the force main design in accordance with the Town's Standard Details and shall be submitted to Castle Rock Water for review and approval. The design shall be such that the launching and retrieval points are located in manholes or vaults, and can be isolated from the force main with isolation valves. A flanged wye or other approved fitting shall be provided at the launching point, and the retrieval station shall be such that the accumulated material dislodged from the force main may be conveniently removed and disposed of

by the Town. A potable fire hydrant shall be provided in the vicinity of the launching station that shall serve as a launch-water supply point.

5.5.10 Termination

Force mains shall transition into the gravity sewer system at a dedicated manhole. The connection of the force main to the manhole shall be made by connecting the force main to a short section of gravity main stubbed out from the manhole. The gravity stub shall be a size that is equal to or larger diameter pipe than the force main, and shall be installed at an elevation that will prevent wastewater from discharging back into the force main when the gravity system is flowing full. The manhole interior shall be coated for protection against hydrogen sulfide corrosion. The manhole and its opening shall be oversized to permit retrieval of cleaning pigs and ancillary equipment. The manhole at the discharge point shall not be an in-line gravity manhole.

5.5.11 Identification

Minimum identification requirements for force mains shall consist of tracer wire and warning tape as required for potable water mains, and green marked polywrap for ductile iron pipe. The warning tape shall be labeled, "Wastewater Force Main".

5.6 Site Improvements

5.6.1 Property

5.6.1.1 Property Dedication

1. In order for Castle Rock Water to operate and maintain the lift station and associated facilities, adequately sized parcels shall be reserved by the developer at appropriate locations approved by Castle Rock Water. Lift station sites, including utility easements, will not be considered as part of the Town's public use or open space land dedication requirements.
2. Site selection for lift stations shall address all local, State and Federal regulations, including skyline, ridgeline, noise issues, order control and ventilation measures, endangered species, and impacts to waters of the United States (Corps of Engineers).

Applicants must supply the following property information:

- a. Legal Description (conducted by a Professional Licensed Surveyor)
- b. Zoning
- c. Easement Provisions
- d. Dedication to Town of Castle Rock (property and facility/structure(s) shall be deeded to the Town)
- e. Address for billing purposes.

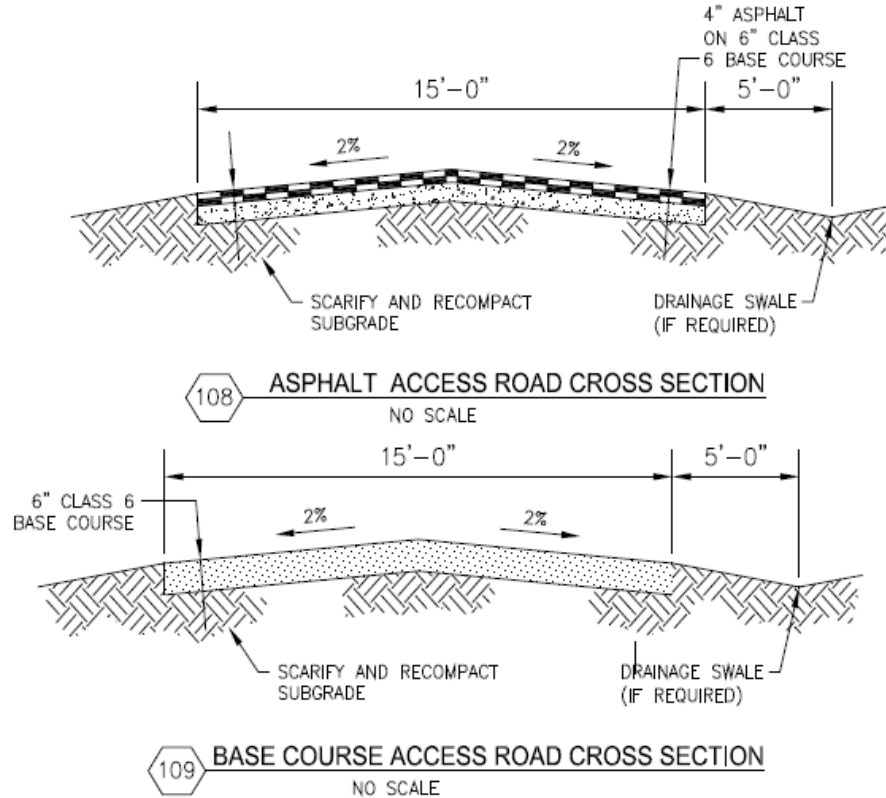
5.6.1.2 Site Configuration

1. The site shall accommodate facility layout for all current and future lift station facilities, odor control and ventilation facilities, enclosures, piping, buildings, driveways, electrical & control cabinets, generators, transformers, and

- appurtenant facilities.
2. Site layout shall accommodate outside high-voltage transformers.
 3. The size of the site is dependent on the type of facility. The proposed site shall be approved by Castle Rock Water during the development review process. The minimum size and configuration of the site shall be that which will allow for efficient operation by Castle Rock Water.

5.6.2 Site Amenities

1. Water service connection, meter, and backflow prevention shall be provided in compliance with Castle Rock Water and Cross-Connection Control requirements.
2. Screening, landscaping and irrigation system design (temporary and permanent) shall conform to the Town's Landscape and Irrigation Design Criteria Manual and Water Use Management Plan Criteria. Landscaping shall not hinder access, operations or maintenance of the facilities.
3. An exterior yard hydrant shall be supplied from the potable water system, including the service tap, metering equipment and required backflow prevention assemblies.
4. Site drainage shall conform to the Town's Stormwater Drainage Design and Technical Criteria Manual.
5. Access roads shall be a minimum of 15 feet wide with a clear width of twenty feet to accommodate maintenance and emergency vehicles. Access roads shall have a maximum longitudinal slope of ten percent and a maximum cross-slope of two percent. A minimum radius of 250 feet to the road centerline shall be provided to accommodate a 65-foot tractor-trailer truck and the Town's largest vacuum truck. The road surface shall be Class 6 Aggregate Base Course or asphalt, depending on slope, location and configuration. Materials and compaction shall conform to Town Criteria. Typical access road cross sections are displayed on the following page.



6. Fencing shall be provided for site delineation and security of the facilities as directed by Castle Rock Water. Access gates shall be provided to accommodate standard trucks and large maintenance vehicles, including tractor trailers, and shall include entry equipment commensurate with the level of security necessary at the site. Fencing materials, height and style shall be selected as appropriate to blend into the surrounding neighborhood design, and shall be subject to Castle Rock Water approval.
7. Consideration shall be given to private architectural control, including homeowner association and/or metropolitan district criteria; however, Town Criteria shall govern over private development guidelines or requirements.

5.7 Supervisory Control and Data Acquisition System (SCADA)

5.7.1 Scope

The SCADA system shall be designed and installed to monitor certain types of facilities throughout the Town. This chapter provides general specifications for the equipment and materials necessary to design the required controls telemetry and instrumentation features at the applicable facilities. Equipment shall include all control components including, but not limited to, sensing elements, transmitters, receivers, controls alarms, indicators, totalizers,

monitoring panels, radio or microwave equipment and all other items necessary to provide a complete and operational system. The resulting system shall be operationally reliable on a continuous basis and require minimum maintenance efforts. The system shall provide for long-term cost-effective operations, and shall be generally uniform from one facility to the next in appearance, materials and equipment.

5.7.2 Purpose and Rationale of the SCADA System

The primary purpose of the SCADA system is to provide Castle Rock Water with a means to monitor, control and operate a large-scale utility system with Castle Rock Water staff. The widely-varied topography throughout the Town has necessitated complex utility systems that must be fine-tuned on a regular basis to optimize the management of the Town's resources.

The secondary purpose of the SCADA system is the collection and archiving of operational data. The ongoing collection of data gives the Town the ability to analyze information that is specific to the region, and to more accurately plan for future growth.

5.7.3 General Design Criteria

5.7.3.1 Design Responsibility

The controls and instrumentation staff of Castle Rock Water shall be responsible for the coordination and execution of the design, adjustment, calibration and start-up of all control and instrumentation systems. The developer and engineer shall meet and work with Castle Rock Water staff to provide a working system that can perform all the functions as outlined herein.

5.7.3.2 Programming

All new programming shall be completed by Castle Rock Water staff working with the current Town consultant, as specified by Castle Rock Water. As new facilities are added to the system, the central computer shall be programmed to control and display these facilities, and to report back a variety of operational status information as set forth in these Criteria. The developer is responsible for integrating SCADA using a method approved by Castle Rock Water.

5.7.3.3 Base Standards to be Met

1. All ASTM Standards with latest revisions.
2. Federal Occupational Safety and Health Administration (OSHA)
3. International Building Code (IBC)
4. International Mechanical Code (IMC)
5. International Plumbing Code (IPC)
6. National Electrical Code (NEC) (ANSI C1) (National Fire Protection Association No. 70)
7. National Electrical Safety Code (ANSI C2) (National Bureau of Standards – H30)
8. American National Standards Institute, Inc. (ANSI)

9. National Electrical Manufacturers Association (NEMA)
10. Institute of Electrical and Electronics Engineers (IEEE)
11. Insulated Power Cable Engineers Association (IPCEA)
12. Underwriter's Laboratories (UL)
13. Lighting Protection Code (ANSI C5.1) (NFPA No. 78) (LPI 1975)
14. Instrument Society of America (ISA)

5.7.4 Minimum Facility Design Requirements

5.7.4.1 General

All wastewater lift stations, flow measuring stations, and stand-alone grinder facilities shall have SCADA telemetry and all associated instrumentation installed or accounted for in conjunction with the initial construction of the facility. All SCADA units shall be intelligent, and be capable of isolated automatic operation. All necessary communication hardware and software shall be included to transmit the control signals to the appropriate central computer via the Town's 900 MHz radio network. The telemetry and instrumentation installation shall include all associated equipment such as power, radio connections, wireless network connections, phone connections, telemetry control programming, visible and audible signals, readouts and alarms, and all associated enclosures. All telemetry elements, except antennas, shall be installed within a building or appropriate weather-proof enclosure.

5.7.4.2 Wastewater Lift Station Instrumentation

1. Facility Monitoring and Control Function:

- a. Inlet flow rate
- b. Control of pumps based on wet well level
- c. Run signal for each pump
- d. Pumping rate in GPM for each pump
- e. Totalized flow in MG for the lift station
- f. Level indicators for wet well
- g. Discharge pressures for each pump
- h. Elapsed pump run time in hours
- i. Real-time kilowatt demand
- j. Peak kilowatt demand during billing cycle
- k. Lead/lag pump configuration controls
- l. Control logic for alternating redundant pumps
- m. Totalized number of pump cycles for each pump
- n. Generator run signal
- o. Security cameras

2. Facility Alarms:

- a. High/low wet level alarms
- b. High/low discharge pressure alarms
- c. Pump failure alarm
- d. High/low building temperature alarms

- e. Bearing high temperature alarm for each pump bearing
- f. Motor winding high temperature alarm for each pump
- g. Building intrusion alarm
- h. Water on the floor alarm
- i. Fire/smoke alarm
- j. Power failure alarm
- k. Electrical ground-fault alarm



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